Wolfgang Gubisch

Mastering Advanced Rhinoplasty

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With contributions by Helmut Fischer

Springer

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ISBN 978-3-319-67536-7 ISBN 978-3-319-67537-4 (eBook)

https://doi.org/10.1007/978-3-319-67537-4

Library of Congress Control Number: 2017956916

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Dedicated to Reny, Simon and Philipp, without whose patience, understanding and support, I might never had completed this project.

Preface

The nose is a distinctive facial feature of immense aesthetic importance in the center of the face. Attention focuses on the eyes in an attractive human face but quickly diverts to an unattractive or unnaturally shaped nose. To achieve optimal facial beauty, therefore, the nose must fit harmoniously and inconspicuously into the face. The nose is important to more than facial beauty, however; it is also an important sensory organ vital to one of the essential functions of life: breathing. For this reason, the significance of the nose has been respected in all cultures since ancient times—its amputation has long been used as a severe form of both physical and psychological punishments.

The ultimate objective of aesthetic rhinoplasty is to create a harmonious and natural-appearing nose that assimilates into the surrounding face with no visible signs of previous surgery. Of course, the functional aspects must also be respected, and the patient needs to be able to breathe comfortably and without restriction. Only then can the surgical result be considered a success.

In the early years of aesthetic rhinoplasty, nasal reduction procedures were the first improvements patients sought. In all probability, the German surgeon Dieffenbach performed the first nose reduction, employing a direct surgical approach in which he incised the whole dorsum to reduce the underlying skeletal framework. He was the successor to Ferdinand von Graefe who first started nasal reconstruction at a university clinic in Europe. Even though the first closed rhinoplasty was performed by Rowe who published this operation in 1887 in New York, in 1898 Jacques Joseph—today accepted as the godfather of rhinoplasty on both sides of the Atlantic—performed the first total nasal reduction, not knowing about his colleague's prior operation in North America. Although these colleagues were unaware of Dieffenbach's operation in 1845, in the more than 100-year history of standardized rhinoplasty, this procedure has become the most common surgical procedure in aesthetic surgery. Further, while a successful rhinoplasty may have enormous beneficial impact, every surgeon must be aware that a failed rhinoplasty leaves the patient with a facial deformity that cannot be concealed. For this reason, every rhinoplasty surgeon bears an enormous responsibility for the psychosocial well-being of the patient. Unfortunately, there are now many surgeons who lack sufficient training or experience in this challenging field and who perform cosmetic nasal surgery primarily for economic gain. In 2009, rhinoplasty was the number one aesthetic operation in men. Nearly 70,000 men in the United States underwent the operation. In women, rhinoplasty was the second-most common aesthetic procedure after breast augmentation. Nearly 180,000 American women had their noses changed by this surgical procedure. The same tendency can be seen in Europe and elsewhere. It is therefore not surprising that of all aesthetic procedures, rhinoplasty has one of the highest rates of patient dissatisfaction. Indeed, according to the recent medical literature, rhinoplasty failure rates are estimated at 30 %, and future increases are likely.

There are already many books, some of them excellent, on the market. However, only a limited number of rhinoplasty textbooks deal with secondary rhinoplasty. Presently, complex secondary rhinoplasty accounts for approximately 50 % of my practice, and the demand for revision rhinoplasty is increasing worldwide. A greater understanding of the complex nuances of revision rhinoplasty is needed.

I have been operating on noses since 1976. With my medical background—double-boarded in plastic surgery and ENT—I am highly specialized in the field of rhinoplasty.

In 1980, I performed the first extracorporeal septal reconstruction, developing this technique into a standard procedure for the severely deformed septum. Over a period of about 20 years, I used the closed approach for extracorporeal septoplasty, which I had recommended for much of my early career. For this reason, I was invited to several meetings, where there was always considerable emphasis and controversy regarding the preference for the open versus closed rhinoplasty approach. Although I was always invited as a representative of the closed approach, thanks to these many discussions I slowly began to appreciate arguments in favor of the open approach. Ultimately, it was the influence of Gilbert Aiach, the famous French rhinoplasty surgeon, that prompted a complete change of mind in this regard. Now we too almost exclusively use the open approach. This procedure is more precise with regard to both the analysis and the surgical procedure itself, and it helps to avoid problems that commonly arise with the closed technique, such as an unexpected drooping of the tip. Furthermore, precision increases safety and enhances quality. I personally think that the open rhinoplasty approach prevents numerous complications that would otherwise require revision surgery.

Furthermore, the open surgical approach enables us to perform many other useful rhinoplasty techniques with greater accuracy, such as the sliding technique (which we published in 2004) or the spreader flap technique for widening the inner valve. Although the spreader flap technique can also be used in a closed technique, as with the extracorporeal septoplasty, the closed approach is much less predictable and less reproducible relative to the open approach.

Finally, for many years, colleagues from all over the world who attended our Stuttgart courses on functional and aesthetic rhinoplasty have been encouraging me to publish our experience in this challenging and complex field. So finally I present this atlas, with a view to sharing our techniques and to helping all interested colleagues master the ever-challenging demands of secondary rhinoplasty.

I would like to express my sincere thanks to Rollin Daniel who encouraged me to start this project and who greatly supported me in achieving this goal. Furthermore, I am extremly grateful to Rick Davis for translating my Suebian English into an understandable American one without his support and help this book would not have been published.

My deep thanks go to Helmut Fischer who wrote chapters 3 and 4. He has been working with me for many years and stimulated me with a lot of new ideas. I am very grateful for the regular discussions about rhinoplasty problems with him, which increased the level of our work a lot!

Last but not least, I want to thank the many patients who graciously permitted use of their clinical photographs for publication in this rhinoplasty atlas. Because of their generous support, readers will undoubtedly gain a much clearer understanding of this challenging and often vexing operation. I will always be grateful for their selfless and valuable contribution.

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W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_1

1.1 Surgical Principles in Primary Septoplasty

The septum is the central part of the framework of the nasal skeleton. It is partially cartilaginous, partially bone. It is also perhaps the most underestimated and neglected structure of the nose. In a review of 469 of our own rhinoplasties performed in 2009, 198 procedures were found to be revision cases. One hundred and fifty-three of these revision cases (77.2 %) required surgical correction of a residual septal deformity that created a negative functional and aesthetic outcome. And whereas the functional importance of the nasal septum is often appreciated, its importance to the aesthetic outcome of surgery is often greatly underappreciated. As a consequence, failed cosmetic and functional surgeries are increasingly common.

Only a straight septum will permit the nose itself to remain straight. This is particularly true for the so-called septal "L-strut," the L-shaped outer septal perimeter composed of both the dorsal and caudal segments. Unfortunately, the technical solutions and advice given in textbooks for septoplasty are often difficult to translate into reliable clinical results. For example, the scoring technique as well as the expectation that the scoring technique will keep a septum straight by releasing the unbalanced tension lines often does not work. Therefore, in addition to straightening the septum, it must also be properly supported and secured after scoring. For this reason, in all cases in which we release the septum from the premaxilla, for example, to take out a spur or to shorten the vertical length of the caudal septum, we make a drill hole through the anterior spine (◘ Fig. 1.1a) and fix the caudal septum with at least three stitches to keep the cartilage anchored to different parts of the spine (◘ Fig. 1.1b). Moreover, if we feel that scoring will help to straighten the septum, we always apply a splint of ethmoid bone to keep the scored cartilage straight during the healing process (◘ Fig. 1.2).

Following the classification of Bahman Guyuron, the ultimate objective is a straight septal framework. If the central part is bent but the L-strut is still straight, it is relatively easy to remove the deviated segment, straighten it, and put it back. However, if the dorsal strut is straight but the caudal septum is deflected (i.e., the L-strut is bent), it may be difficult to achieve a completely straight septum without reconstructing the L-strut. There are two options to solve this problem: a less difficult one that preserves the straight part and takes out only the deformed segment (◘ Fig. 1.3; see Case 3) or a more complicated procedure that involves taking out the entire septal framework, called an *extracorporeal* septal reconstruction (◘ Fig. 1.4). The latter option means that the whole septum is removed, preferably with the bony and the cartilaginous segments in one piece. By measuring the original length of the dorsum as well as of the anterior border of the septum, straight segments with the required dimensions can be sought for reconstruction. Frequently, there is a straight segment located at the bony cartilaginous junction that measures between 30 and 35 mm. This can be used as the new dorsum. Typically, the anterior border measures between 18 and 20 mm, and a separate straight replacement piece can also be found. However, if a straight segment with the required dimensions is unavailable, the remaining bent segments can be straightened by "laminating" reciprocally bent pieces to balance the deflection. In all cases of an extracorporeal septoplasty, spreader grafts are inserted to keep the dorsal septum straight and to simultaneously support the internal nasal valve (◘ Fig. 1.5).

A precise fixation of the replanted septum is essential for the success of the procedure. First, it is essential to suture the reconstructed septum to the upper lateral cartilages (◘ Fig. 1.6) and in most cases to the nasal bones as well (◘ Fig. 1.7). However, in noses with long upper lateral cartilages, it is often sufficient to only fix the replant to the upper lateral cartilage. Conversely, in cases with long nasal bones and short upper lateral cartilages, fixation to the nasal bones is a must (◘ Fig. 1.7). This first requires drilling perforations in the nasal bones to permit placement of mattress sutures.

Recently we developed two additional techniques for securing the reimplanted septum back to the bony vault. With our previously described technique, it was sometimes difficult to find the opposite drill hole when passing the suture through the reimplanted septum. Therefore, we now use what we call the "crisscross" technique. With this method, we drill a hole through the distal nasal bone on the right side and then pass the suture obliquely through the reimplanted septum until it emerges from the contralateral ULC. We then drill a hole through the distal left nasal bone and repeat the process. In this manner, the reimplanted septum is securely fastened at the keystone area with a crisscrossing mattress suture where we begin the suture fixation (◘ Fig. 1.8).

If the nasal bones are too short to permit access for drill hole placement, my collegue Sebastian Haack suggested to create osseous drill holes using a percutaneous technique called the "transcutaneous-transosseous-cerclage technique" (TTC-technique). The drill holes are created by mounting the hub of an 18-gauge needle over a cylindrical drill bit and then penetrating the skin with the needle before drilling through both nasal bones and the reimplanted septum with a single pass (◘ Fig. 1.9). The needle is then left in position but disconnected from the drill, and a 4-0 PDS suture is fed retrograde through the needle tip until it emerges from the needle hub. The needle is then removed leaving the suture in place, and a small hook is passed subcutaneously to retrieve the suture tails from beneath the skin flap. The suture is then tied over the bony dorsum to immobilize the reimplanted septum leaving the suture buried subcutaneously.

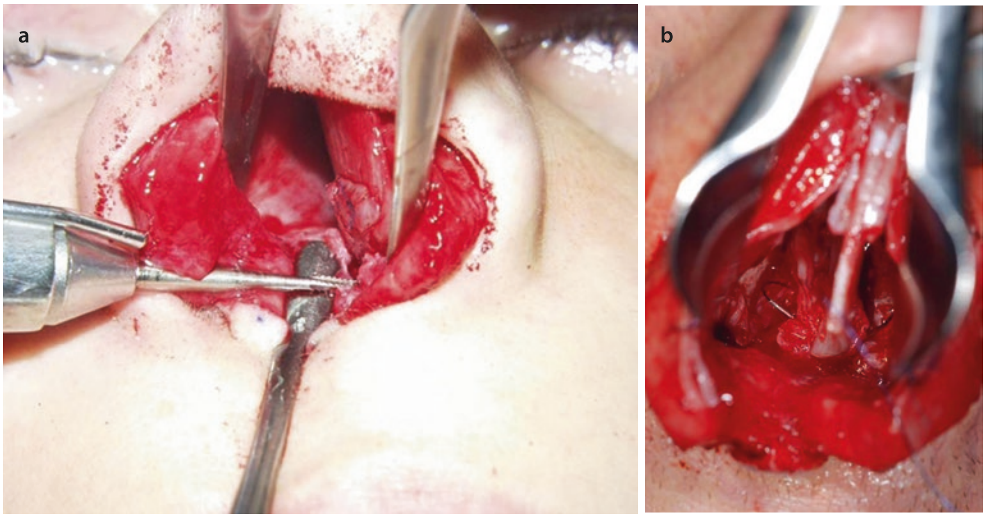


Fig. 1.1 (**a**) Drilling a hole through the anterior nasal spine (ANS) with a Lindemann fraise. (**b**) Fixation of the septum to the anterior nasal spine via a transverse bony drill hole

After secure fixation of the septum to the nasal dorsum, the caudal septum is stabilized in a longitudinal groove, which is drilled to the anterior spine. Before fixation, precise adaptation of anterior septal length is established by trimming excess cartilage from the base of the caudal septum. Only then is the septum fixed to the anterior spine through a transverse drill hole placed through the nasal spine, resulting in safe and reliable immobilization (Fig. 1.1).

Before fixation of the replanted septum to the anterior nasal spine is performed, it must be confirmed that the spine rests in the anatomic midline. If this is not the case, treatment depends on whether the spine is wide and broad enough to permit partial resection on one side so that the remnant is positioned in the midline (Fig. 1.10). If so, the caudal septum can be successfully secured to the spinal remnant. In cases where the anterior spine is dislocated by more than 2–3 mm, we amputate the spine with a Lindemann burr, reposition the bony fragment onto adjacent bony structures, and secure the fragment with microscrews and microplates (Fig. 1.11). However, in such cases it is often difficult to fixate the caudal septum to the repositioned nasal spine, making it necessary to fix the septum directly to the microplate (Fig. 1.12).

In severely deformed noses, there can be problems with minor dorsal irregularities because concurrent osteotomies are often needed to straighten the bony nasal pyramid. Camouflage can be accomplished with different onlay grafts such as reinsertion of a modified dorsal hump (Fig. 1.13), morselized cartilage (Fig. 1.14), free transplanted diced cartilage (FDC) (Fig. 1.15), or a fascia graft, either autogenous or allogenic (Fig. 1.16). The graft should cover the whole dorsum to create a smooth and uniform surface.

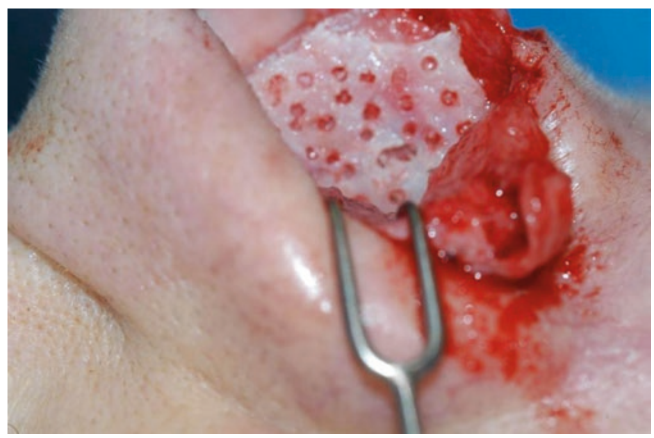


Fig. 1.2 Splinting of the scored septum using the perpendicular ethmoid plate

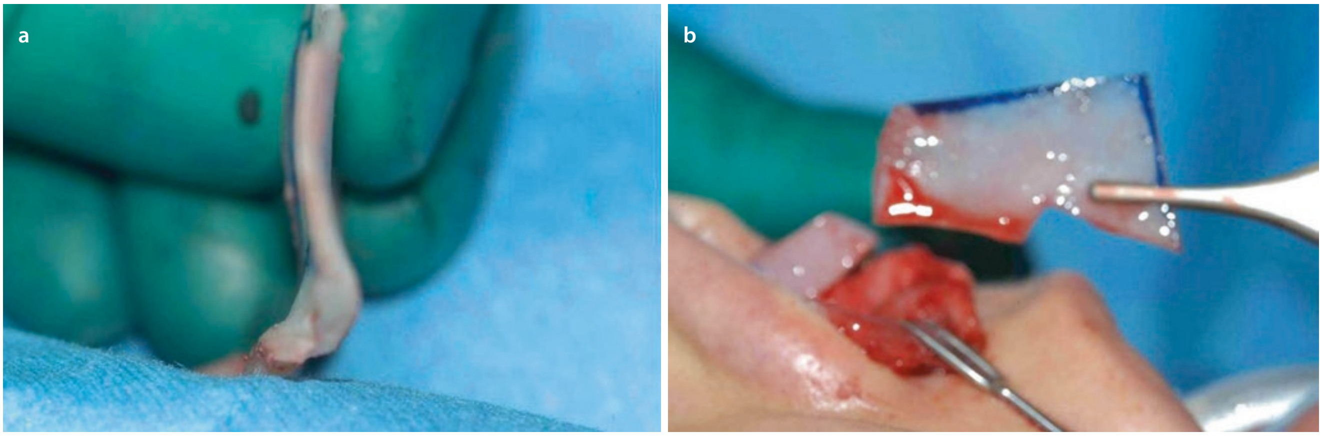


Fig. 1.3 (**a**, **b**) Endonasal septal correction with reinsertion of straight segment

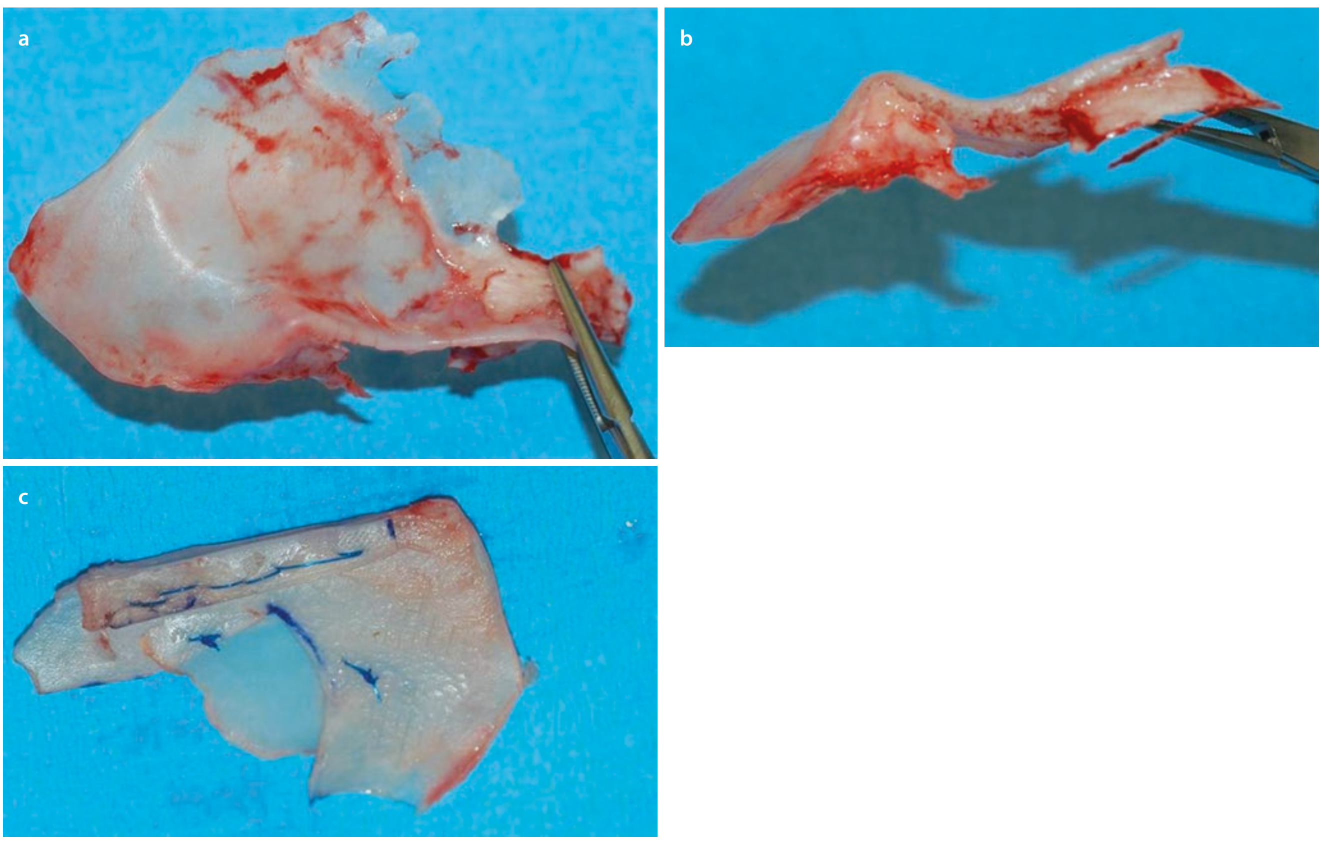


Fig. 1.4 (**a**–**c**) Explanted severely deformed septum

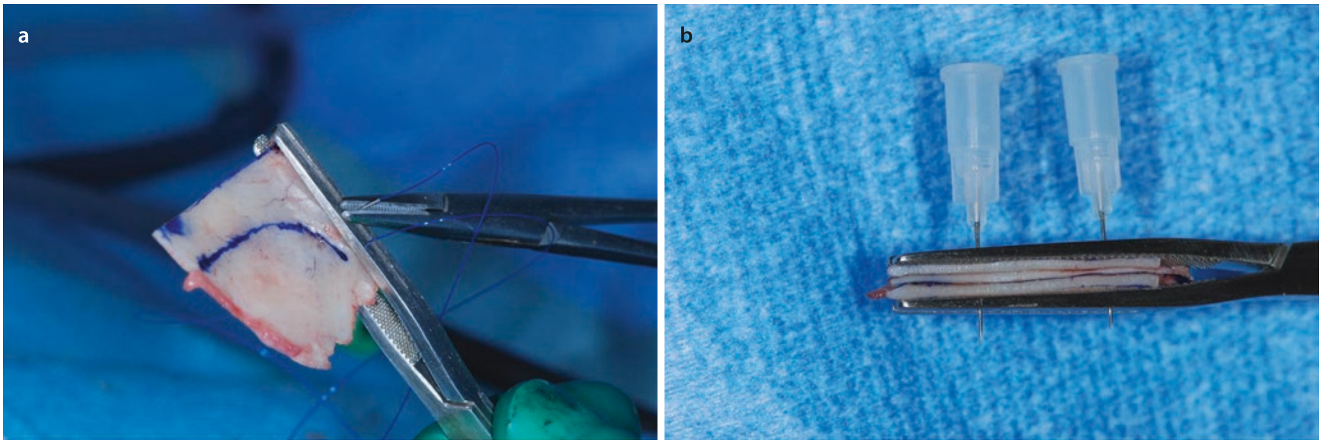


Fig. 1.5 (**a**, **b**) Creation of L-shaped neoseptum fixing spreader grafts

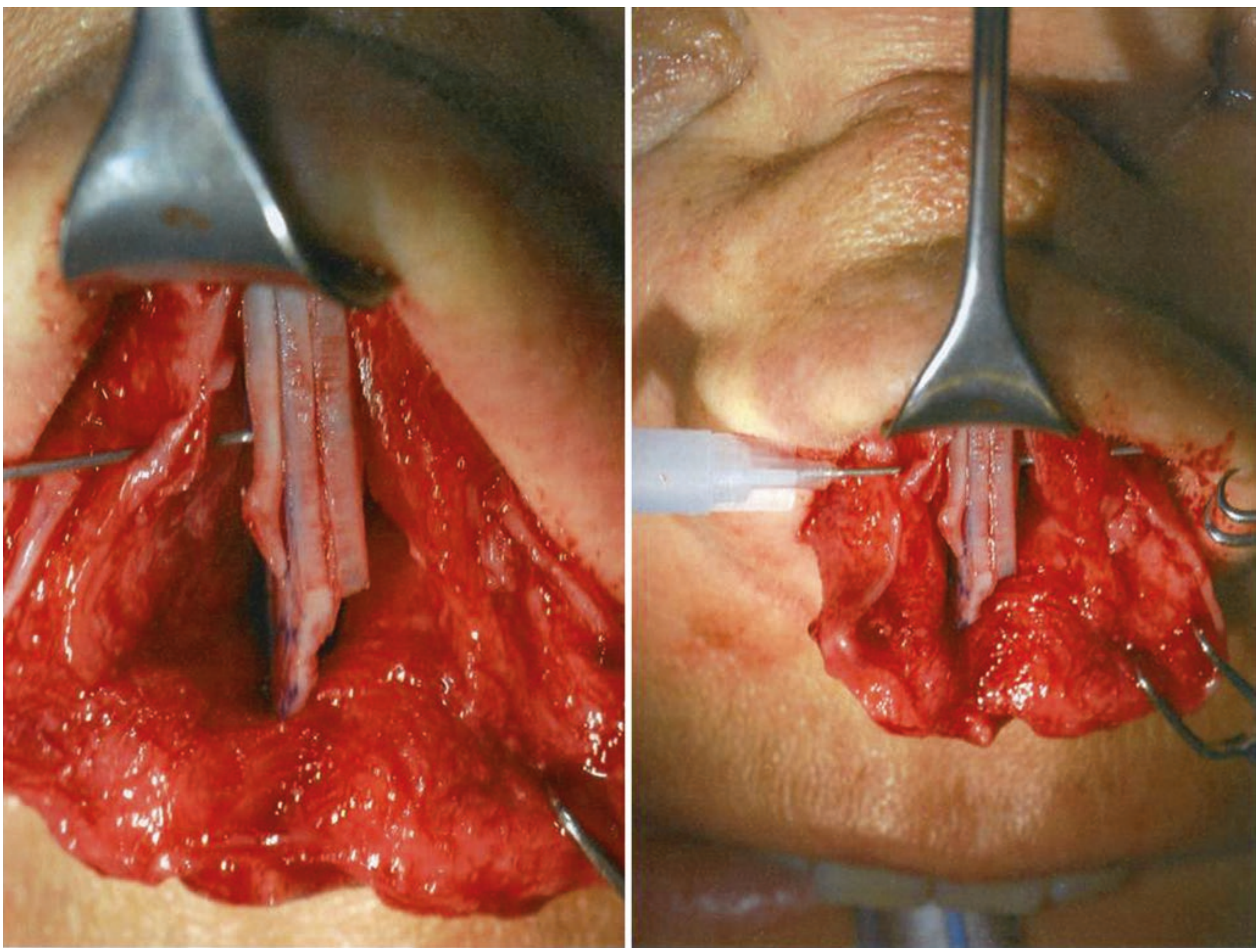


Fig. 1.6 Suture fixation of neoseptum to the upper lateral cartilage

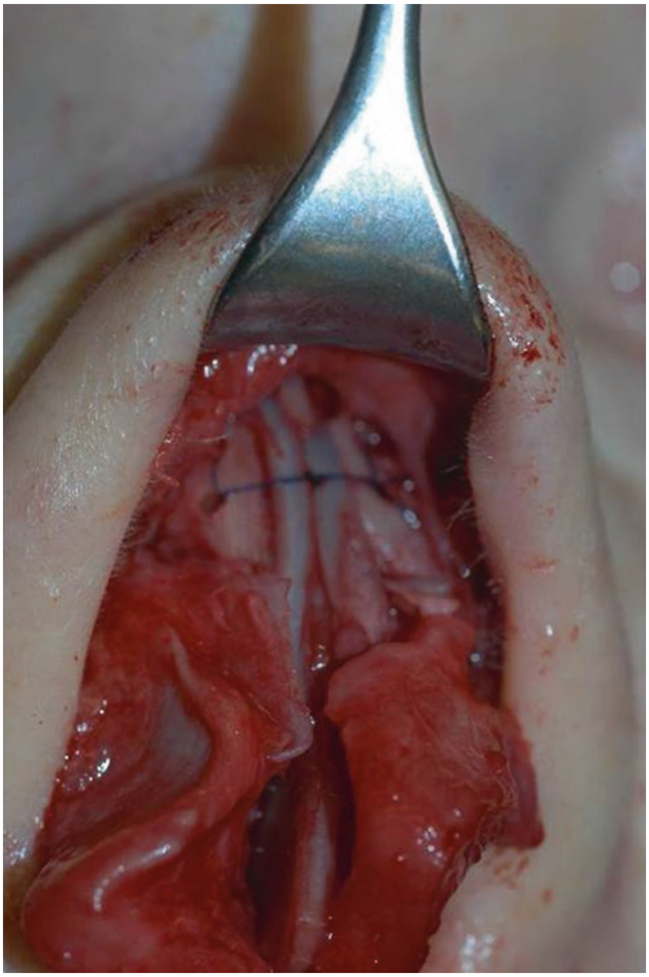


Fig. 1.7 Suture fixation of the neoseptum to the nasal bones using bony drill holes

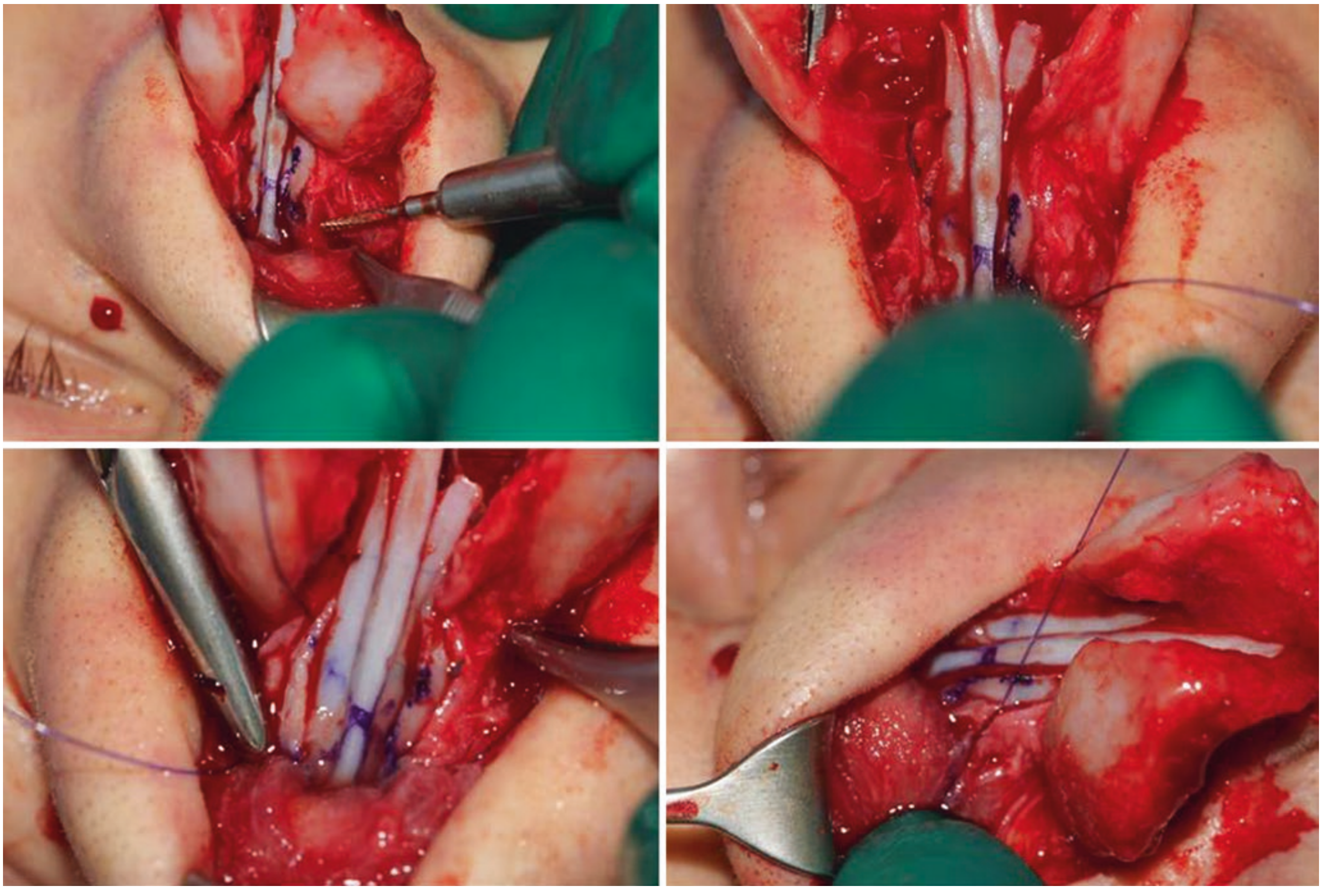


Fig. 1.8 Crisscross technique for reconstruction of the keystone area

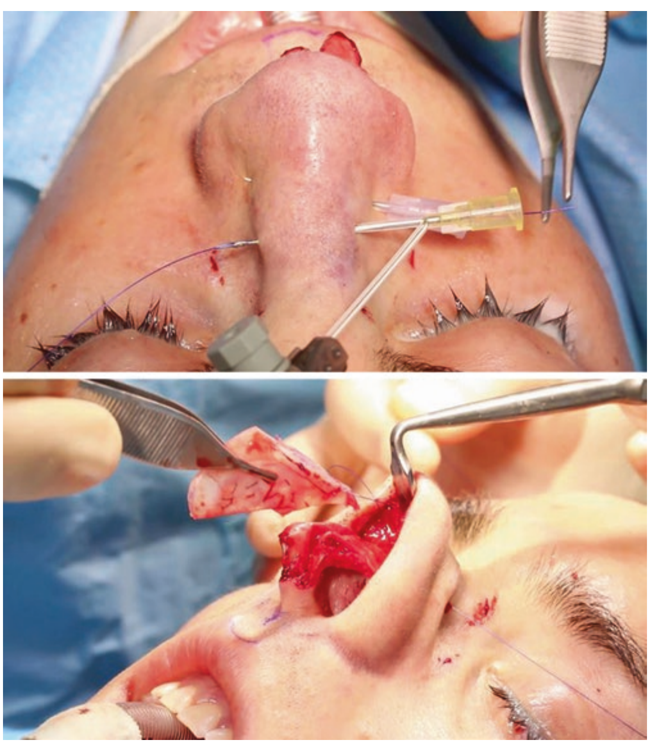


Fig. 1.9 TTC technique to fix the septal replant to the bony pyramid

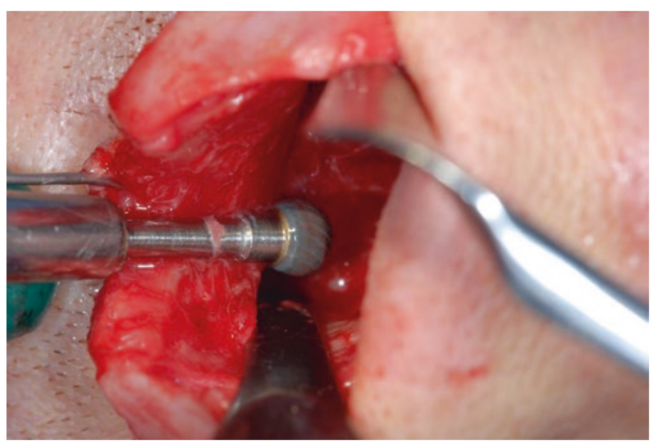


Fig. 1.10 Partial resection of the anterior nasal spine

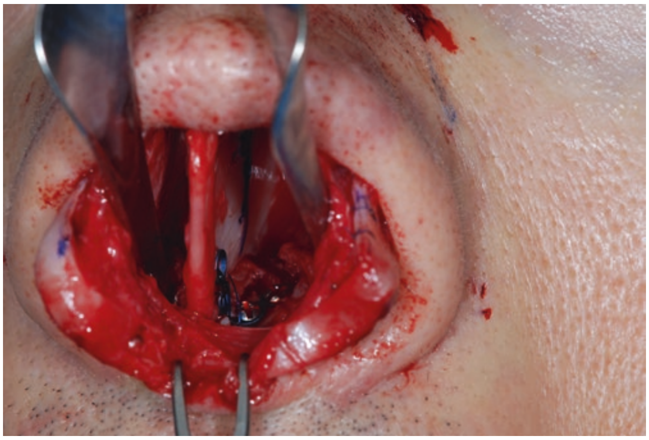


Fig. 1.11 Fracturing and fixation by osteosynthesis of the anterior nasal spine

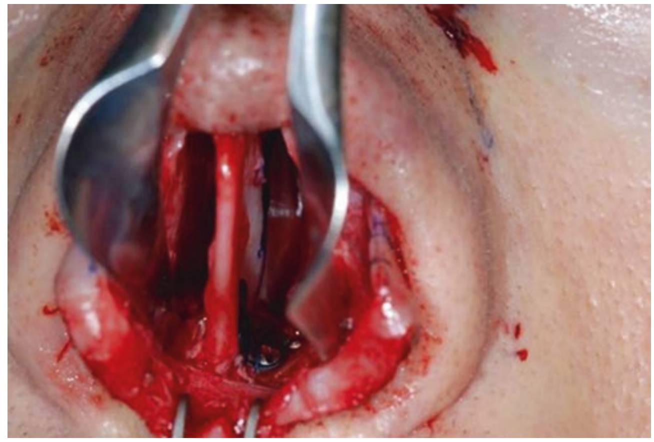


Fig. 1.12 Fixation of the septum to a microplate

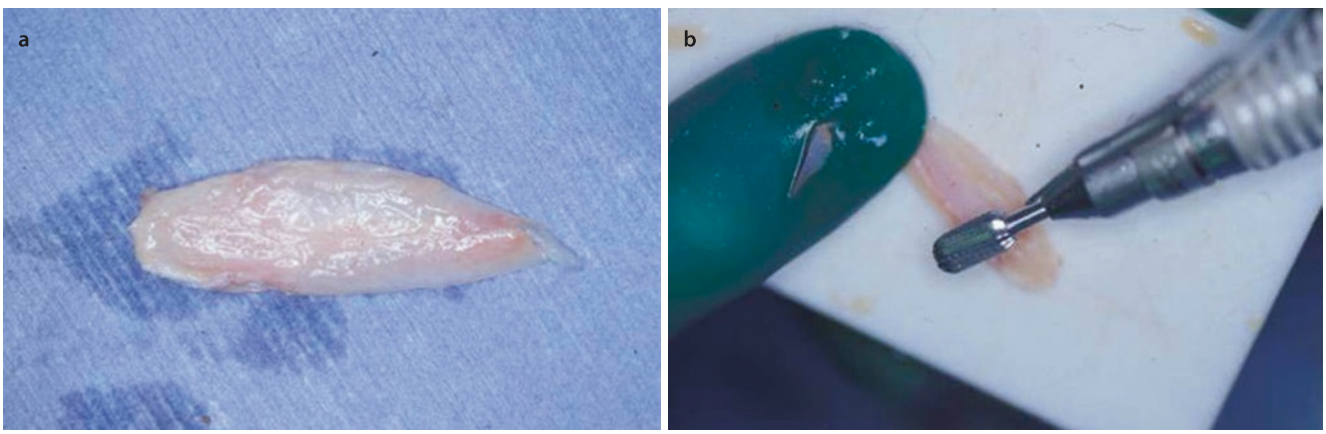


Fig. 1.13 (**a**) Removed hump after using compound technique. (**b**) Molding the hump with a cylindrical drill for dorsal grafting

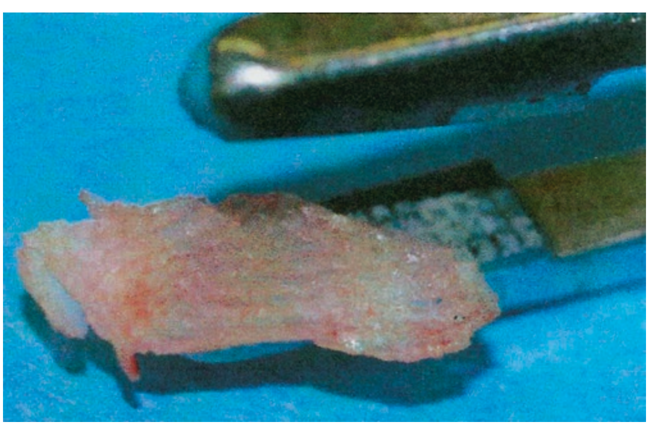


Fig. 1.14 Dorsal graft from morselized cartilage

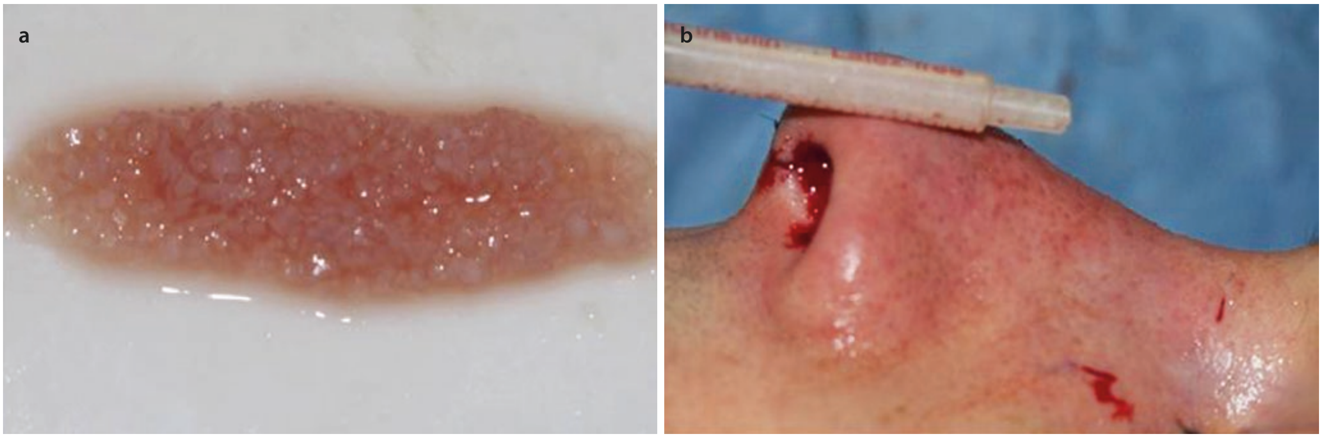


Fig. 1.15 (**a**, **b**) Camouflaging dorsal irregularities with free diced cartilage (FDC)

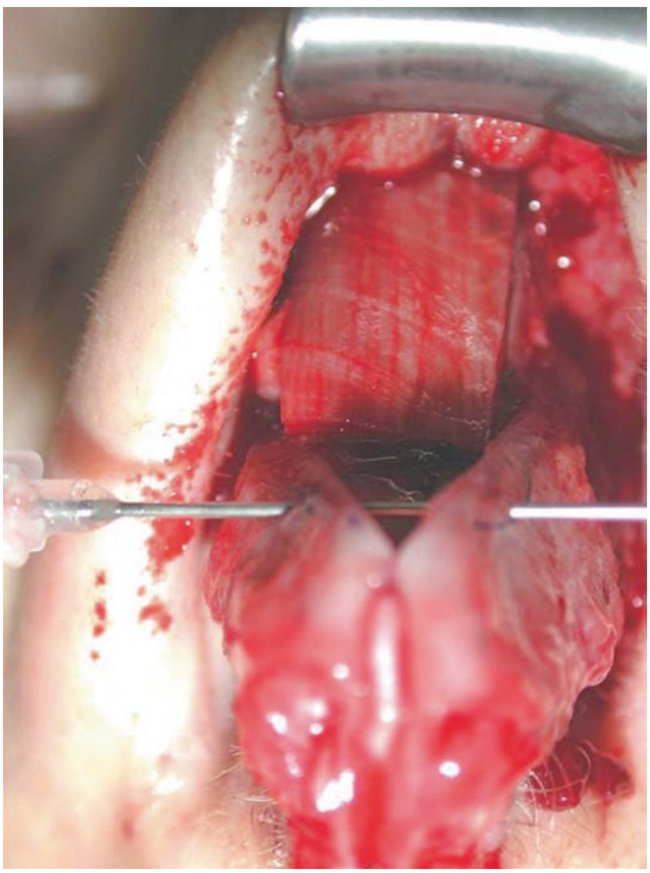


Fig. 1.16 Dorsal graft from allogenic fascia lata (Tutoplast)

1.2 Case Studies: Primary Septoplasty

1.2.1 Case 1: Technique: Fixation of the Caudal Septum to the Nasal Spine

Through the open approach, the nasal spine is bluntly dissected from the soft-tissue attachments using scissors or a round knife. This dissection is carried out between the two medial crural segments of the lower lateral cartilage to expose the spine along the bony floor of the nasal cavity, where it continues as the maxillary crest. The relation to the caudal septum and the shape of the spine can be clearly seen, and its central location can be confirmed. A power-driven Lindemann burr is used to drill two or three transverse holes across the nasal spine for firm fixation of the caudal septum. An anteroposterior oriented midline groove is then burred into the nasal spine to receive the relocated septum. It is necessary to adequately mobilize the septum from the maxillary crest to allow it to return to the midline for fixation. This technique is also used in the replantation of the septum in an extracorporeal septoplasty. A nonabsorbable 4.0 suture such as a Prolene suture is used to achieve firm fixation with multiple passes through cartilage and bone.

A 28-year-old male presented with breathing problems and a nose that was slightly deviated to the right. In profile, a small hump was seen. The columella was oblique rather than vertical, and the caudal septum was displaced into the left nasal vestibule. Endonasal examination also revealed a wide spur on the left side.

Intraoperatively, the septum was found to be too tall and was dislocated off the premaxilla into the left nasal vestibule (Fig. 1.17). The base of the septum was subsequently shortened and mobilized from the maxillary crest to permit midline repositioning, where it was seated into the predrilled groove (Fig. 1.18). Firm suture fixation to bone was then possible through the drill holes in the nasal spine.

Postoperatively, the axis of the nose is seen to be straight with a vertical columella and near symmetrical nostrils. In profile, the dorsum was straight (Figs. 1.19, 1.20, and 1.21).

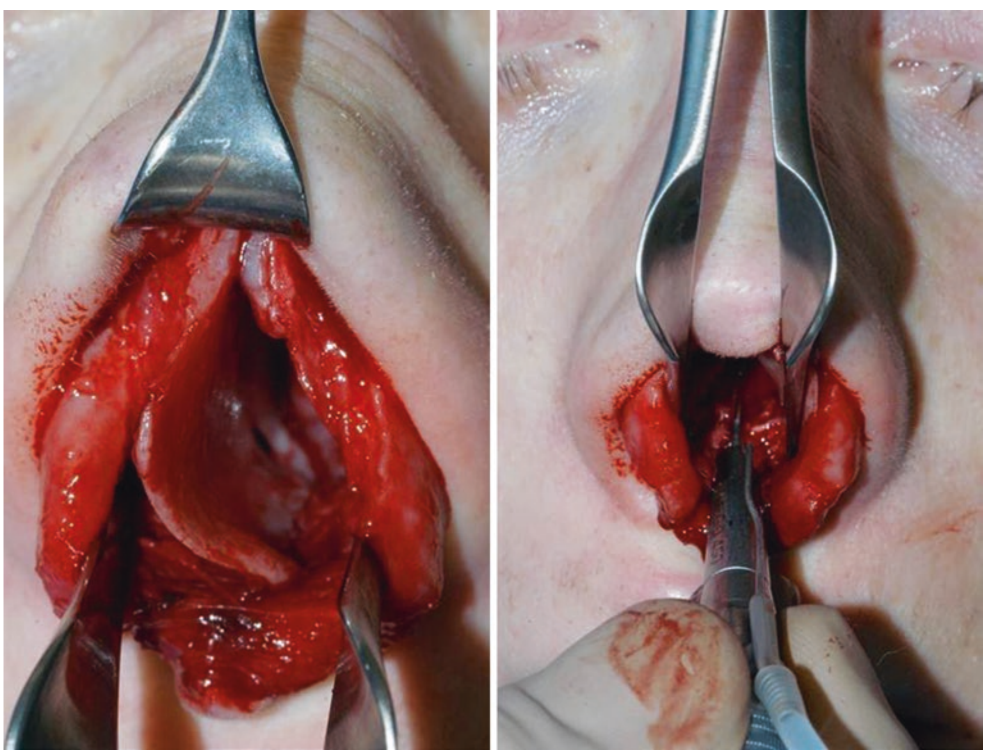


Fig. 1.17 The dislocated septum, drilling a groove into the anterior nasal spine (ANS)

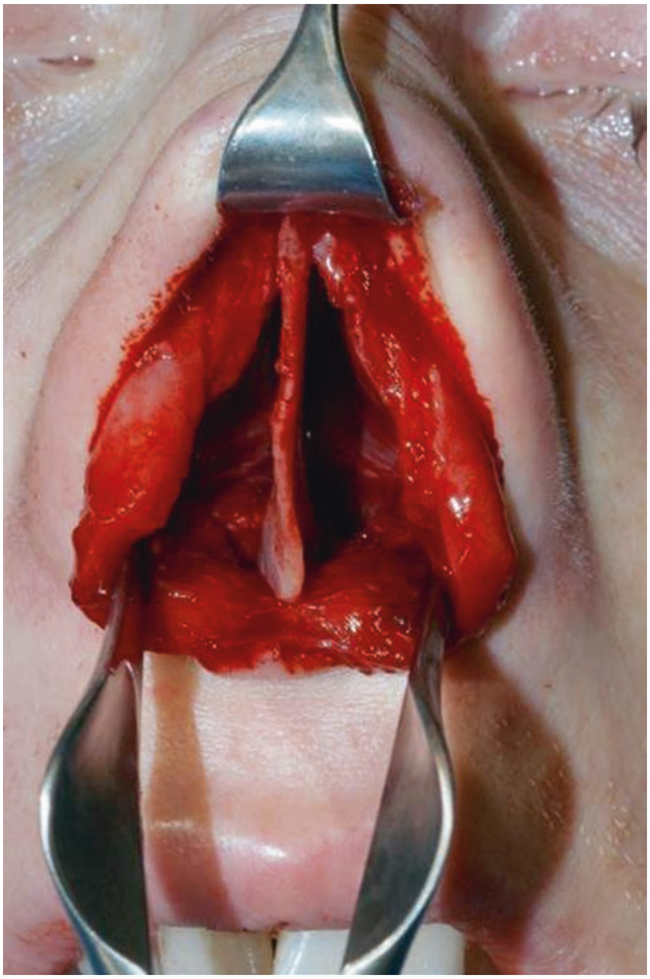


Fig. 1.18 The shortened septum is fixed in the midline

Fig. 1.19 Front view pre-op/post-op

Fig. 1.20 Profile view pre-op/post-op

Fig. 1.21 Base view pre-op/post-op

1.2.2 Case 2: Technique: Using Cartilaginous Splinting Grafts to Straighten the Septum

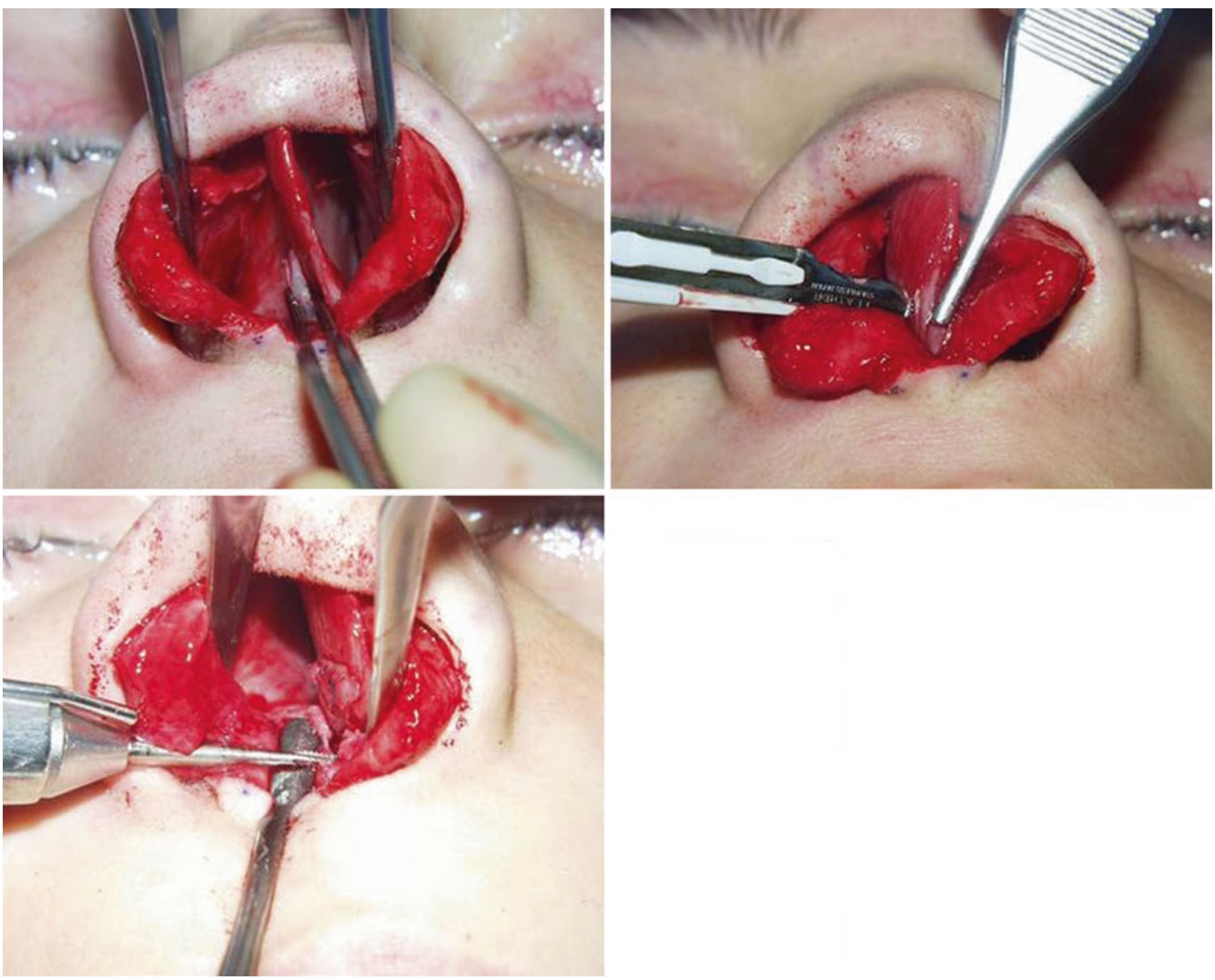
Once the septum has been returned to the midline or scored to correct its convexity, grafts of septal cartilage or perpendicular plate bone can be applied to maintain the shape and ensure a durable result.

These grafts are not used for straightening of the dorsum, where spreader grafts are favored.

A septal cartilage graft is obtained during submucous resection of a deviated central portion of the septum. This cartilage is applied to the caudal septal strut using its inherent convexity to flatten the deviated segment and render the preserved septum straight. The two opposing cartilages are united with a 5-0 Prolene suture. A modified Aiach clamp helps to hold the cartilages straight and closely opposed while the suture is placed.

A 23-year-old woman presented with a crooked nose, deviation of the dorsal lines, and deviation of the columella and the nasal tip to the right.

An open rhinoplasty was planned. At operation the dorsal septum was noted to be straight and was therefore preserved. However, the deformed caudal septum was straightened endonasally by scoring the deformed sections and splinting the caudal septum with a cartilage graft harvested from the posterior septum (◘ Figs. 1.22 and 1.23). The residual quadrangular septum extending to the bony cartilaginous junction was then removed. A sagittal groove and transverse suture hole were drilled into the anterior nasal spine (ANS) for suture fixation of the caudal septum in the midline. The dorsum was then lowered using the component technique allowing both overprojected upper lateral cartilage to be used as spreader flaps. The deviated nasal pyramid was then straightened using parasagittal medial osteotomies, followed by percutaneous low-to-low lateral and transverse osteotomies. After placing a columellar strut fabricated from excised septal cartilage, the tip was contoured using both transdomal and spanning sutures followed by placement of a shield graft also made from septal cartilage. Alar rim grafts were then placed for alar rim contouring and support (◘ Figs. 1.24, 1.25, and 1.26).



◘ **Fig. 1.22** Splinting of the scored septum and drilling a hole through the anterior nasal spine (ANS)

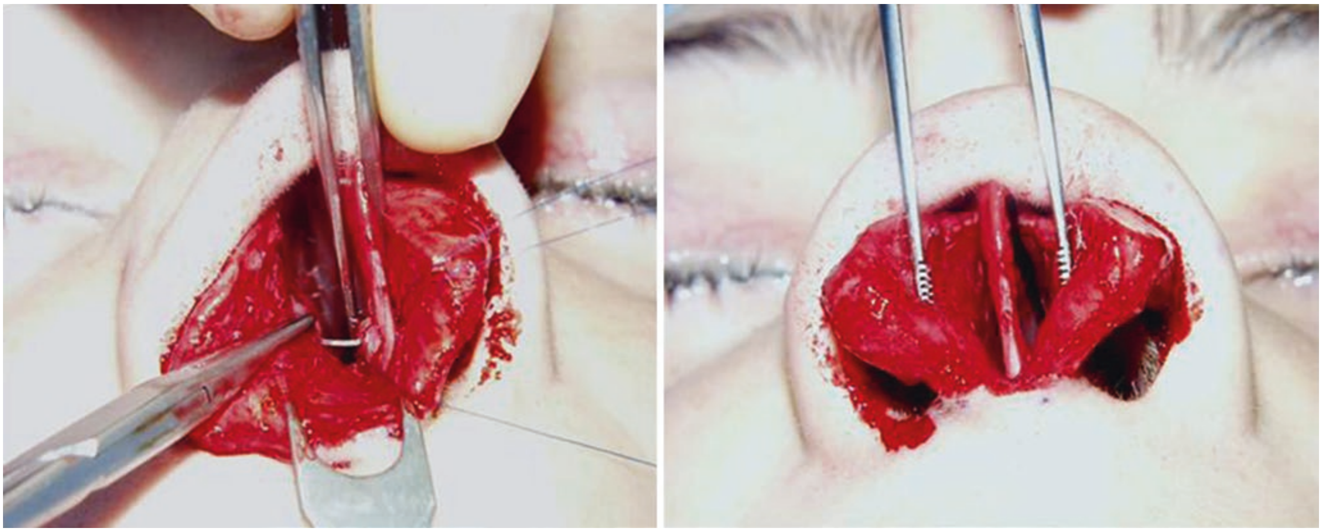


Fig. 1.23 The straightened septum is fixed on top of the anterior nasal spine (ANS)

Fig. 1.24 Front view pre-op/post-op

Fig. 1.25 Profile view pre-op/post-op

Fig. 1.26 Base view pre-op/post-op

1.2.3 Case 3: Technique: Partial Extracorporeal Septoplasty (Septal Exchange Technique)

There are two options for treating a deviated anterior septum. The first is removal of the entire septum with replantation of a reconstructed, straight septum (extracorporeal septoplasty). When the dorsum is straight and only the anterior septum is deviated, a dorsal strut can be maintained while the deviated anterior portion is removed with the central cartilaginous septum (partial extracorporeal septoplasty).

Second, through the open approach, the septum is dissected free from the perichondrium in its entirety. A straight dorsal strut of at least 1 cm in width is marked, and the projection of the desired anterior septum is measured. The remaining central septum and deformed anterior portion are removed as one large piece, often including a segment of perpendicular plate, vomer, and maxillary crest. The piece is studied to identify the straightest portion. This is invariably located at the posterior bony cartilaginous junction of the explanted septum. An anterior septal strut is fashioned from this, using the already measured projection as a guide to the length of the anterior border. The graft is designed to be large enough to also provide a straight dorsal border. This allows fixation to the already preserved dorsum and simultaneously serves as a unilateral spreader graft.

The graft is re-placed into the nose between the intact layers of perichondrium, and it is fixed to the cartilaginous dorsum with 5-0 Prolene sutures. Firm bony attachment is achieved by suturing the graft to drill holes in the nasal spine.

A 25-year-old female patient presented with a crooked nose. The columella was oblique and the nostrils asymmetric. An S-shaped deformity was palpable within the caudal septum.

An open rhinoplasty was planned. At operation, the dorsal septum was found to be straight and was therefore preserved (Fig. 1.27). The deformed anterior septum, including the residual central septal cartilage up to the bony cartilaginous posterior junction, was removed (Fig. 1.27). This large graft was flipped 180° to allow the straight posterior portion adjacent to the bony cartilaginous junction to become the anterior border. The incised superior border was applied to the dorsal strut for fixation and as a spreader graft. A second spreader graft was applied to the opposite side (Fig. 1.28).

The postoperative result showed a straight dorsum and a straight columella with symmetric nostrils (Figs. 1.29, 1.30, and 1.31).

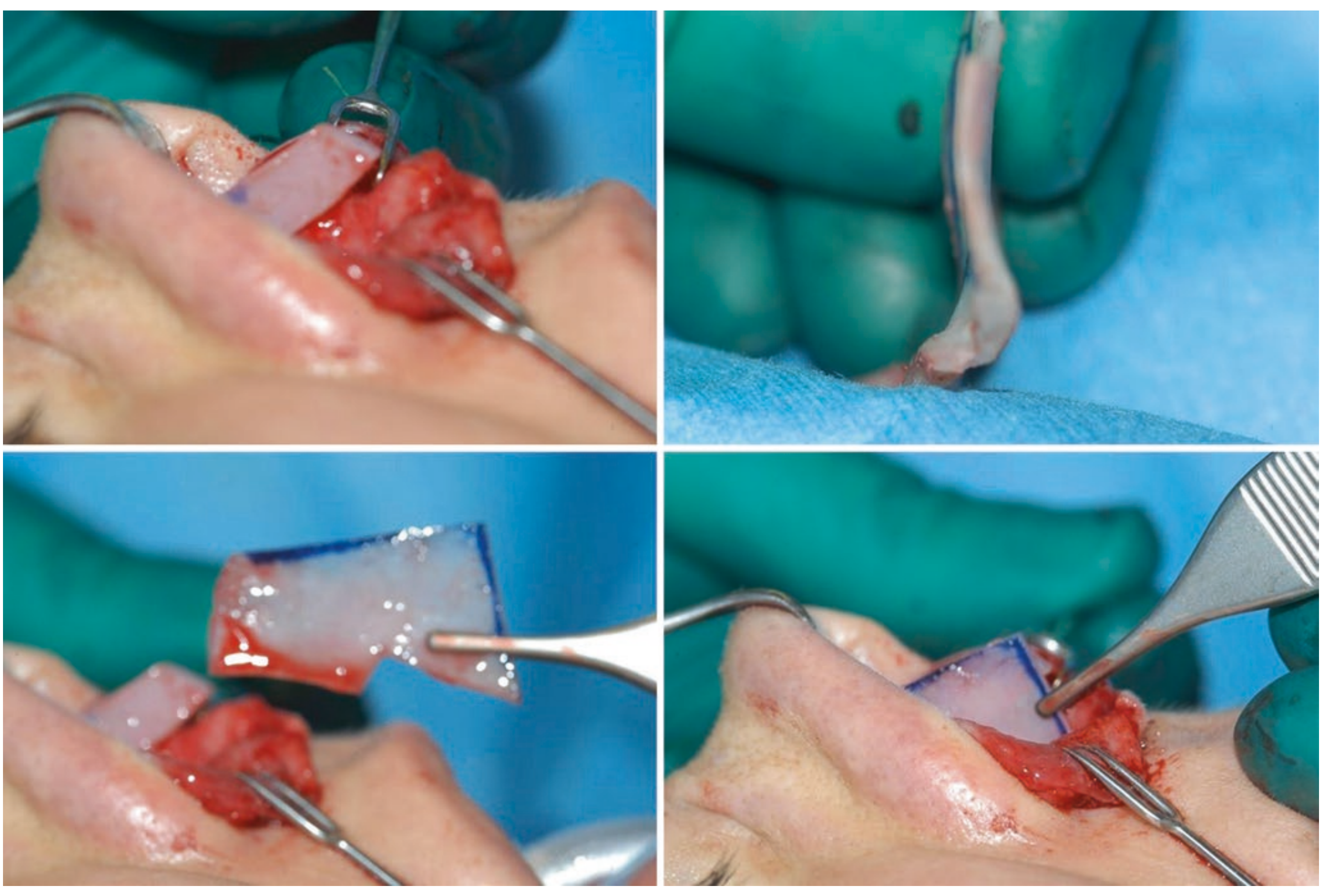


Fig. 1.27 Septal exchange technique, preserving a dorsal strut, turning the explanted septum 90°

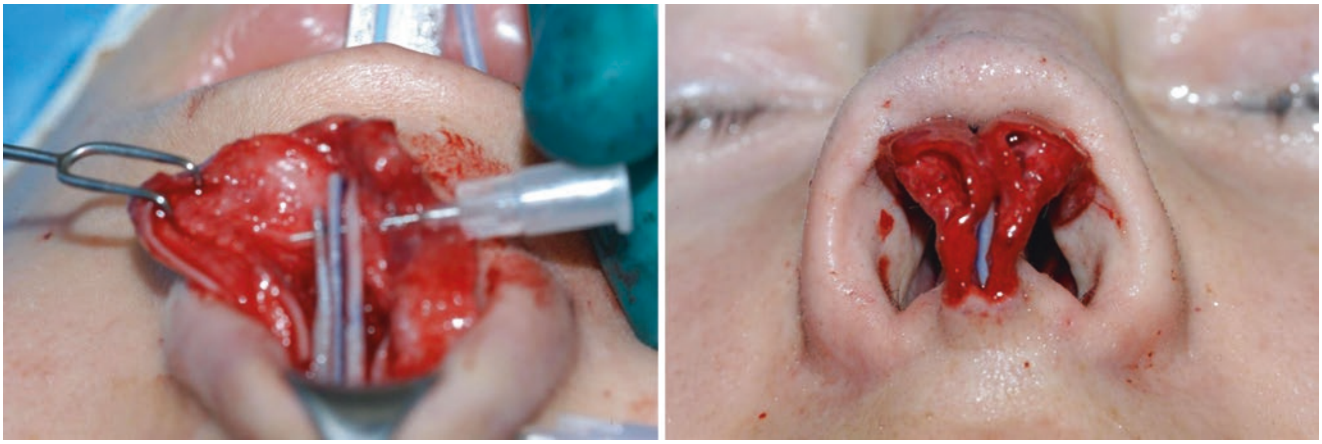


Fig. 1.28 The replant is fixed to the dorsal strut, for balancing a spreader graft is put to the opposite side

Fig. 1.29 Front view pre-op/post-op after exchange technique

Fig. 1.30 Profile view pre-op/post-op after exchange technique

Fig. 1.31 Base view pre-op/post-op after exchange technique

1.2.4 Case 4: Technique: Extracorporeal Septoplasty

Through an open rhinoplasty approach, the entire bony and cartilaginous septum can be removed. In cases of a severely deformed septum, this may be the best means of achieving a straight nose.

Once the soft tissue has been elevated via a mid-columella incision, the anterior septal border is identified. Meticulous subperichondrial dissection is necessary to ensure that intact mucosal flaps are preserved. The correct plane is found using the pointed tips of a scissors to "scratch" the perichondrial edge free. A size 15 blade can also be used to incise the perichondrium at the anterior border and allow access. Upper tunnels are created on either side of the septum, and the upper lateral cartilages are separated from the septum with a straight sharp scissors. This again preserves the mucosal lining and the pocket into which the reconstructed septum will eventually be returned. With the help of a nasal speculum, the lower tunnels can be approached and dissected under direct vision. The strong fibrous attachments at the junction of the septum and maxillary crest need to be carefully released to access the lower tunnels. With the lower tunnels dissected, the nasal spine, maxillary crest, and vomer are visible.

Complete mobilization of the septum requires fracturing through the perpendicular plate using pressure from a small 5-mm osteotome. The same osteotome is also used to break the attachment to the maxilla. Paramedian osteotomies of nasal bones dorsally complete the dissection, and the septum can be removed as one large piece. Before removal, septal length and projection are measured as a guide to reconstruction. These dimensions are usually 35–40 mm for the length and 25–30 mm for projection.

The anatomy of the septum can now be fully appreciated with all fractures and deviations in plain view. Careful planning is necessary to design a straight septal framework, spreader grafts, and ideally a columellar strut from the explanted septum. The straightest portion usually lies in the bony cartilaginous region of the septum. This serves as the anterior border. A straight dorsal border is then cut to meet the new anterior one. The dimensions are guided by the measurements made before removing the septum but sometimes are limited by the size of the available cartilage. Spreader grafts are cut from the remaining septum and fixed to the neoseptum before replantation. The three cartilage components are held with a modified Aiach forceps and fixed with a horizontal mattress suture of 4-0 Prolene applied with a straight needle. The application of spreader grafts at this stage is also an opportunity to eliminate any remaining minor deviations of the neoseptum caused by their splinting effect.

The key to replantation of the septum is firm fixation in the true midline. Anteriorly, this is achieved via drill holes in the nasal spine as previously described for septal relocation. It is critical to ensure that the nasal spine is truly midline. Dorsally, drill holes are made in the nasal bones for firm fixation. In this situation a 4-0 Prolene permanent suture or a 4-0 slowly resorbable PDS suture is used to hold cartilage to bone. Fixation is completed by suturing the neoseptum to the upper lateral cartilage.

In the situation in which the nasal bones are too short to allow drill holes and sutures to be placed, fixation is adequate to just the comparatively long upper lateral cartilages and nasal spine.

After completion of any tip refining and supporting maneuvers, a 4-0 polydioxanone (PDS) suture is used to integrate the columellar strut, medial crura, and anterior septum; at the same time the mucosa is applied to the neoseptum, and dead space is eliminated. This suture is placed in a running caudal-to-cranial quilting pattern. After closure of the columella incision, silicone splints are applied to both sides of the septal mucosa and fixed with a 4-0 Prolene suture. The knot is tied in the left vestibule according to convention. These splints remain in place for 2 weeks. Invariably, osteotomies have been performed as part of the total rhinoplasty; however, a plaster nose splint is always applied to control position, shape, and swelling. This may be changed after one week, but removed after two weeks.

A 16-year-old girl presented with a wide, deviated nose and obstruction of the right nostril as the result of a bike accident several years previously. Although she initially was seen at the age of 12, we opted to postpone surgery because extracorporeal septoplasty was required to repair the deformity and we prefer to wait at least 2 years after menarche (or the change in voice) before performing this procedure. We believe that delaying surgery until after the adolescent growth spurt avoids adverse effects upon facial skeletal growth.

Open rhinoplasty was planned, and at the time of surgery, the septum was found to be severely deformed. Extracorporeal septoplasty was indicated to identify a straight cartilaginous area for reconstruction of the septum. The area was located in the posterior septum behind the fracture line in the cartilage. This piece was rotated 90° to achieve adequate dorsal length and anterior projection (■ Fig. 1.32).

From the deformed anterior septal remnant, two spreader grafts could be fashioned and attached to the new septum. The straight "neoseptum" with attached spreader grafts was returned to the nose and fixed to nasal bones, upper lateral cartilage, and the nasal spine. Low-to-low and transverse osteotomies were performed to narrow the dorsum. Suture techniques of placing intradomal, interdomal, and spanning sutures were used to refine the tip.

Postoperatively, the nose was straight with acceptable dorsal lines and a symmetrical narrow tip (■ Figs. 1.33, 1.34, and 1.35).

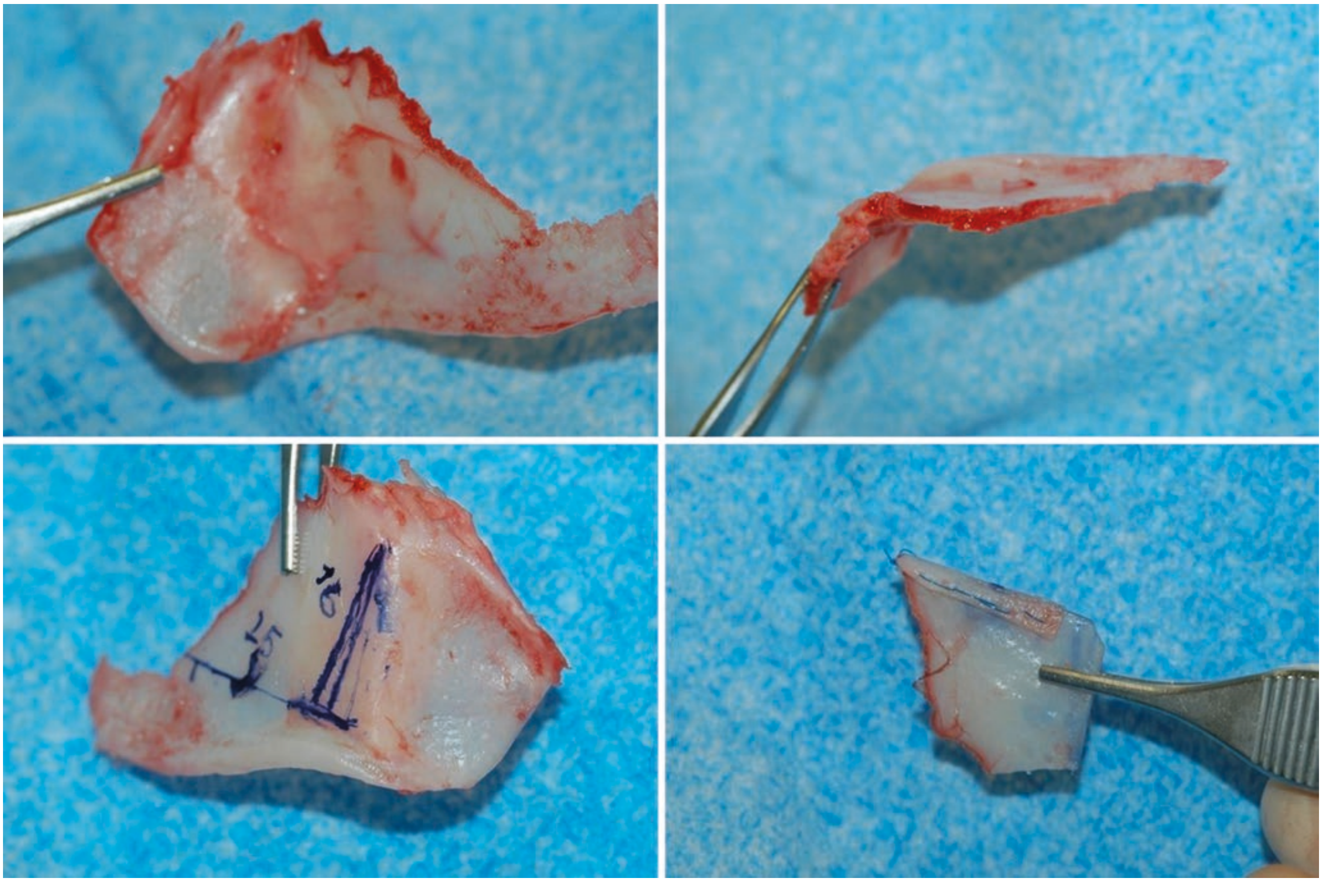


Fig. 1.32 Extracorporeal septal reconstruction by turning the septum 90° and putting on spreader grafts

Fig. 1.33 Front view pre-op/post-op after extracorporeal septal reconstruction by turning the septum 90° and putting on spreader grafts

Fig. 1.34 Profile view pre-op/post-op after extracorporeal septal reconstruction by turning the septum 90° and putting on spreader grafts

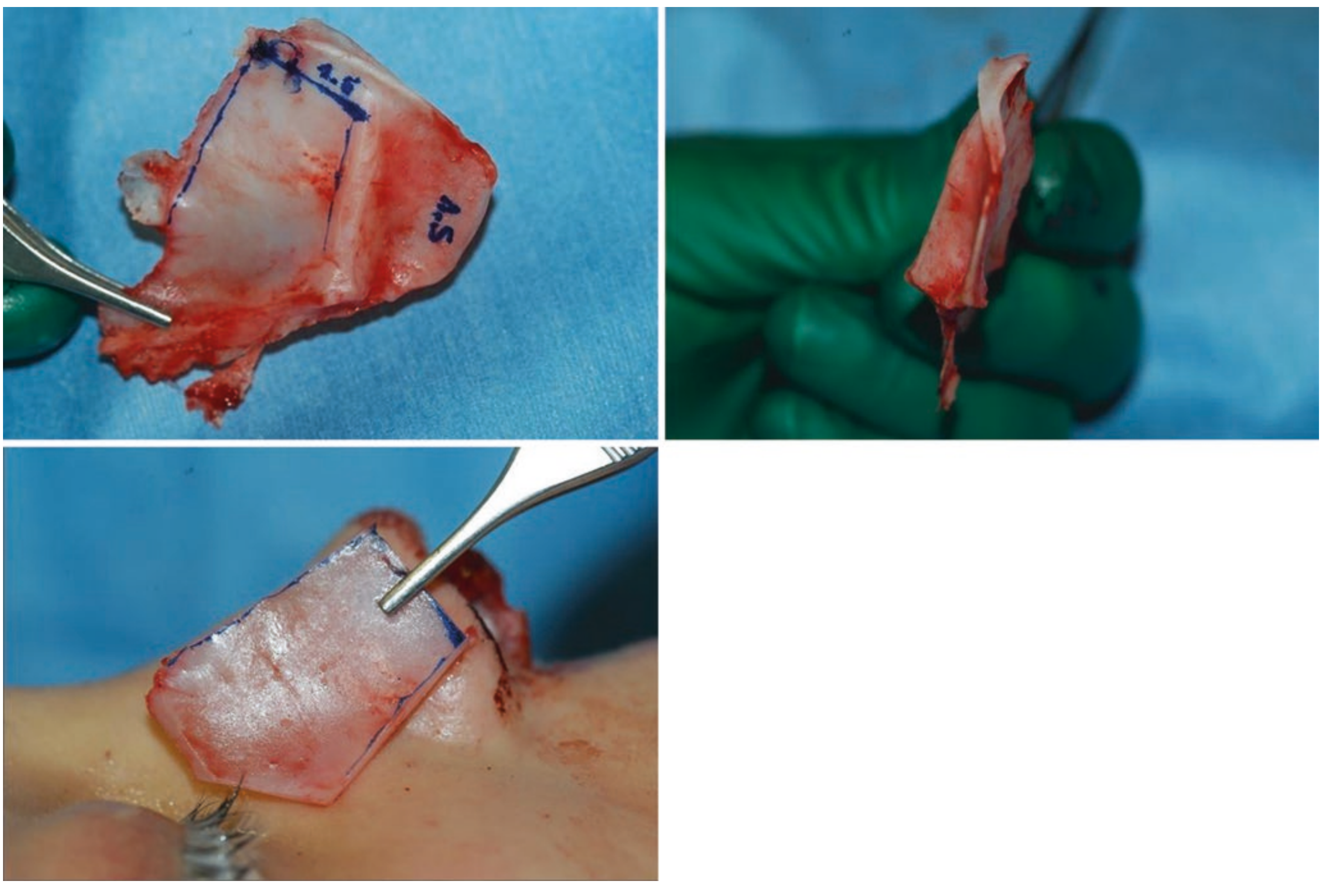
Fig. 1.35 Base view pre-op/post-op after extracorporeal septal reconstruction by turning the septum by 90° and putting on spreader grafts

1.2.5 Case 5: Extracorporeal Septal Reconstruction for Severe Anterior Septal Angulation and Dislocation of the Caudal Septum

A 26-year-old girl presented with a nasal deformity resulting from trauma. Her nose was deviated to the right, and the left nasal bone was depressed. Palpation of the anterior septum demonstrated significant bending.

Open rhinoplasty was performed, and owing to the severe deformity of the anterior septum, an extracorporeal septoplasty technique was used. A straight posterior segment was found with adequate dimensions and cut to size to create the neoseptum. The inferior border was rotated 180° to become the new dorsum, while a straight anterior border was cut just behind the deviation in the original septum (▫ Fig. 1.36). Spreader grafts were harvested from the anterior deformed cartilage and applied to the new dorsum, acting as splints to hold the septum straight once it was sutured in place.

Tip sutures were used to refine the domes, and then the nose was closed in the usual manner. Using this procedure, a permanently straight nose with a straight septum was achieved allowing normal function (▫ Figs. 1.37, 1.38, and 1.39).



▫ **Fig. 1.36** Extracorporeal septal reconstruction in a transverse dislocated anterior septum with resection of the deformed anterior part and straightening by spreader grafts

Fig. 1.37 Front view pre-op/post-op

Fig. 1.38 Profile view pre-op/post-op

Fig. 1.39 Base view pre-op/post-op

1.2.6 Case 6: Extracorporeal Septal Reconstruction for Building a L-Shaped Neoseptum

A 19-year-old boy presented with an extremely deviated nose following trauma in childhood. The anterior septal border was dislocated into the left nostril. The posterior septum had suffered a multidimensional deformation with sharp edges, indicating multiple previous septal fractures.

Open rhinoplasty was performed, and the entire septum was removed. A bigger piece was straightened by shaping and scoring, and a further straight piece of posterior septal cartilage was used as a splint to maintain the shape of the construct (Fig. 1.40). The result was a straight neoseptum that could be replanted and fixed to the nasal bones, upper lateral cartilages (ULCs), and anterior nasal spine (ANS). Tip sutures were used to stabilize the domes. A columellar strut and a shield graft were placed to provide a well-supported lobule (Fig. 1.41). The nose was closed in the usual manner.

Follow-up after 1 year demonstrated a straight nose with a straight columella, symmetrical nostrils, and open functional airways bilaterally (Figs. 1.42, 1.43, and 1.44).

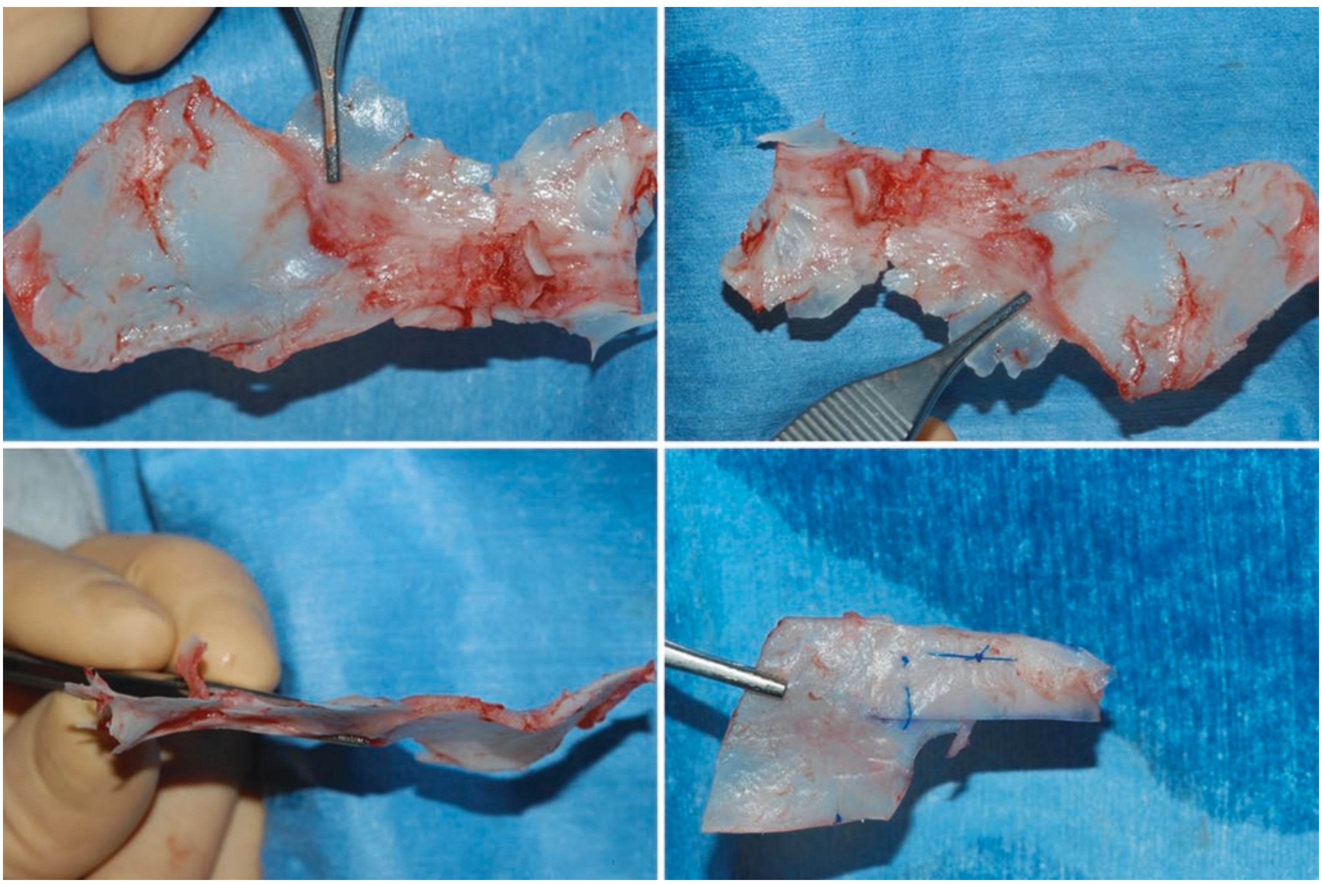


Fig. 1.40 Extracorporeal septal reconstruction with splinting of the bended parts by posteriorly harvested cartilage

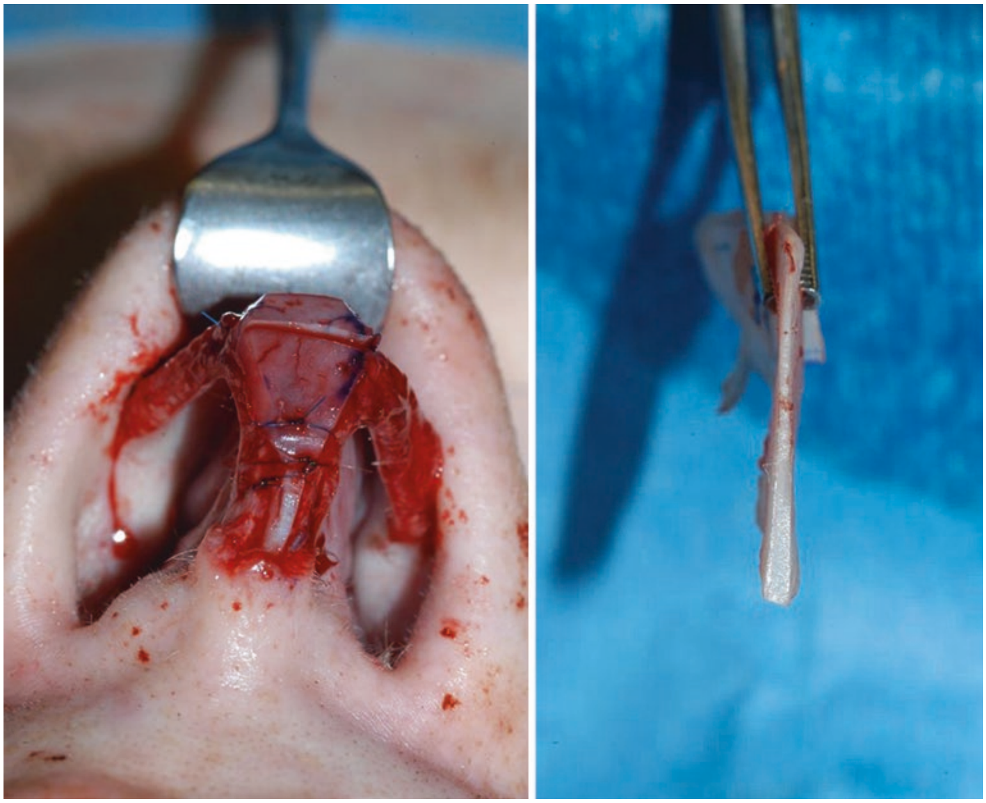


Fig. 1.41 The straight neoseptum in the front view, tip contouring with shield graft, which is horizontally incised for more natural shape

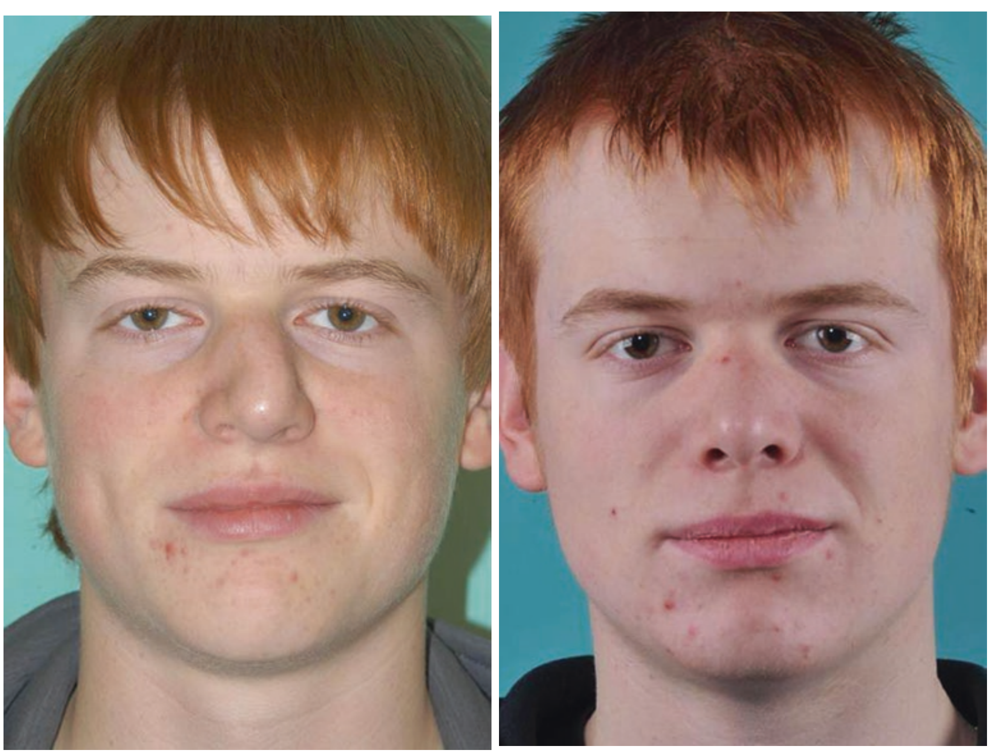


Fig. 1.42 Front view pre-op/post-op

Fig. 1.43 Profile view pre-op/post-op

Fig. 1.44 Base view pre-op/post-op

1.2.7 Case 7: Technique: Extracorporeal Septal Reconstruction Using Bone Graft for Splinting

During submucous resection of the quadrangular septum, a portion of the bony perpendicular plate can also be harvested to create a splinting graft for more effective straightening of a deformed caudal septum. The graft can be fabricated from an osseous specimen or from a composite specimen consisting of perpendicular plate with the attached septal cartilage. In both cases, a straight donor specimen is selected and thinned with a powered burr to a final thickness of 1–2 mm. Multiple small perforations are then made with a drill to facilitate suture fixation and tissue in-growth. A modified Aiach clamp is used to temporarily stabilize the construct while a 5-0 Prolene suture is used for fixation.

A 31-year-old female presented for surgery with a severe post-traumatic deviation of the nose. Examination revealed a wide nasal tip and extreme rightward deviation of the caudal septum (Fig. 1.45) causing deviation of the outer nasal framework. An extracorporeal septal reconstruction was indicated because of severe deformity of the L-strut.

Using the external rhinoplasty approach, paramedian osteotomies were used to release the upper bony septum, and the entire septal partition was removed. After scoring and splinting the deviated cartilage segments with perforated ethmoid bone grafts (Fig. 1.46) and placement of bilateral spreader grafts, the septal construct was rotated 90° and reinserted so that the bony cartilaginous junction became the new dorsal septum and the dorsum became the new caudal septum. Suture fixation to the nasal spine, ULC, and nasal bones was performed for stabilization, and the newly rebuilt dorsum was then augmented with three layers of allogenic fascia lata. Prior to reinsertion of the new septal construct, osteotomies were performed to straighten the bony pyramid (Figs. 1.47, 1.48, and 1.49).

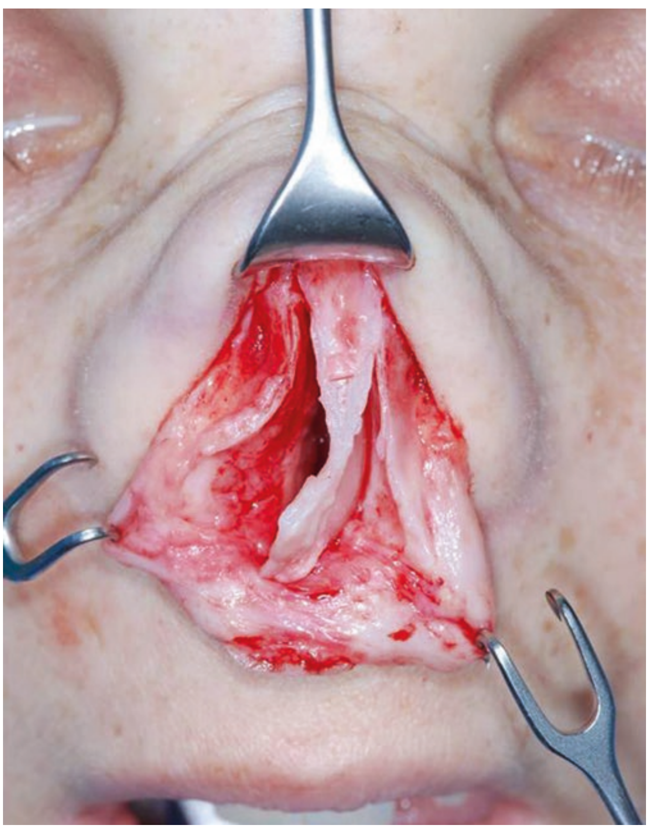


Fig. 1.45 C-shaped deviation of the anterior septum

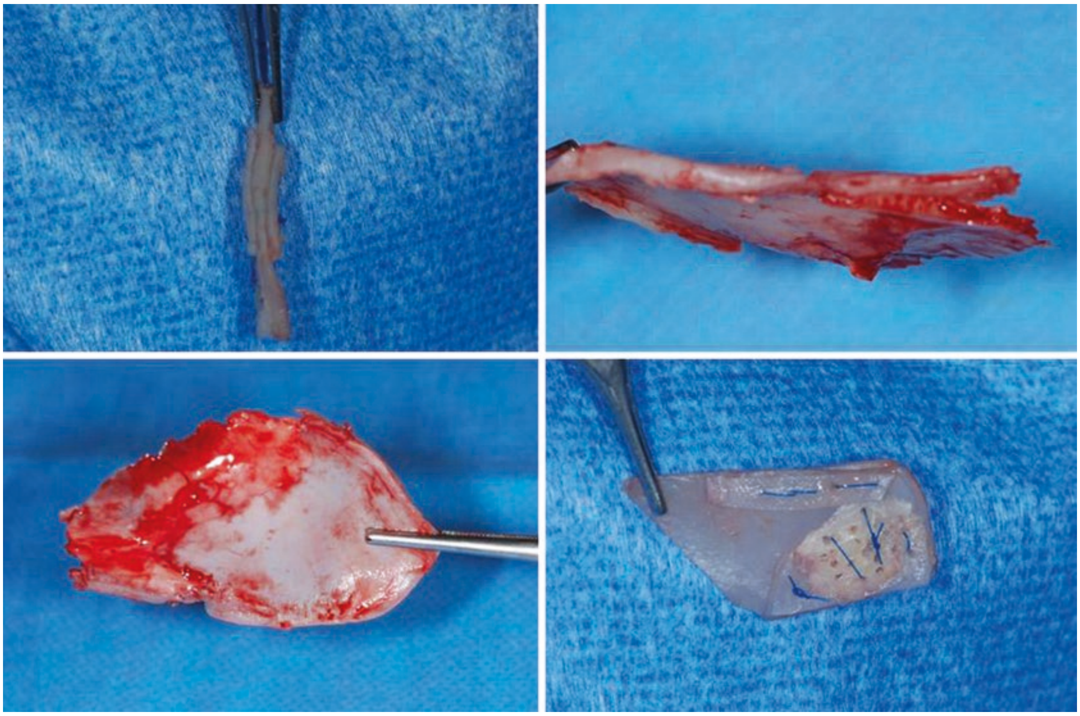


Fig. 1.46 Extracorporeal septal reconstruction with splinting of the bended parts by thinned ethmoid bone

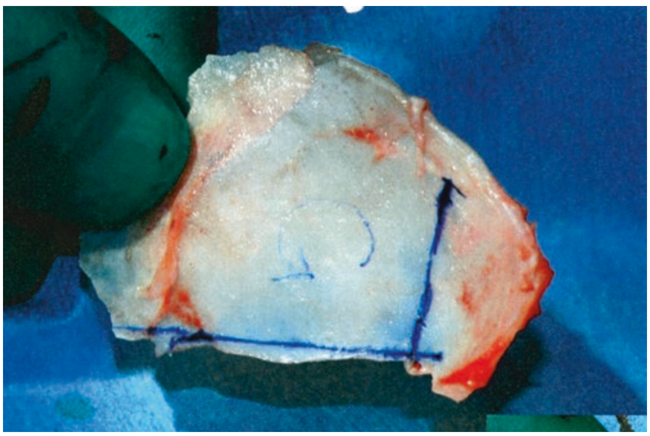
Fig. 1.47 Front view pre-op/post-op after straightening by splint from the ethmoid bone and spreader grafts

Fig. 1.48 Profile view pre-op/post-op after extracorporeal septal reconstruction and covering the dorsum with four layers of alloplastic fascia; tip suspension with posterior sling

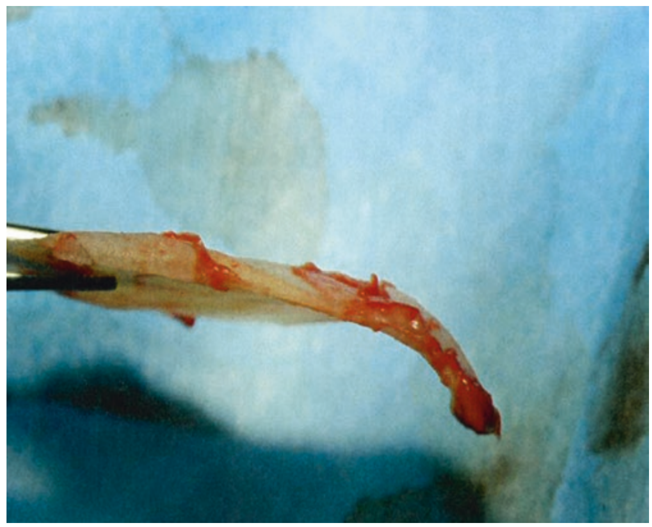
Fig. 1.49 Base view pre-op/post-op after extracorporeal septal reconstruction with splinting of the bended parts by thinned ethmoid bone

1.2.8 Case 8: Extracorporeal Septal Reconstruction by Resection of the Deviated Anterior Septum and Turning the Posterior Part 180°

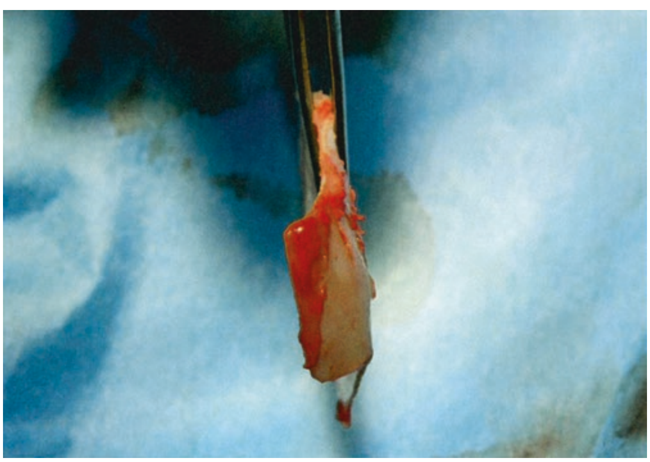
A 32-year-old female presented for primary surgery with a post-traumatic nasal deformity. Examination revealed deviation of the external nose, an overprojected nasal dorsum, and deviation of the septum to the patient's left side with oblique misalignment of the columella. The patient also reported nasal airway obstruction. Using the external rhinoplasty approach, the deformed quadrangular septum was removed (◘ Figs. 1.50, 1.51, and 1.52). The deviated anterior segment then was excised and used for spreader grafts (◘ Fig. 1.53). The septal remnant was turned upside down and reinserted so that the septal base became the new dorsal septum reinforced with spreader grafts. The septal construct was then sutured to the ULC, nasal bones, and the anterior nasal spine after drill holes were created in the nasal bones and nasal spine. The deviated bony pyramid was then straightened using percutaneous osteotomies. The tip was refined using both transdomal and spanning sutures (◘ Fig. 1.54, 1.55, and 1.56).



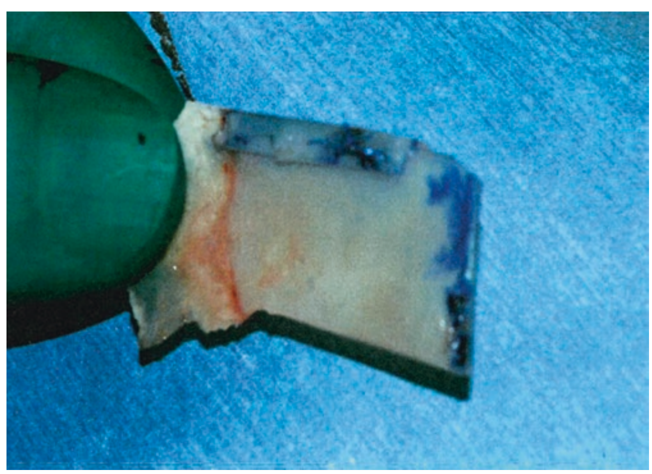
◘ **Fig. 1.50** Side view of the explanted severely bended septum



◘ **Fig. 1.52** View from above to the explanted severely bended septum



◘ **Fig. 1.51** Front view of the explanted severely bended septum



◘ **Fig. 1.53** Extracorporeal septal reconstruction of a severely C-shaped bended cartilage by turning the septum 90° and putting on spreader grafts from the anterior deformed part

Fig. 1.54 Front view pre-op/post-op after extracorporeal septal reconstruction

Fig. 1.55 Profile view pre-op/post-op after extracorporeal septal reconstruction

Fig. 1.56 Base view pre-op/post-op after extracorporeal septal reconstruction

Suggested Reading

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Secondary Septoplasty

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_2

2.1 Surgical Principles

The septum plays an important role in most cases of revision rhinoplasty, since residual deformity is often present. The residual deformity is often caused by an insufficient analysis and subsequent inappropriate or incomplete surgical technique. If this is the case, the long-term outcome is often disappointing, with drooping of the tip, saddling of the dorsum, and/or recurrence of the septal and/or nasal deviation.

The most challenging problem is a deformity of the anterior septum, specifically of the caudal border. To overcome this problem, we straighten the deflected part by means of suture techniques (modified horizontal mattress sutures) (Fig. 2.1) or by scoring, combined with splinting. For this purpose, we insert a straight cartilaginous piece from the posterior septum on the scored part or a thinned out perpendicular plate (Fig. 2.2). Alternatively, the whole septum can be removed for creation of a straight framework followed by replacement of the neoseptum (Fig. 2.3).

If the deformed anterior border has been resected and adequate tip support is lacking, progressive drooping of the tip will lead to an acute nasolabial angle. Additionally, a pseudo-hump deformity may result from tip ptosis and the prominence of the neighboring structures. In order to correct this, different techniques are available. Increased tip support can be achieved with a strong columellar strut. If there is not suitable septal cartilage, we prefer to use a sandwich graft from the concha (Fig. 2.4). This can be harvested easily, and by doubling the cartilage onto itself, a durable and straight graft can be created. Such a graft can be easily secured to the residual septal structure and will give reliable support to the tip. Alternatively, a septal extension graft can be used, but its stable fixation is more difficult. To stabilize the graft fixation, we use thinned and perforated perpendicular plates for splinting. Extended spreader grafts can be used as well, but they may be visible or even palpable if the grafts extend to the septal caudal border (Fig. 2.5). If shorter ones are used, the stability of the graft fixation is compromised.

Alternatively, the whole septum can be mobilized and brought into a more anterior position, which is a procedure equivalent to an extracorporeal septal reconstruction (Fig. 2.6). If adequate septal straightening is not performed during the primary procedure, a deviated dorsum and deviated axis of the nose will result. Permanent straightening requires splinting, which is best achieved with spreader grafts. These grafts have the added advantage of simultaneously widening the inner valves for better airway function (Figs. 2.7 and 2.8).

When using perpendicular plate for stabilization, the bone must be thinned thoroughly, and multiple drill holes must be added to facilitate secure fixation with multiple mattress sutures (Fig. 2.9). Furthermore, fibrous tissue will grow through the drill holes, which provides an additional means of stabilization. Although splinting with polydioxanone (PDS) foil is technically less demanding (although it has a high cost), it can be used only if the mucosal flap is intact. A review of our own cases revealed that PDS foil is unlikely to succeed without fully intact mucosa (Fig. 2.10).

If there is insufficient septal cartilage to permit spreader grafts for lining, strips of conchal cartilage can be used instead (▶ see Fig. 2.7). Because conchal cartilage grafts are always curved, they must be applied to the deviated septum in a way that uses the opposing convexities to achieve a straight construct (Fig. 2.11). Alternatively, in some cases bone grafts from the perpendicular plate can also be used.

If there is insufficient septal cartilage available for creating a stable neoseptum, we prefer a total reconstruction from both conchae. To create a permanent straight cartilaginous framework, we suture the opposing convexities of the conchal cartilage opposite one another, stabilize them with several layers of through-and-through mattress sutures, and then sculpt them to the desired size and shape to create a neoseptum (Fig. 2.12).

A significant risk of any septal correction is a saddling of the dorsum. This may develop for two different reasons: (1) either the resection was too extensive and scar formation led to contracture and downward migration of the neoseptum, or (2) fixation to the anterior spine was insufficient, again leading to a saddle-nose deformity. Of course, such a deformity can be camouflaged by an augmentation graft, but this corrects only the aesthetic component. Consequently, if both shape and function are to be restored, a reconstruction using the principles of an extracorporeal septal reconstruction is required (Fig. 2.13). If there is no cartilage available, for example, because rib cartilage harvest was refused by the patient, a double-layered PDS foil used as a spreader graft may be an alternative solution (Fig. 2.14).

In all cases of extracorporeal septal reconstructions, a careful fixation to the upper lateral cartilage and the nasal bones as well as to the anterior spine is essential.

Regardless of the technique used for septal reconstruction, it is important to stabilize the caudal septum/medial crura/columellar strut complex to achieve adequate long-term tip support. For this reason, we always secure the reconstructed caudal segments with sutures. When using PDS stitches for this purpose, the stabilization is temporary, lasting for several months before the sutures are resorbed. As a minor complication, PDS sutures sometimes cause inflammation and discomfort owing to hydrolysis of the dissolving suture material. Erythema is occasionally observed in the area of mattress suture placement, but we have never seen a frank wound infection. If erythema is observed, we treat the area with topical antibiotic ointment and if necessary remove the central knot.

Transseptal mattress sutures work well only with septal or conchal (sandwich graft) cartilage. When using rib grafts, transseptal sutures may lead to an infection, most probably because the inner perichondrium, which protects the cartilage, has been resected during the procedure.

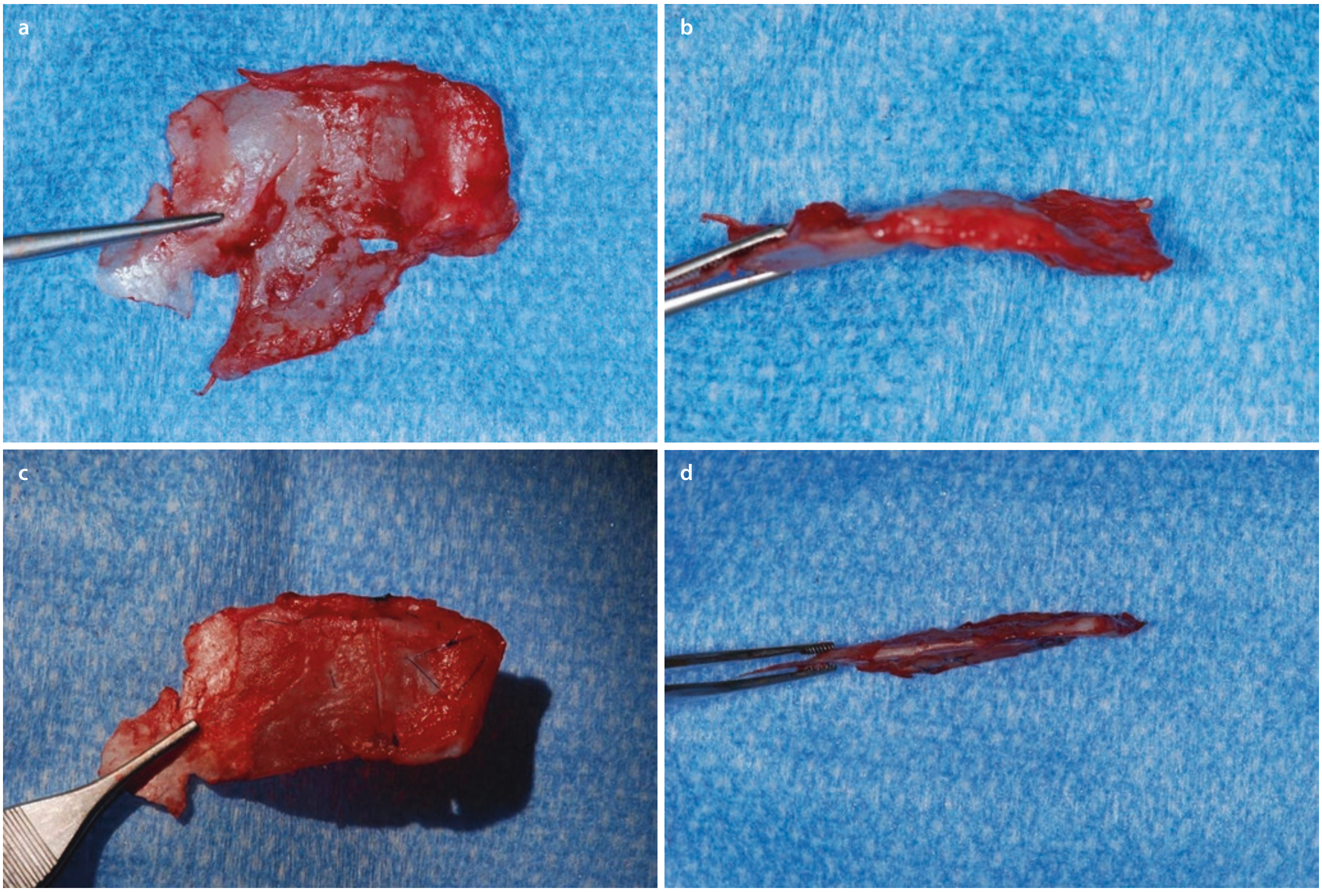

Fig. 2.1 **(a–d)** Straightening of the septum with suture techniques

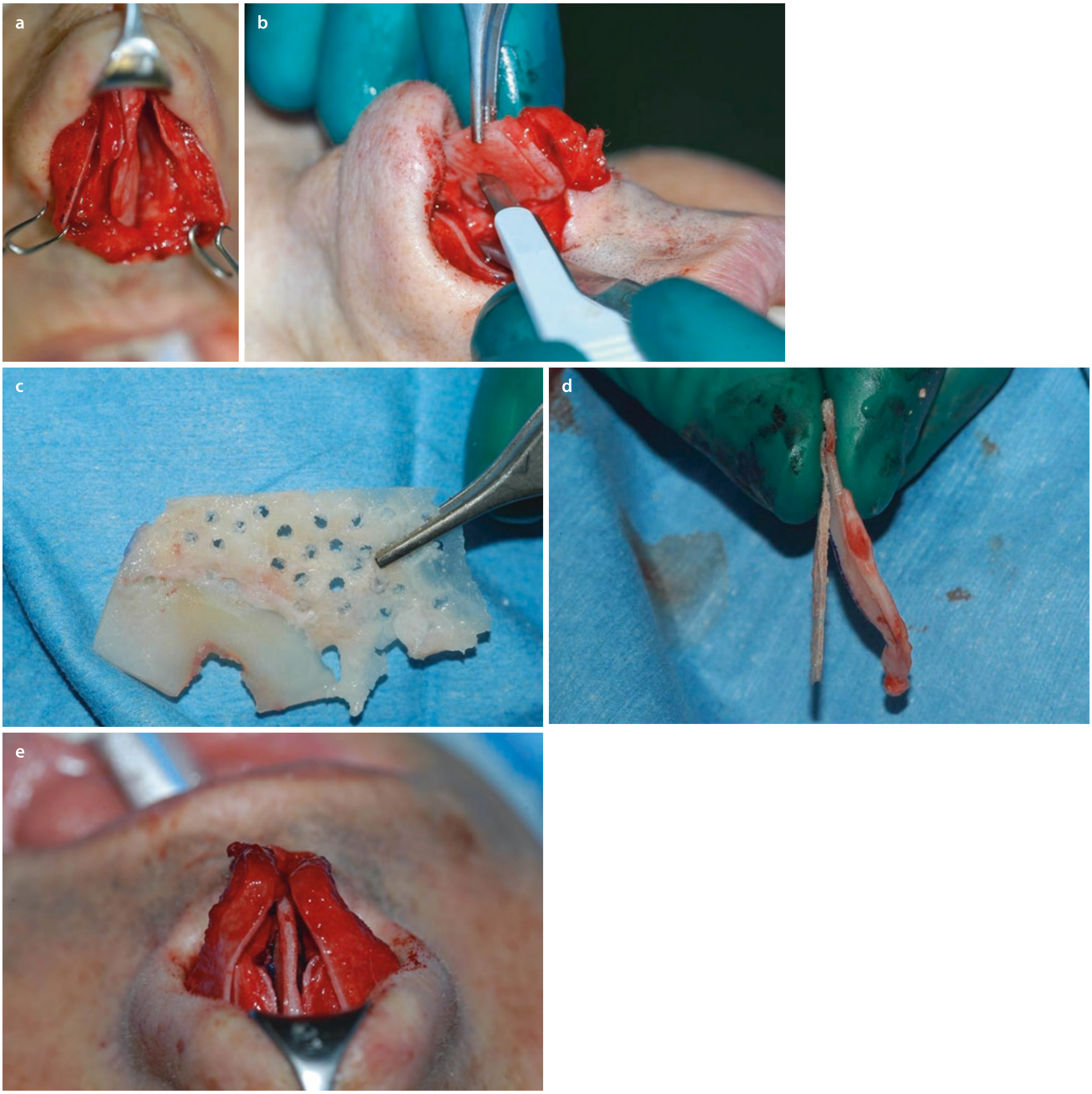

Fig. 2.2 (a–e) Endonasal splinting of the scored anterior septum with a thinned transplant from the central septum

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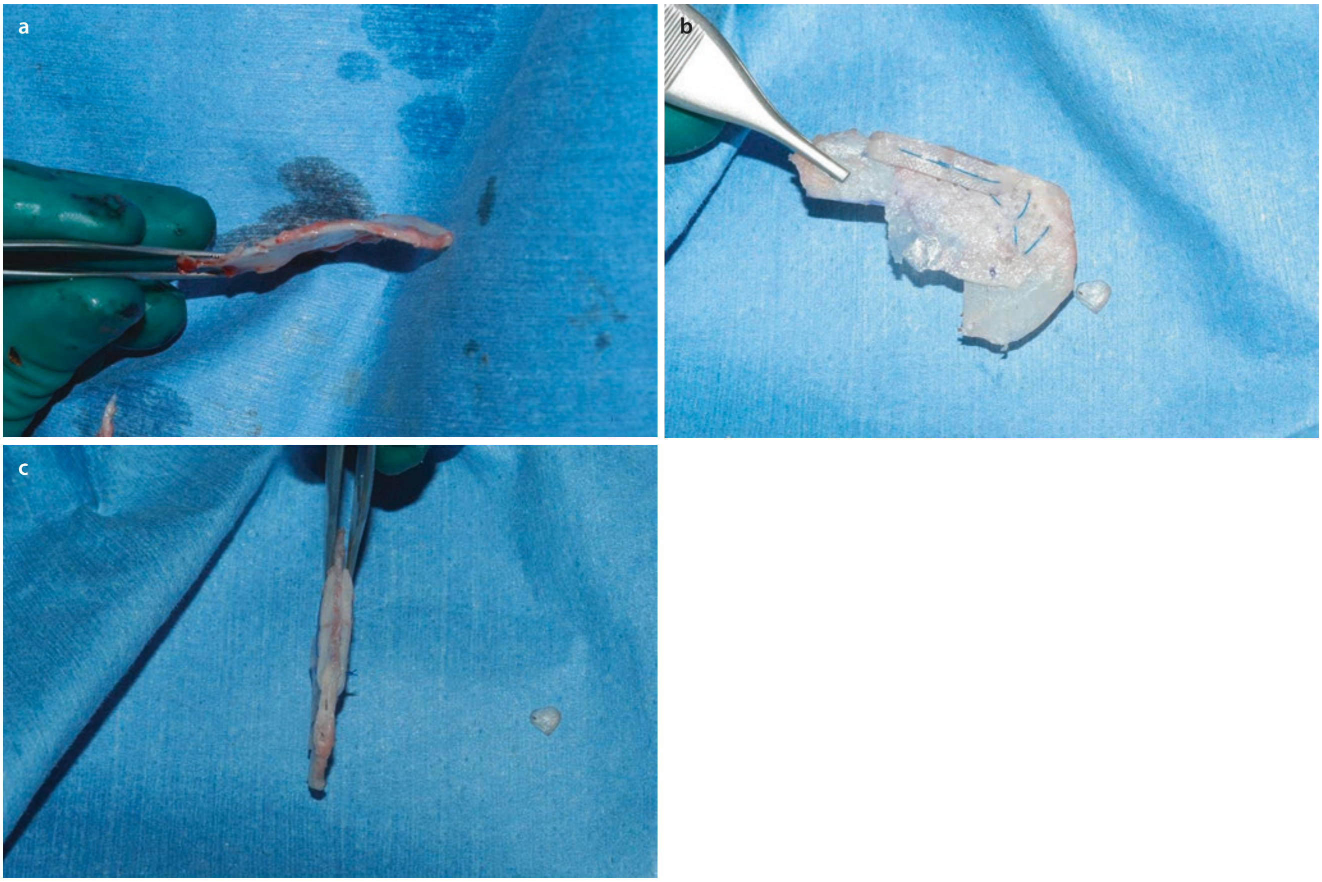


Fig. 2.3 **(a–c)** Extracorporeal straightening with thinned out perpendicular plate and spreader grafts

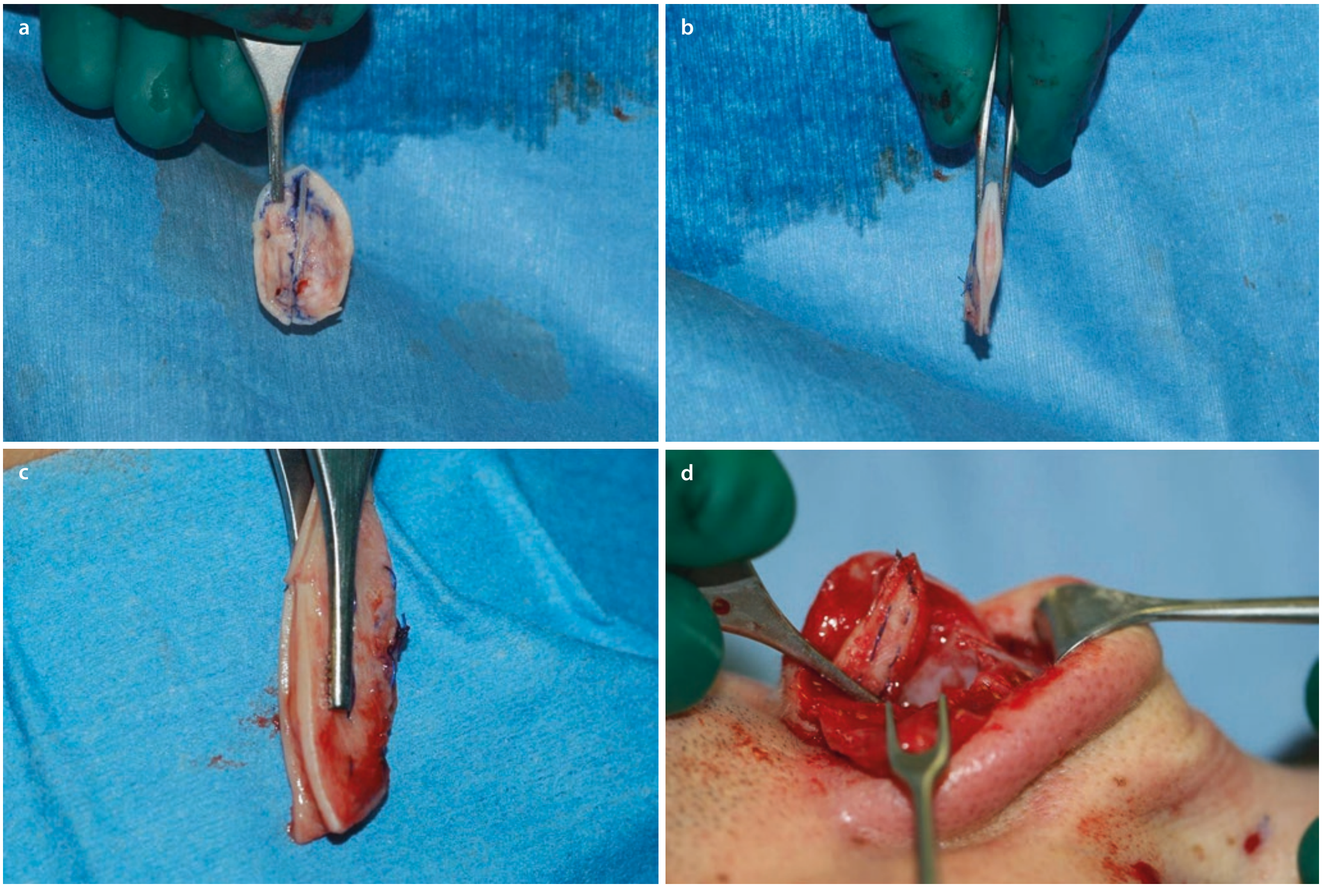


Fig. 2.4 (a–d) Sandwich graft from the concha used as septal extension graft

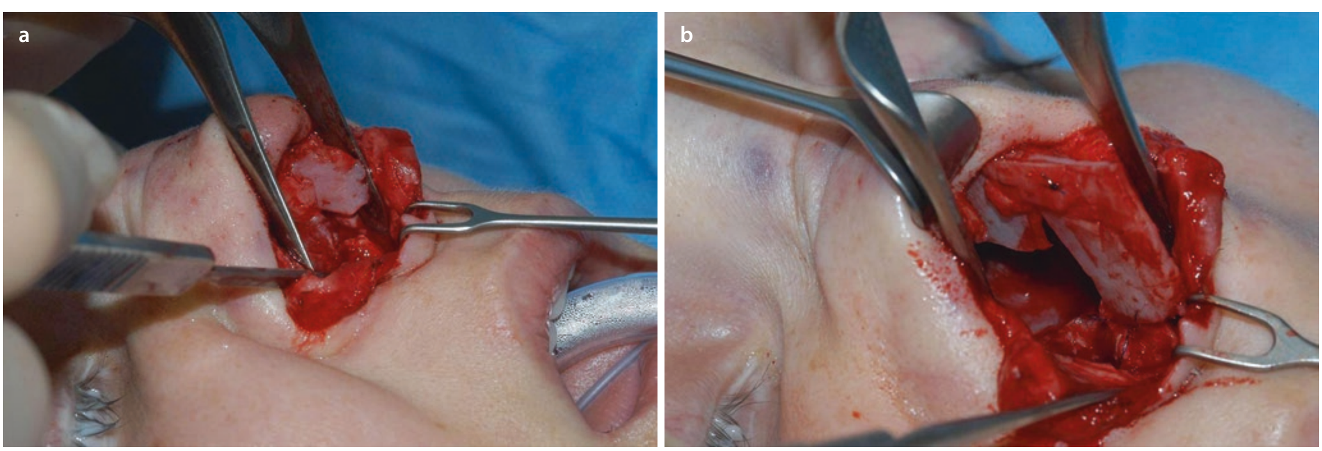


Fig. 2.5 (a, b) Septal extension graft from the central septum fixed to the anterior spine

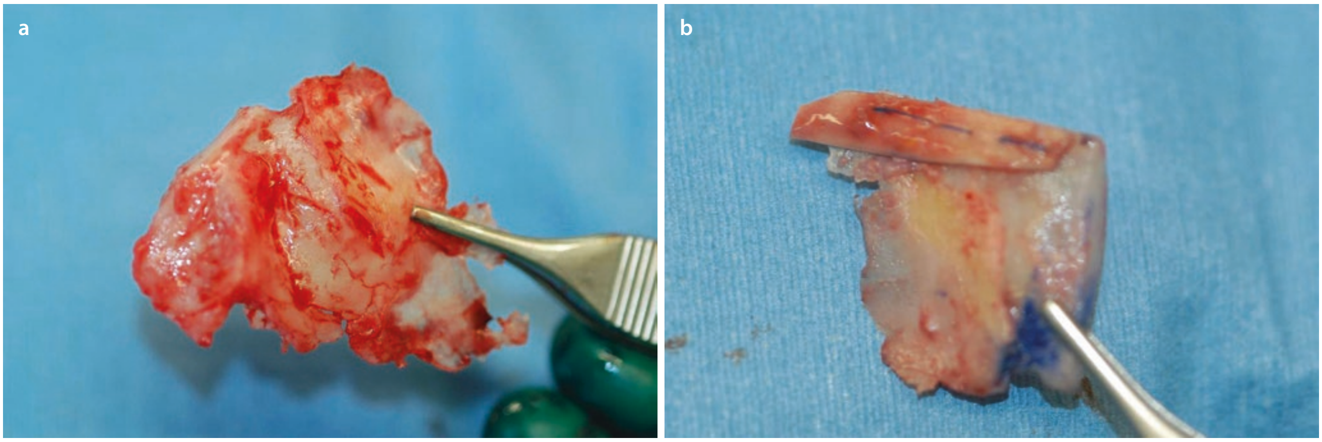


Fig. 2.6 **(a, b)** Extracorporeal septal reconstruction for a deformed anterior border. The neoseptum is replaced in a more anterior position to correct the columellar retraction

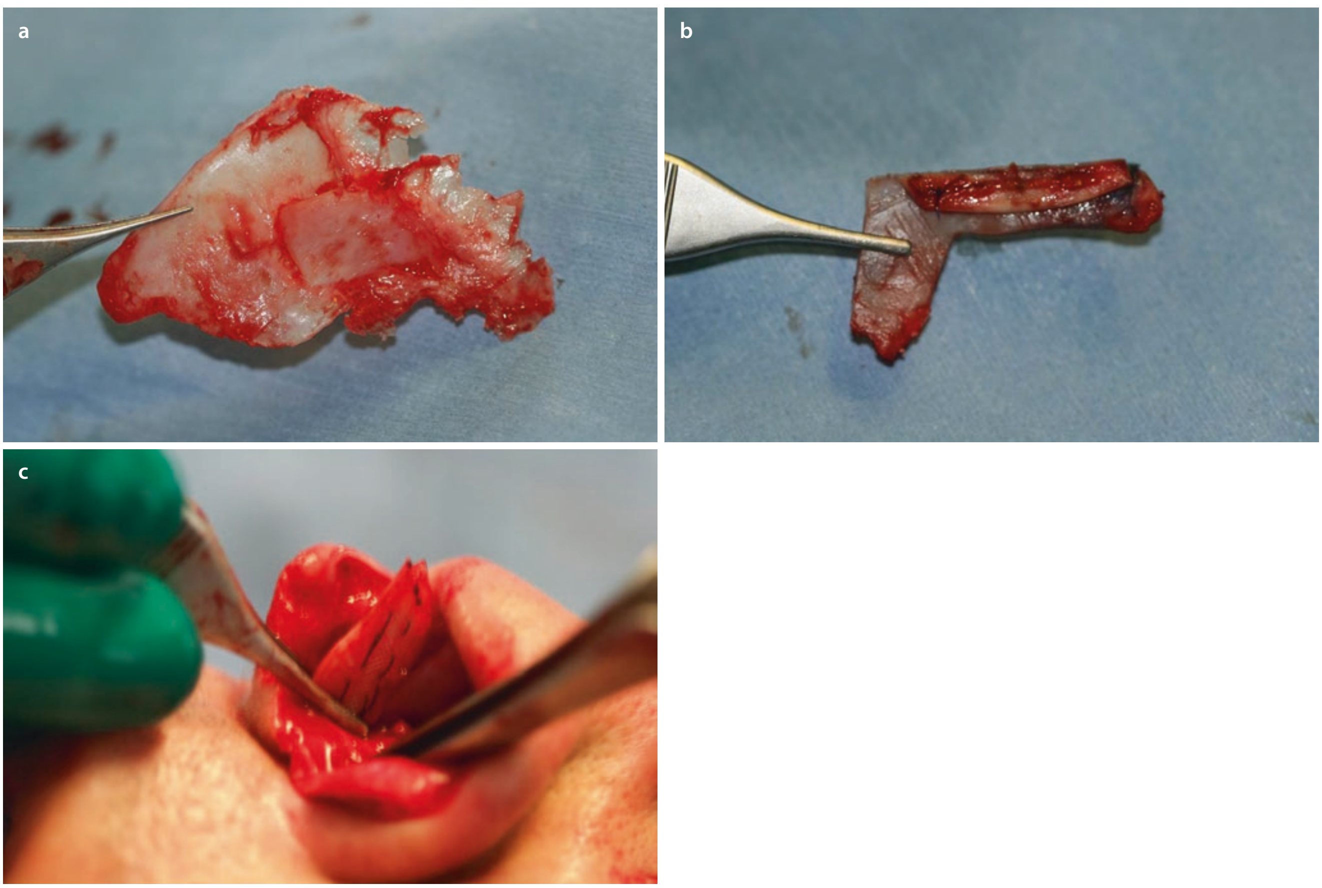


Fig. 2.7 **(a–c)** Extracorporeal septal reconstruction in an overresected anterior border with spreader grafts from the auricle and correction of the retracted columella with a sandwich graft

Fig. 2.8 **(a–d)** Extracorporeal reconstruction of a straight septal frame using a unilateral spreader graft from the residual septum for the dorsum and both an onlay graft from the septum to the anterior border and a sandwich graft from the auricle for reconstruction of a retracted columella

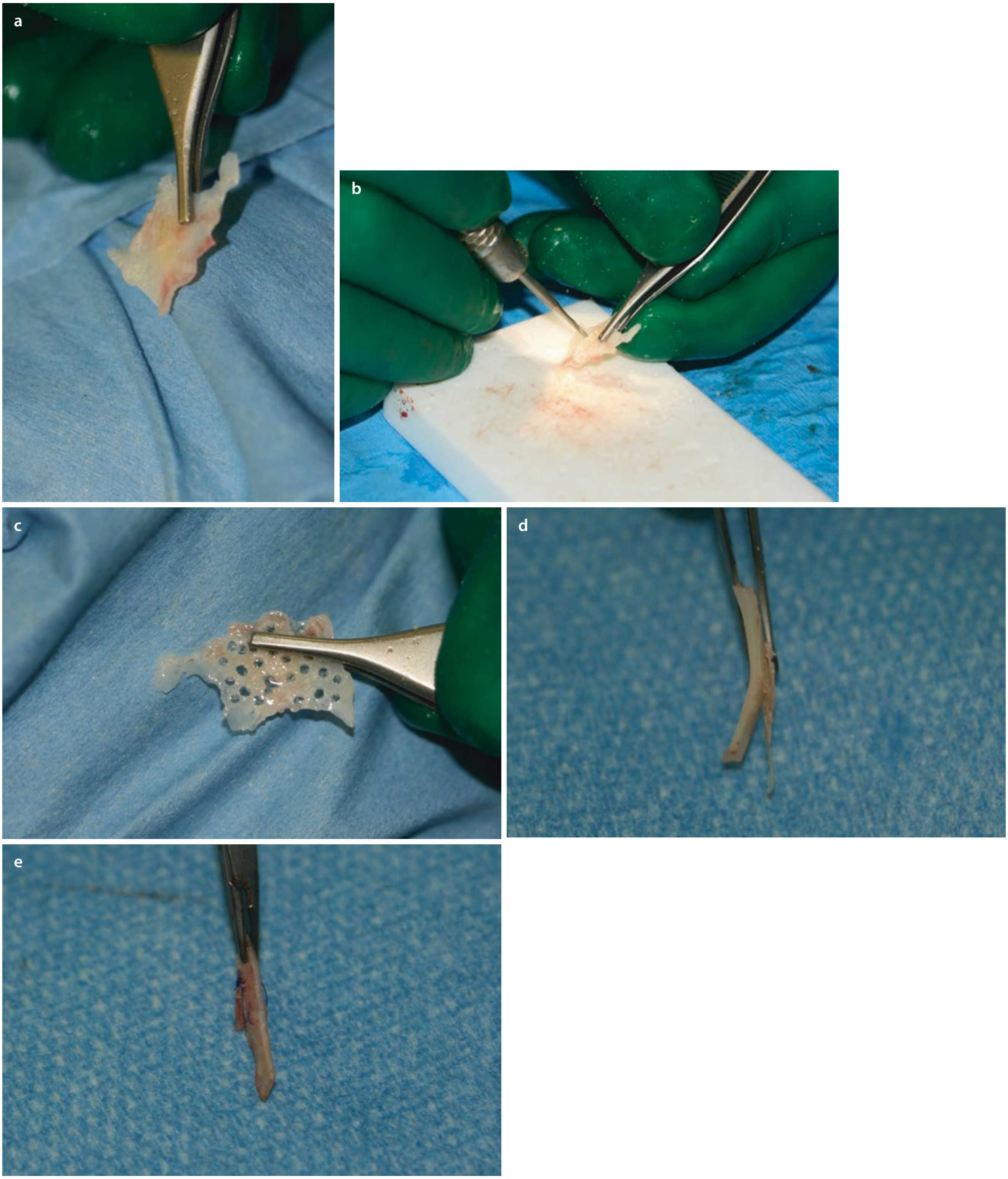


Fig. 2.9 **(a–e)** Straightening with a thinned bone graft from the perpendicular plate with multiple drill holes for fixation and stabilization

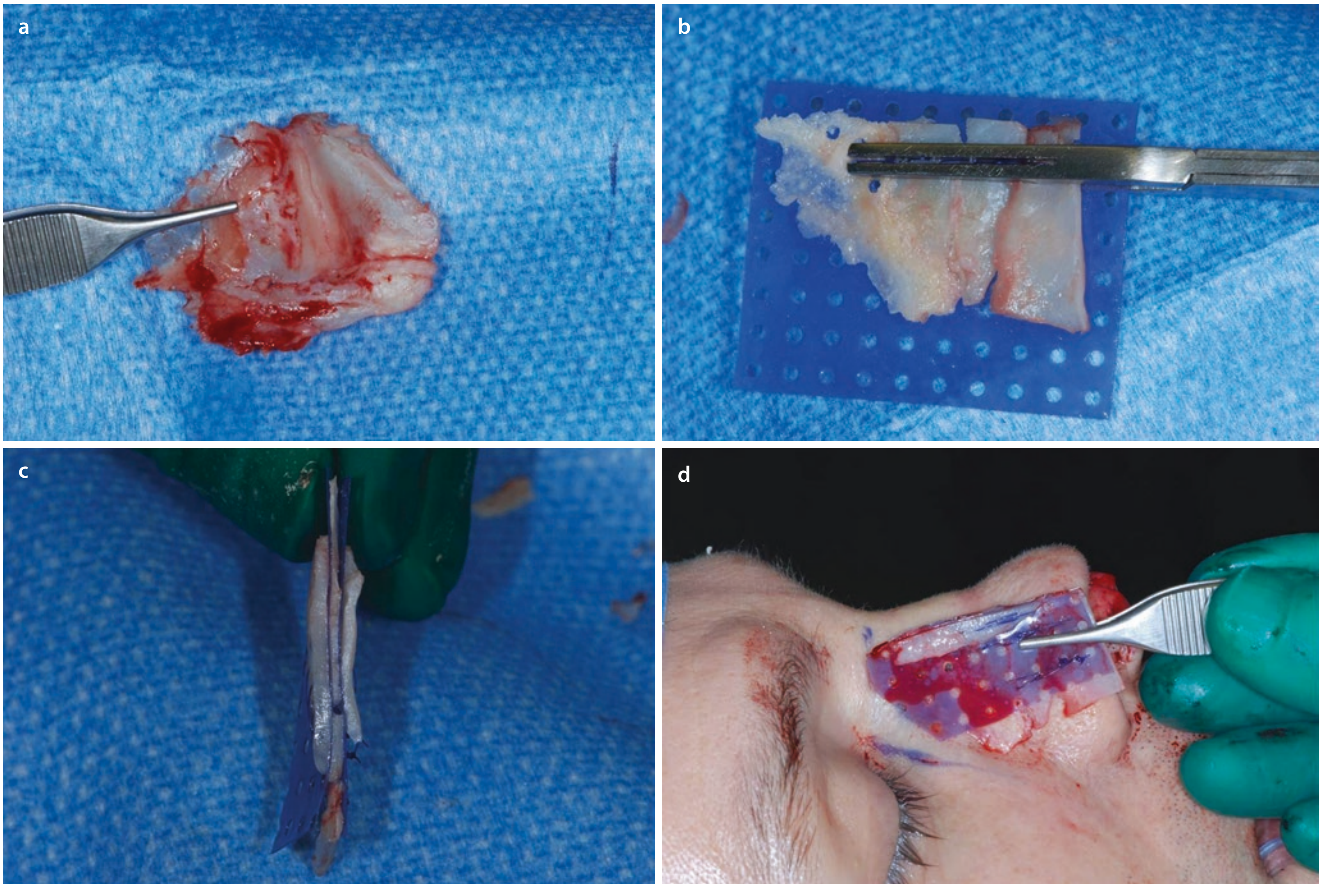


Fig. 2.10 **(a–d)** Extracorporeal septal reconstruction in a multiple fractured septum, which had healed in dislocation. The separated straight pieces are fixed onto a PDS foil keeping it straight by spreader grafts, which are kept in position for suturing with a modified Aiach clamp

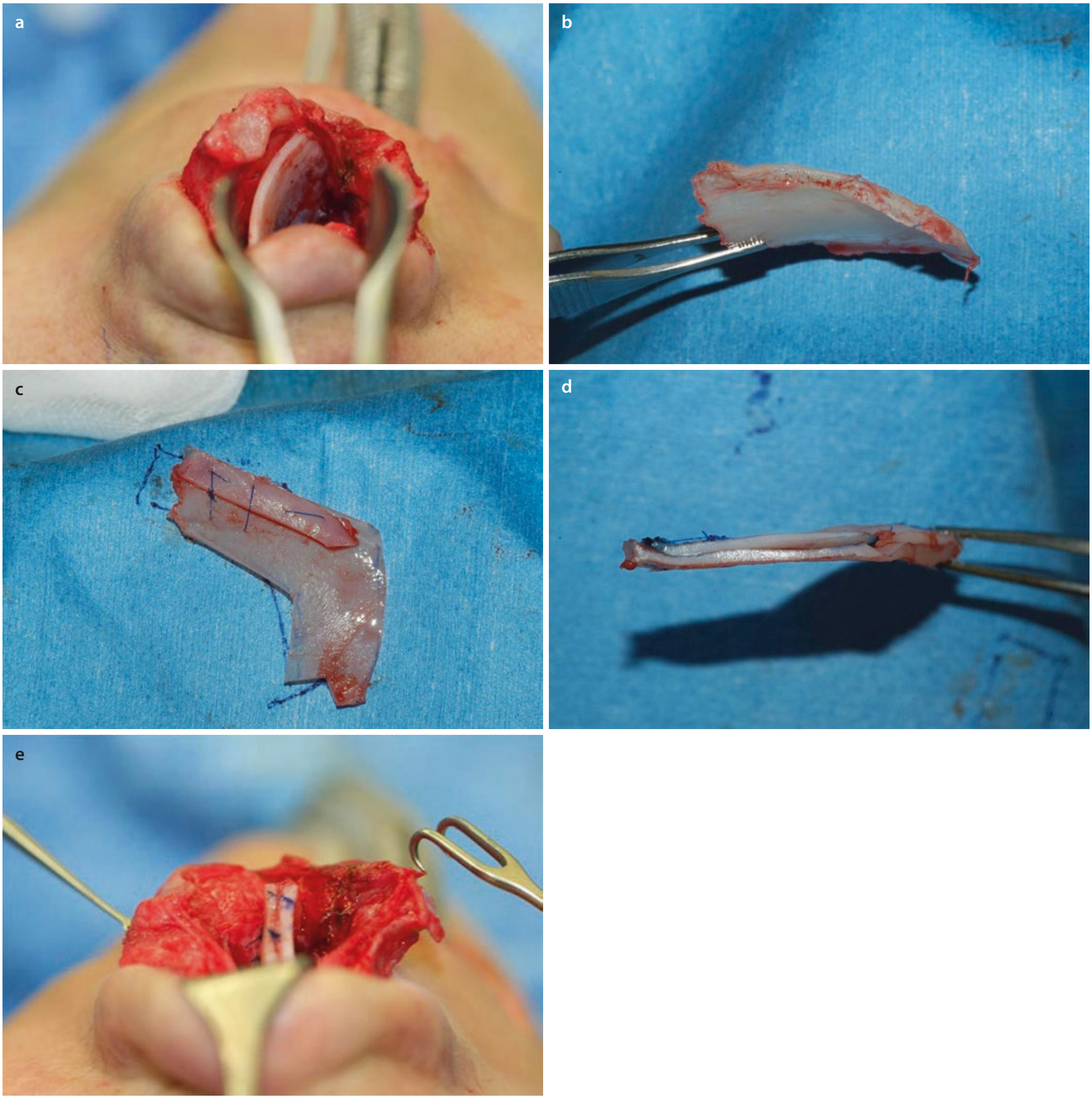


Fig. 2.11 **(a–e)** Extracorporeal septal reconstruction: straightening by a contralateral bent conchal cartilage graft used as a unilateral spreader graft

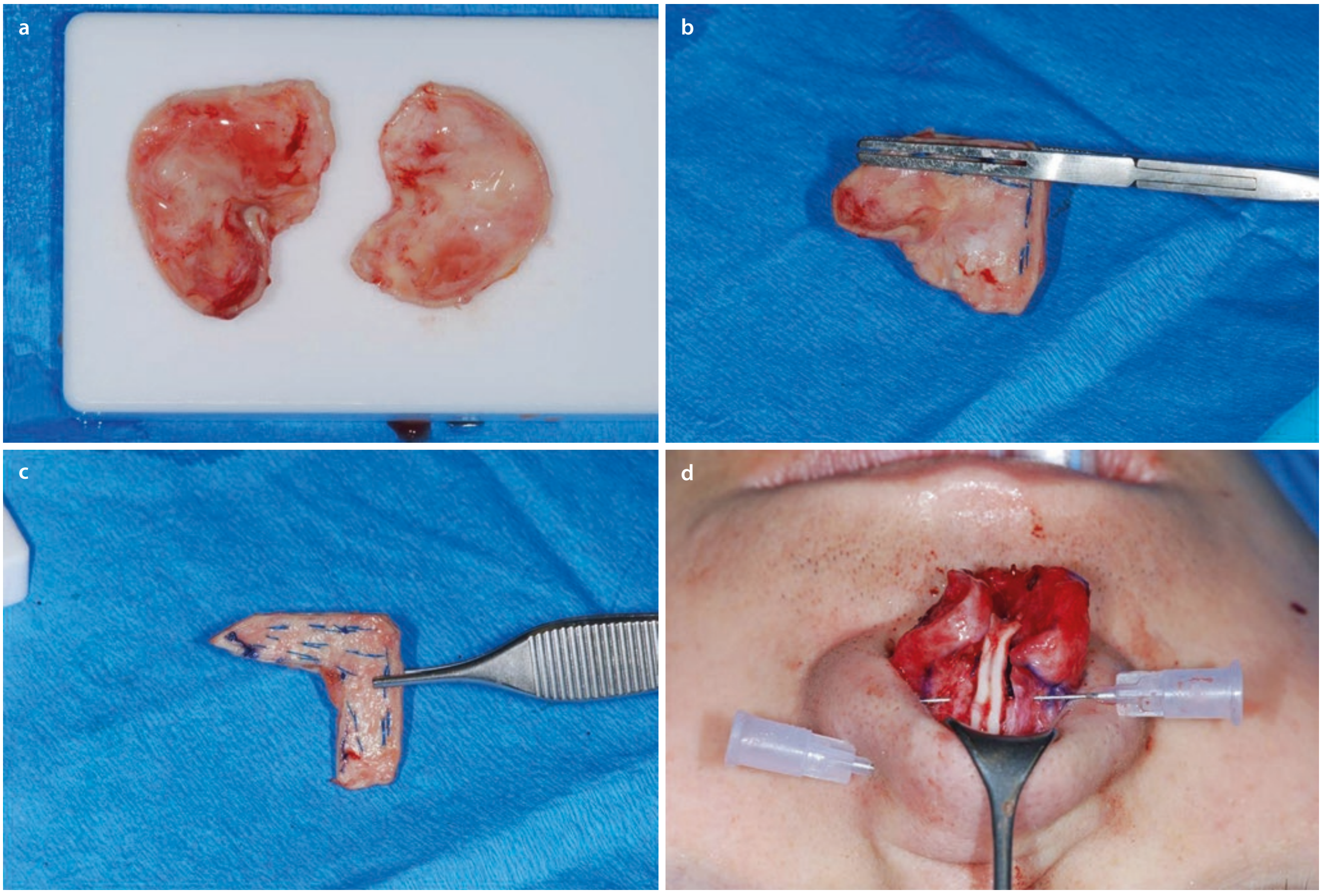


Fig. 2.12 **(a–d)** Total reconstruction of a stable septal framework by doubling conchal grafts

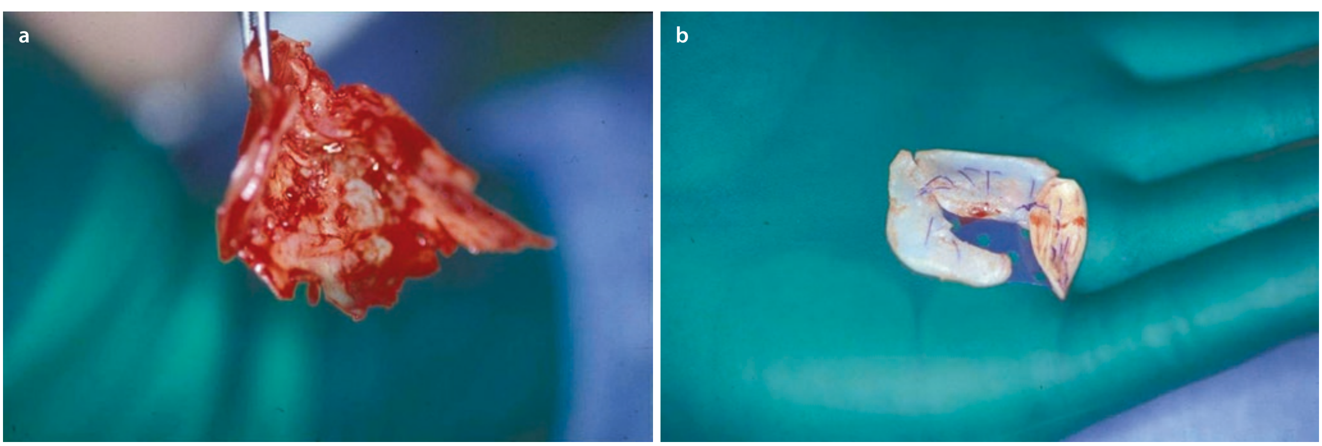


Fig. 2.13 **(a, b)** Reconstruction of a neoseptum from the residual septal components in combination with a conchal graft, both being fixed onto PDS foil

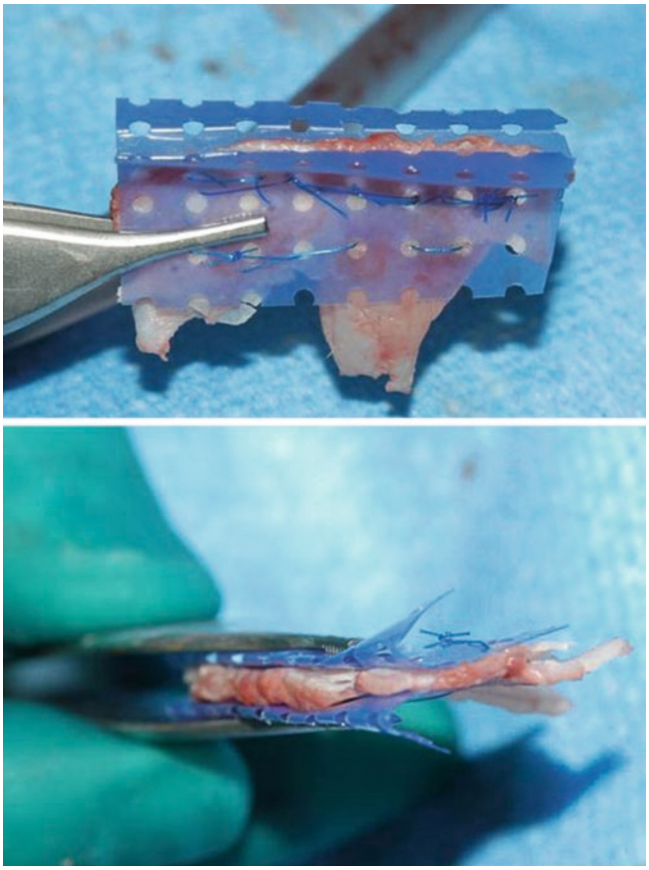


Fig. 2.14 Reconstruction of the internal valve using bended polydioxanone (PDS) foil

2.2 Case Studies

2.2.1 Case 1: Technique: Splinting of a Scored Septum with Ethmoid Bone

The ethmoid bone was thinned with a cylindrical motor drill and then perforated with multiple drill holes and applied with a Lindemann fraise. Fixation could then be performed using multiple back-and-forth mattress sutures.

A 42-year-old woman presented after two previous rhinoplasties. Despite previous septal scoring, there was a slight persistent septal deviation to the right. The deviation was eliminated using a thinned perpendicular plate splint that had been perforated with multiple drill holes for easier fixation to the septum itself and by using multiple back-and-forth mattress sutures for long-term stabilization. Using this technique, satisfactory straightening of the dorsum was accomplished (Fig. 2.15a–d).

Fig. 2.15 **(a)** Thinned ethmoid bone for splinting. (**b**) Front view pre-op/post-op after splinting the scored septum with ethmoid bone graft. (**c**) Profile view pre-op/post-op after splinting the scored septum with ethmoid bone graft. (**d**) Base view pre-op/post-op after splinting the scored septum with ethmoid bone graft

Fig. 2.15 (continued)

2.2.2 Case 2: Technique: Septal Extension Graft

A septal extension graft (SEG) can be used for a variety of indications, including nasal lengthening, lower level cartilages (LLC) contouring, tip support, or augmentation of a weak or overresected anterior septum. A strong and straight piece of septal cartilage is preferred for the creation of an SEG. Suture fixation of the graft can be performed in two different ways, depending upon the anatomy. When the caudal septum is reasonably strong and stable, the SEG can be sutured directly to the caudal septum in a side-to-side configuration for secure immobilization. Alternatively, the SEG can be stabilized using a single (or paired) extended spreader graft or splinting grafts (single or paired from bone or cartilage) when septal support has been compromised or when aggressive nasal lengthening is desired. However, care must be taken to contour the SEG to fit the anterior septal contour precisely.

A 35-year-old female presented after several failed rhinoplasty surgeries. Profile examination revealed a hanging columella, an overresected bony dorsum, and an overprojected lower nose. Frontal examination revealed a deviated nose with an inverted-V deformity, an oblique columella with dislocation from the anterior nasal spine (ANS) into the left nasal vestibule, and asymmetrical nostrils with bilateral alar retraction.

Upon exploration with the open rhinoplasty approach, copious fibrous scar tissue was found covering a weak and unstable caudal septum. Consequently, a large piece of cartilage was harvested from the posterior quadrangular septum and sutured to the caudal septum as a septal extension graft (◘ Fig. 2.16a). Using transverse drill holes created in the ANS, the base of the caudal septum was then sutured in the midline to the ANS (◘ Fig. 2.16b). To straighten the dorsal L-strut, 8 cm of the ninth rib was harvested and cut diagonally into 1.5 mm wide strips, which were used as extended spreader grafts. In addition to straightening the middle vault, extended spreader graft placement stabilized the septal extension graft and eliminated the inverted-V deformity. Tip deprojection was performed using a lateral crural overlap technique followed by tongue-in-groove fixation of the medial crura to the septal extension graft for elimination of the hanging columella. Asymmetrical alar rim grafts were placed to correct tip asymmetry and to contour and strengthen the alar rims. The remaining cartilage was finely diced and used as onlay graft material to smooth the nasal dorsum (◘ Fig. 2.16c–e).

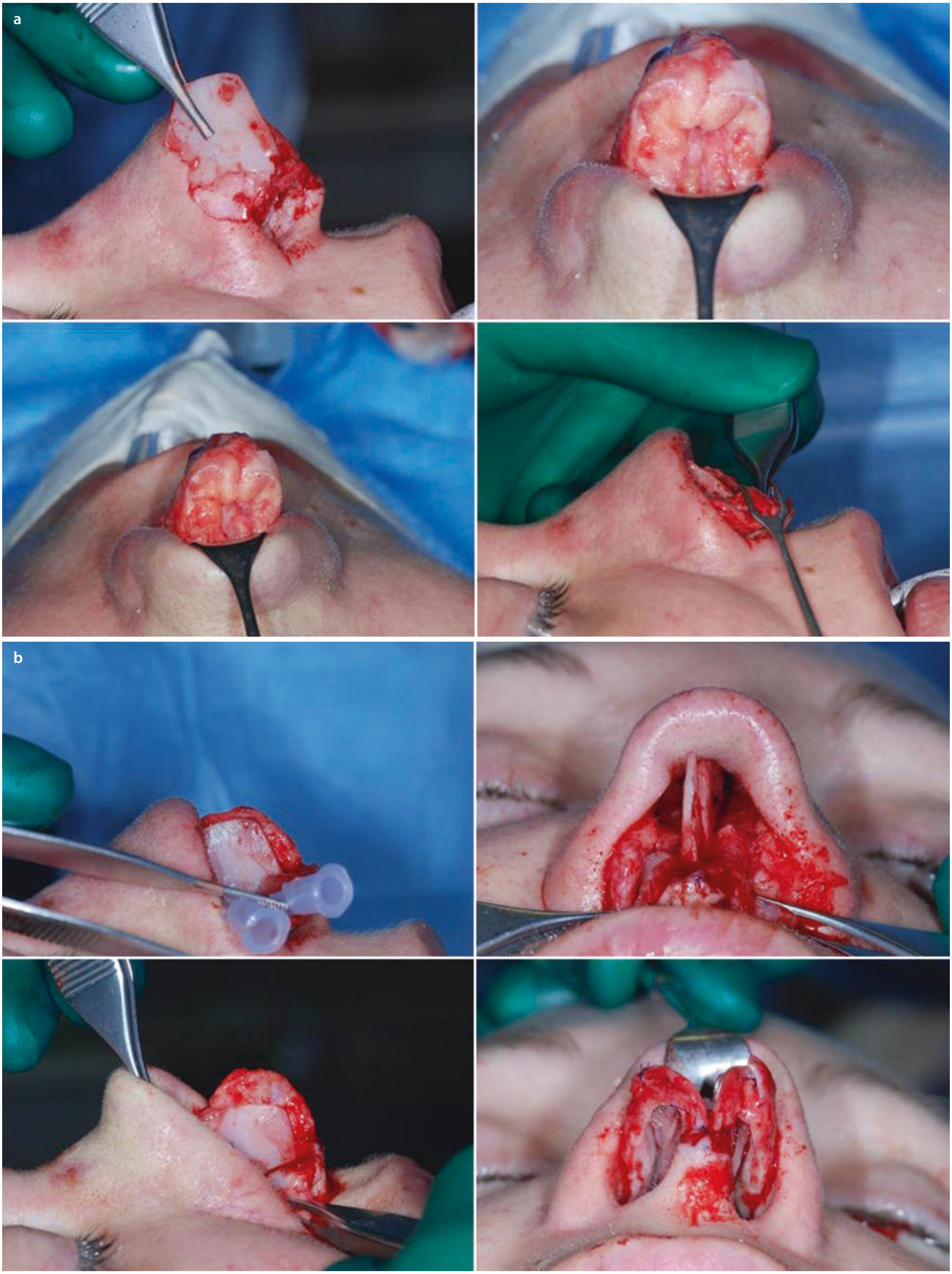


Fig. 2.16 **(a)** Endonasal stabilizing of a weak caudal septum with a septal extension graft. **(b)** Straightening the weak anterior septum with septal extension graft and fixing it in the midline. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 2.16 (continued)

Fig. 2.16 (continued)

2.2.3 Case 3: Technique: Suture Fixation of the Neoseptum to the ANS Using Osseous Drill Holes

Secure fixation of the septal construct after extracorporeal septal reconstruction is essential. In addition to secure cranial fixation of the construct to the ULC and nasal bones, stable caudal fixation to the ANS is equally important. In order to facilitate stable fixation of the septal construct directly to the ANS, a small transverse drill hole is placed to permit passage of the fixation sutures. Whenever possible, this is also combined with the creation of a sagittally oriented groove created within the ANS to further stabilize the neoseptal construct. The neoseptum is also sutured with at least three passes of 4-0 permanent suture placed at different points within the construct to increase stability.

A 53-year-old male patient presented for revision surgery. Examination revealed a bulky tip and a deviated nose secondary to a severe residual deformity of the nasal septum, including dislocation of the caudal septum into the left nasal vestibule with an oblique columella. An overprojected dorsum and an overly narrow cartilaginous dorsum with collapse of the internal nasal valve were also observed.

Using the open rhinoplasty approach, we observed an "accordion-like collapse of the medial crura." Owing to the severity of the septal deformity, an extracorporeal septal reconstruction was required, including doubling of the anterior septum to create a straight caudal L-strut. Spreader grafts were then used to widen the pinched middle vault, and the neoseptum was sutured to the ULC, nasal bones, and ANS after a transverse drill hole and osseous sagittal groove were created in the ANS.

In order to compensate for septal shortening after folding the anterior septum, a double-layered conchal "sandwich" graft was used to lengthen the caudal septum and to provide a strut for the LLC. Tip refinement was accomplished using lateral crural underlay technique (cephalic fold-under flaps), spanning sutures, and a non-integrated shield graft. Rim grafts were used to enhance alar rim contour, and a single layer of allogenic fascia lata was used to smooth the nasal dorsum (Fig. 2.17a–d).

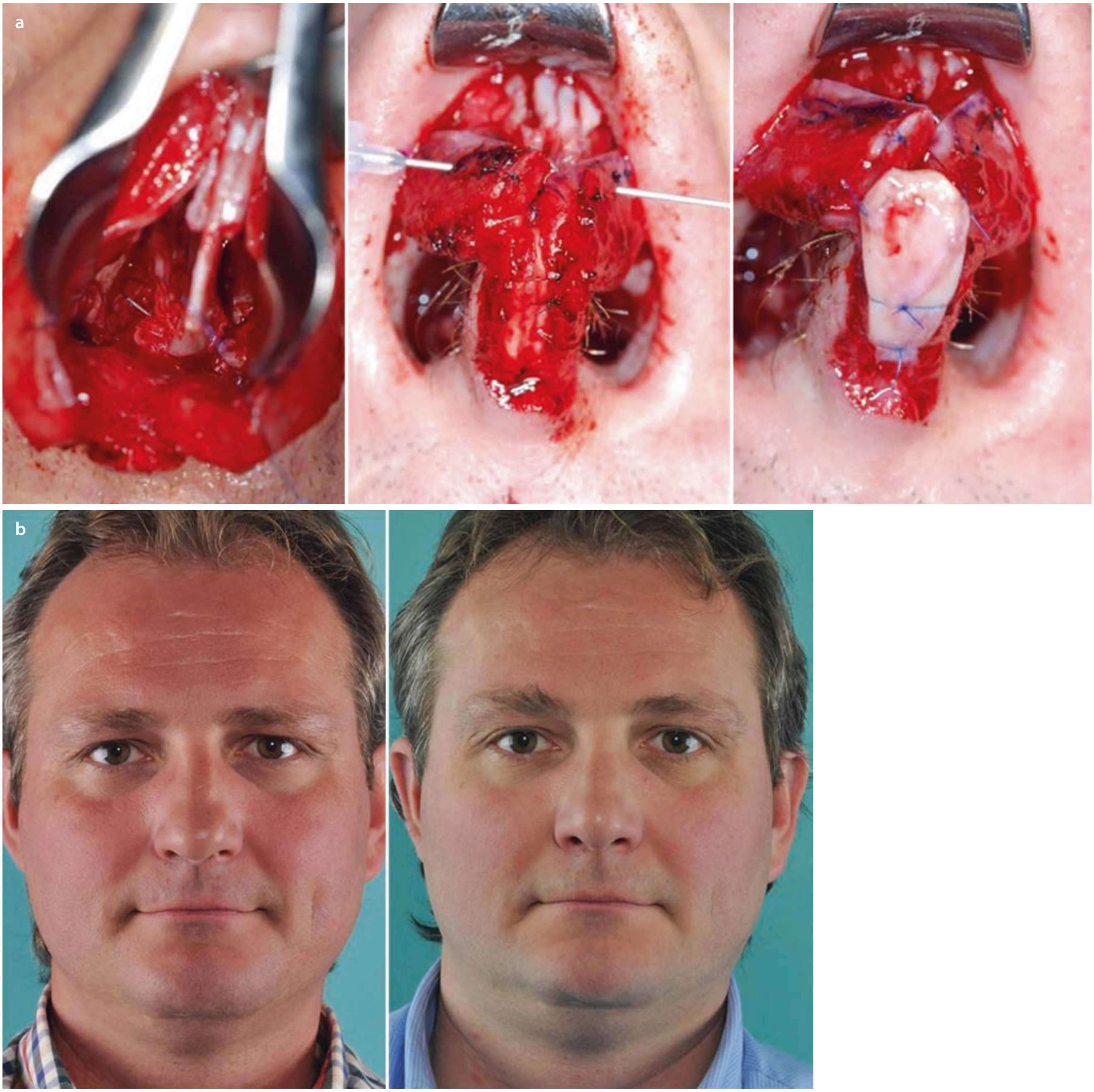


Fig. 2.17 **(a)** Extracorporeal septal reconstruction with fixation to the ANS via a drill hole, sandwich graft from the concha and shield graft for contouring the tip. **(b–d)** Front view, profile view, base view pre-op/post-op

Fig. 2.17 (continued)

2.2.4 Case 4: Technique: Creation of a Neoseptum with PDS Foil, Restoration of Strong Tip Support Using a Sandwich Graft from the Concha

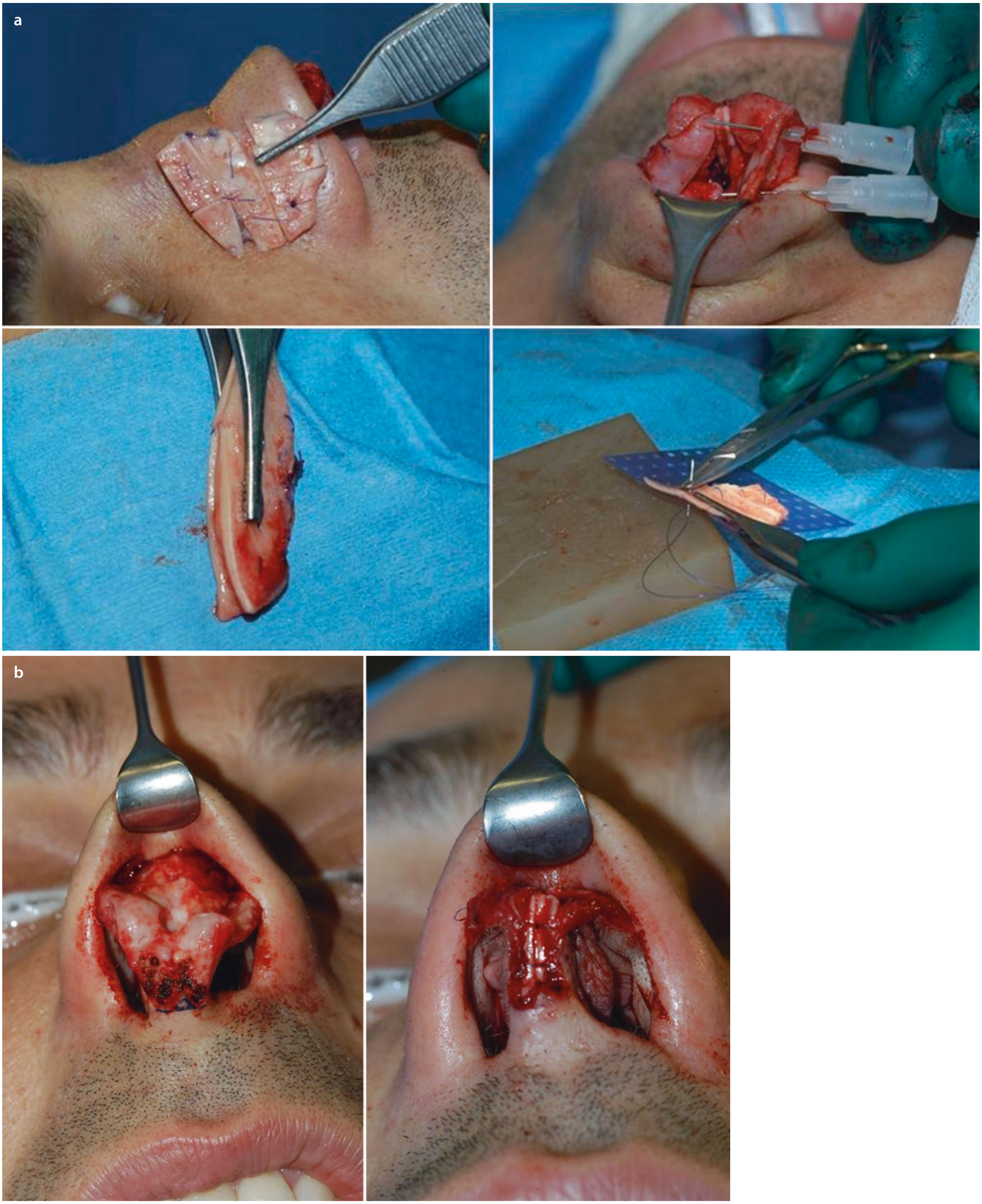
The conchal cartilage was cut through to the perichondrium of the opposite side, and then the straight pieces were fixed to PDS foil. Using this technique, a stable anterior septum was created.

For additional tip support, a sandwich graft from the concha was used. By suturing reciprocal curves of the conchal cartilage to balance opposing forces and create a strong, straight graft, long-term stability is ensured. We use the modified Aiach clamp and suture the cartilage with a 4-0 nonresorbable suture on a sharp Keith needle.

A 37-year-old man presented with severe deformity of the external and internal nose after four previous rhinoseptoplasties.

The nose was significantly deviated to the right with asymmetrical nasal bones, asymmetrical nostrils, and an asymmetrical tip. The anterior septum was overresected, with drooping of the tip and a slightly retracted columella. Concavity of both alae was also observed.

Because of initial overresection of the septum, prior septal reconstruction was undertaken with rib cartilage, but inadequate rib thinning and rib warping resulted in an unsatisfactory outcome. Consequently, the rib graft was removed, and the septum was reconstructed using a concha graft in which the cartilage was cut for straightening; the perichondrium was preserved intact. The now straightened conchal cartilage was then fixed to PDS foil scaffold for support. After osteotomies, the neoseptum was replanted and fixed to the upper lateral cartilage as well as to the nasal bones and the anterior nasal spine. For additional support, a sandwich graft from the second concha was also used. This was positioned using guiding sutures and then fixed to the anterior-most end of the PDS foil scaffold. The concavity of the lateral crura was eliminated using a lateral crural overlay technique. Tip narrowing was attempted using suture techniques, but the cartilage was too thick, so that a dome division with secondary suturing was required (◘ Fig. 2.18a–f).



◘ **Fig. 2.18** **(a)** Extracorporeal septal reconstruction with PDS foil and conchal cartilage. **(b)** Sandwich graft from concha used as columellar strut. **(c)** Removal of the bended rib graft; convexity of both lateral crura, structuring the tip with sandwich graft, dome division after lateral crural overlay technique, then suturing. **(d–f)** Front view, profile view, base view pre-op/post-op

Fig. 2.18 (continued)

Fig. 2.18 (continued)

2.2.5 Case 5: Technique: Straightening by Splinting with Thinned Perpendicular Plate

Deviated septal cartilage can be straightened by splinting with or without scoring. An ideal material for splinting is the thinned perpendicular ethmoid plate. By using an electric drill with a cylindrical-shaped bit, thinning is easily done. The prethinned bone is perforated with as many multiple drill holes as possible to make the fixation easier. For that purpose, we use a straight Keith needle with 4-0 nonresorbable suture. Multiple drill holes are necessary because at the end of the surgery, multiple through-and-through back-and-forth sutures are placed through the replanted septum for stabilization, and the holes must be located by blind palpation.

A 38-year-old female presented following previous corrective nasal surgery 15 years earlier. Initially the result was satisfactory until 3 years ago, when a recurrence of the deviation occurred. On examination, we observed a slight deviation to the right with an asymmetrical tip and a seagull deformity of the left ala. The columella was oblique, and the anterior septal border was dislocated into the right nostril, resulting in nostril asymmetry. In addition, there was a slight malformation of the left nasal entrance with a missing sill and a retraction of the left ala.

Intraoperatively, we found a slightly deviated septal cartilage, since during the previous operation only a spur had been resected. We harvested a large graft from the perpendicular plate, thinned it, perforated it, and fixed it to the deviated dorsal segment of the septum. The septum itself was very weak, which facilitated correction with the application of ethmoid splinting grafts. Furthermore, the anterior septal border had not been relocated and secured to the anterior spine during the primary procedure, which was now performed. In addition, paramedian, percutaneous transverse, and low-to-low lateral osteotomies were performed to straighten the bony pyramid.

During the previous operation, a dome division technique had been used for narrowing the tip. The application of this technique led to the seagull deformity of the left ala; therefore, we reconstructed the domes using an overlapping technique that enabled us to simultaneously correct the seagull deformity. For stabilization of the weak cartilage, we inserted a batten graft on the right lateral crus. The wide columellar base was narrowed by direct suturing of the footplates. The retraction of the left ala could have been corrected by a composite graft from the inner side of the anterior helix, but the patient declined this aspect of the reconstruction (▣ Fig. 2.19a–e).

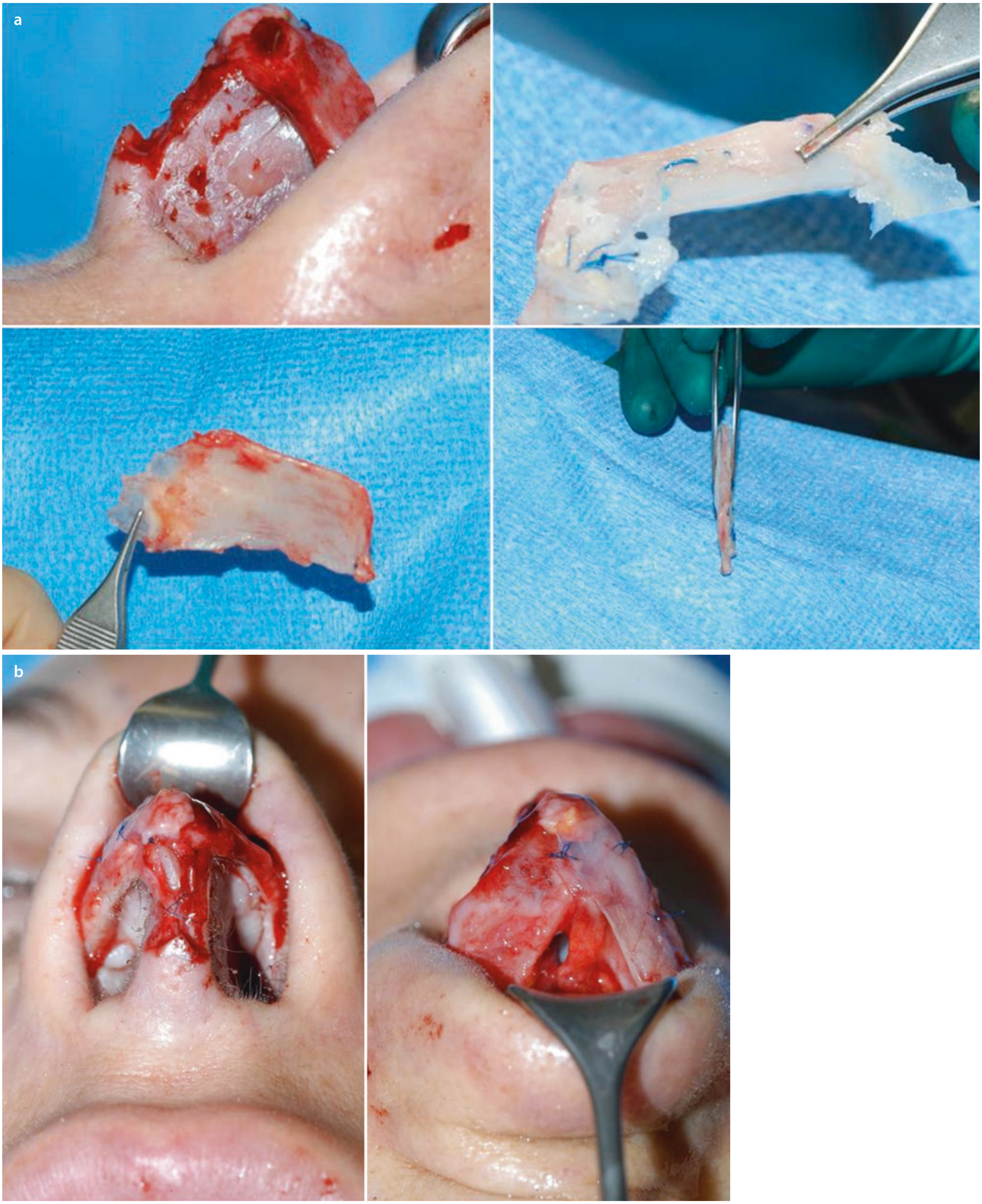


Fig. 2.19 **(a)** Straightening recurrent deviation with perpendicular bone graft. **(b)** Reconstruction of the tip framework with overlap technique and batten graft. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 2.19 (continued)

Fig. 2.19 (continued)

2.2.6 Case 6: Technique: Covering the Reconstructed Septum with Free Diced Cartilage (FDC)

Irregularities of the dorsum have been the most common problem using the technique of extracorporeal septal reconstruction. One option to get a smooth dorsum is using fine diced cartilage, which is applied via a tuberculin syringe after suturing the flap back so that it can be used like a paste to mold the dorsum.

A 42-year-old female presented after previous rhinoplasty for revision surgery. Examination revealed a deviated and overprojected nose, an underprojected tip, an oblique columella with dislocation of the anterior septal border to the left side, and deviation of the quadrangular septum to the right. In addition, the tip was bulbous and the nostrils were asymmetrical. On profile view, the tip was overly round, the dorsum was overprojected, and the radix was overly deep.

Using the external approach, the dorsal septum was first lowered, and then deviated segments of septal cartilage were straightened using a thin piece of perforated ethmoid bone. The bony pyramid was then straightened using low-to-low lateral and transverse osteotomies. Autospreader flaps were then used to widen the internal nasal valves and recontour the dorsal aesthetic lines. Free diced cartilage was then used to augment the radix and provide further refinement to the nasal dorsum.

To support the tip, a sandwich graft harvested from the concha was sutured to the medial crura. Prior to fixation, a deformed portion of the intermediate crus was excised to correct nostril asymmetry. The stumps were then sutured to the sandwich graft in an end-to-end configuration. A shield graft was then placed to increase tip projection and strengthen tip support (▫ Fig. 2.20a–d).

Fig. 2.20 **(a)** Straightening recurrent deviation with a perpendicular ethmoid bone graft and free diced cartilage (FDC) for dorsal camouflage. **(b–d)** Front view, profile view, base view pre-op/post-op

Fig. 2.20 (continued)

2.2.7 Case 7: Technique: Lengthening of the Septum by Extracorporeal Technique

Owing to previous overresection of the caudal septum, reduced septal height resulted in inadequate tip support. After removing the entire residual septum, measurements revealed a septal height at the cartilaginous bony junction of approximately 35 mm, indicating sufficient length for reconstruction of the dorsum. The length of the original dorsum was only 20 mm. There was also sufficient size for simultaneous replacement of the anterior septal border. Therefore, the explanted septum was turned by 90°.

A 44-year-old woman presented after previous rhinoseptoplasty abroad. On examination, a severe polly-beak deformity with asymmetrical nasal tip and prominence on the right side, irregularities of the dorsum, insufficient tip support with underprojection, and a septal perforation were all observed.

Intraoperatively, we found an overshortened anterior septum that was vertically too tall and resulted in dislocation of the caudal septum to the left side, creating a septal spur on that side. Therefore, the entire septum was removed and rotated 90° so that the bony cartilaginous junction became the new dorsum and the dorsal septum became the new anterior border. The reoriented septum was replanted within the septal perforation so that after closure of the mucosa, an anatomic reconstruction was achieved. Because the bony cartilaginous junction was unusually thick, separate spreader grafts were not required because nasal valve width was adequate. Because of short upper lateral cartilages, fixation of the replanted septum to the upper lateral cartilages was insufficient, and additional fixation to the nasal bones was necessary.

Usually we begin drill hole placement on the dorsal part of the right nasal bone and make as many holes as possible to the adjacent bony dorsum of the neoseptum. Then we take a curved 4-0 needle and go through the drill hole on the right side as well as a drill hole through the bony dorsum and observe where the tip of the needle hits the opposite side. At the contact point, we make a final drill hole through the left nasal bone. With this simple method, fixation of the replant to the nasal bone is fast and easy. These days, we would prefer the "crisscross technique" (▶ see Fig. 1.8).

After fixation, we vertically shortened the caudal septum so that it fitted precisely into the groove previously created within the nasal spine. Additionally, a horizontal drill hole was also made through the spine so that we could reattach the caudal septum. Next we covered the new dorsum with previously harvested perichondrium to camouflage the reconstruction. The nasal tip was contoured with a transdomal suture. To straighten the weak lateral crura, a thick piece of septal cartilage was divided and used as a batten graft for both sides so that the ala became strong. Spanning sutures and tip suspension sutures were also used. Finally, to avoid any imperfections with the new structure, a soft-tissue graft was also applied to the nasal tip (Fig. 2.21a–i).

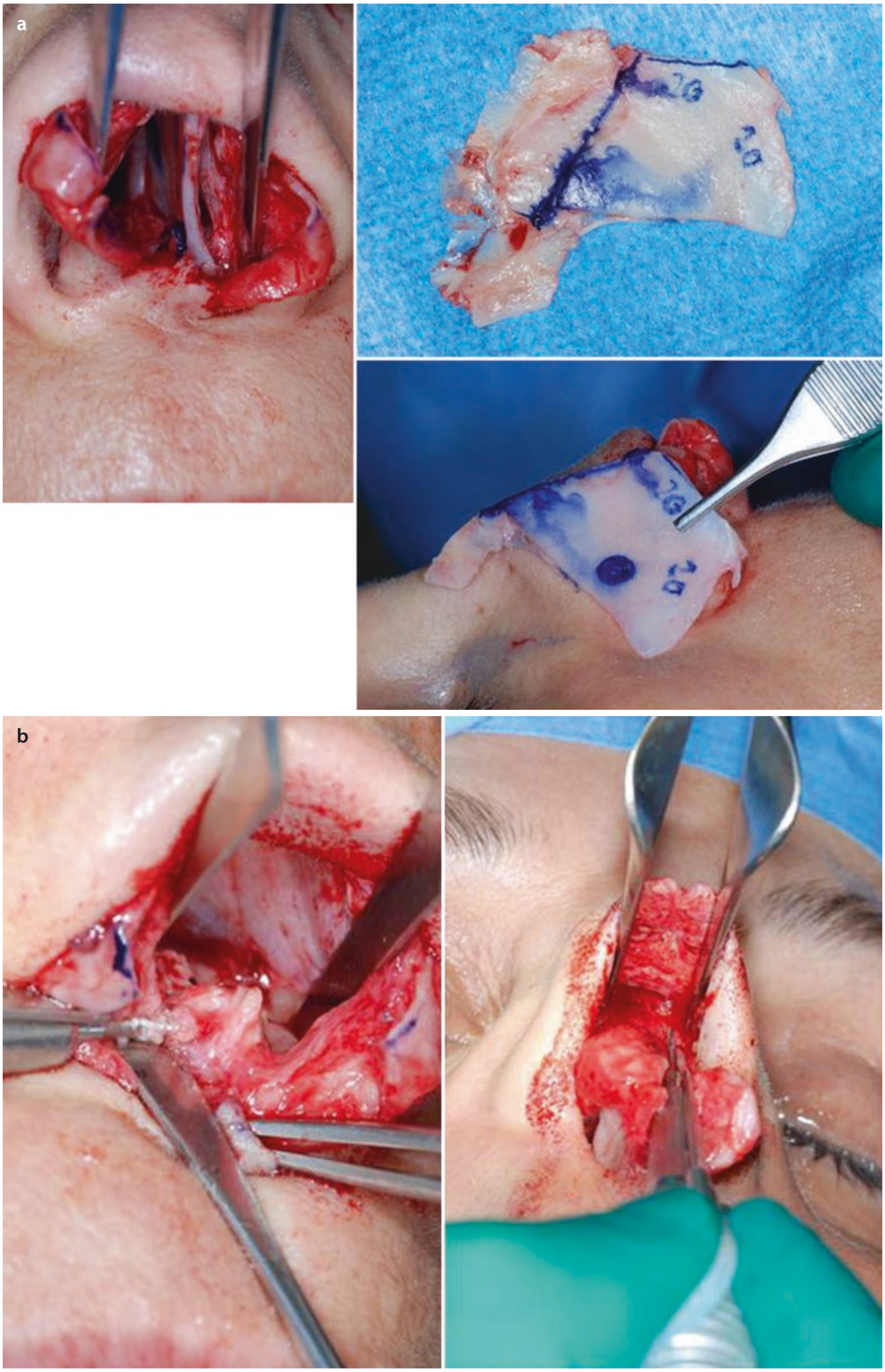
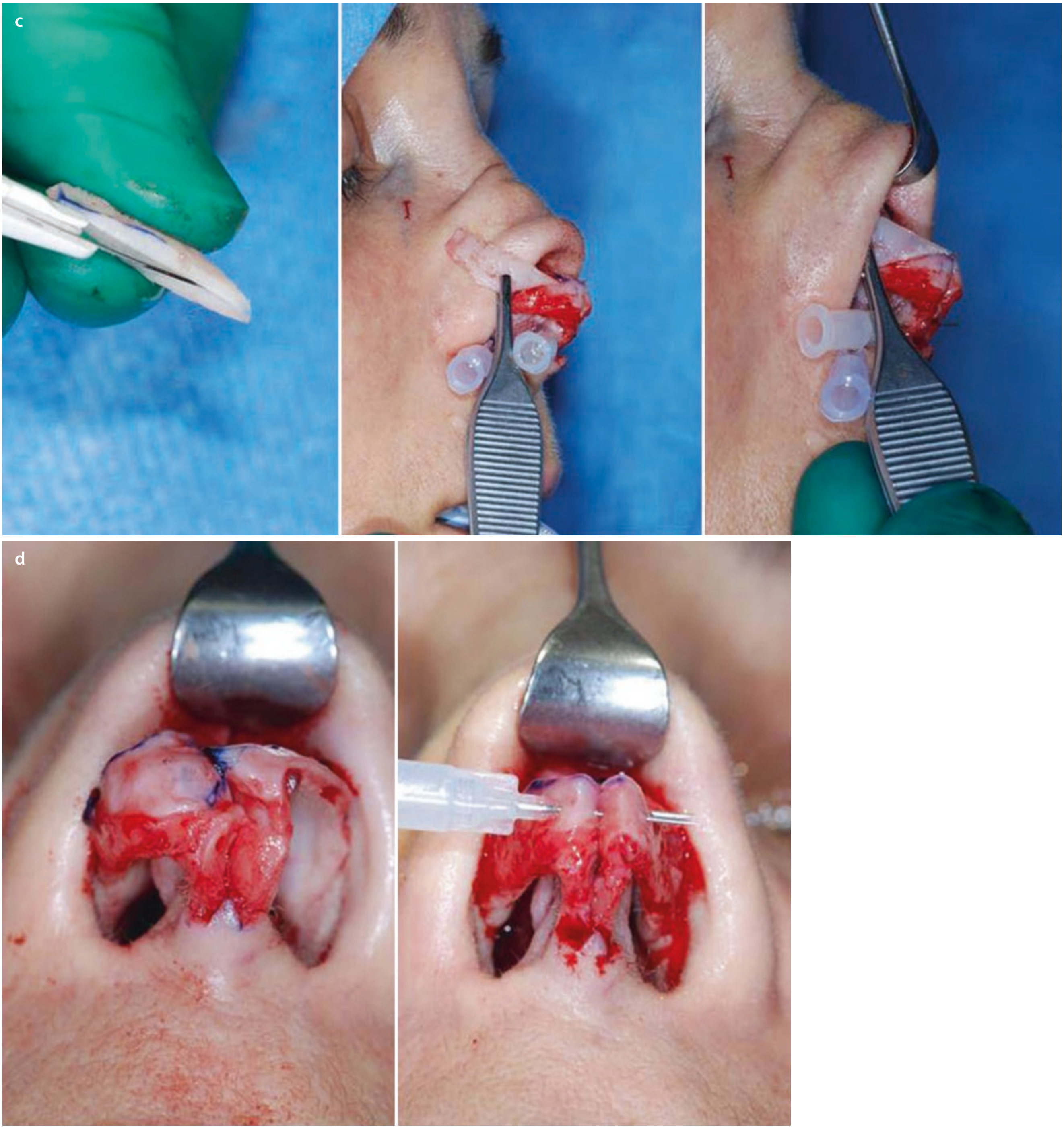


Fig. 2.21 **(a)** The anteriorly overshortened septum slipped to the left side; the explanted septum is turned 90°. **(b)** Drilling a hole and a groove into the anterior nasal spine (ANS) for fixation of the septum. **(c)** Splitting septal cartilage to create thin batten grafts. **(d)** Contouring the domes by transdomal sutures. **(e, f)** Refinements of the batten grafts using a cylindrical drill. **(g–i)** Front view, profile view, base view pre-op/post-op



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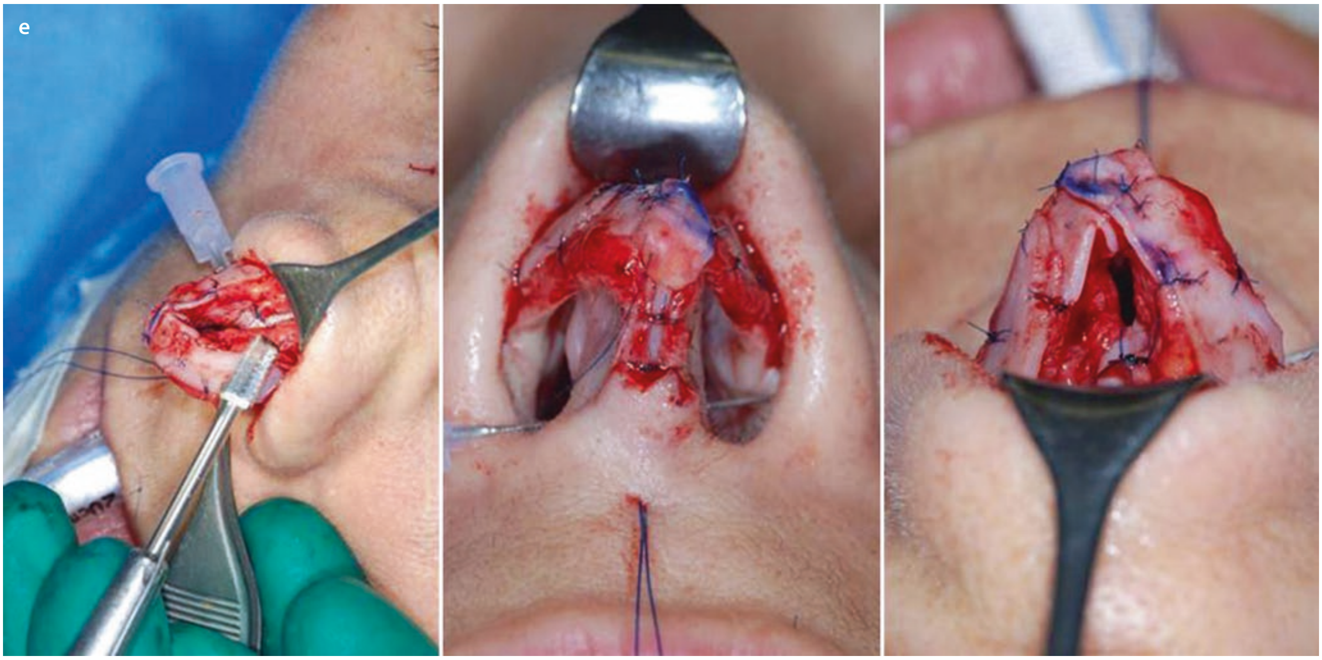


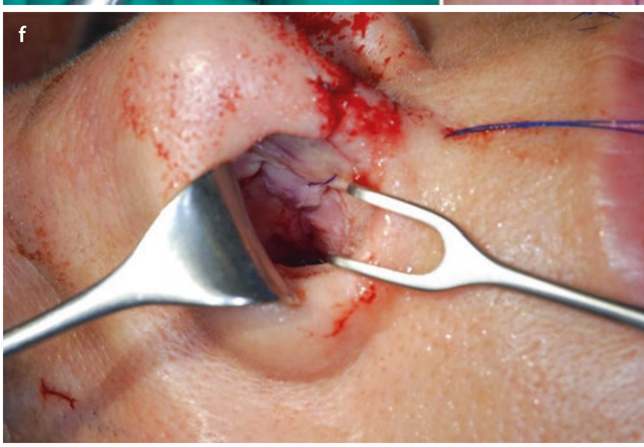


Fig. 2.21 (continued)

Fig. 2.21 (continued)

Fig. 2.21 (continued)

2.2.8 Case 8: Technique: Reconstruction of an Overresected, Deformed Anterior Septum

The bony cartilaginous junction of the nasal septum is nearly always long enough to reconstruct the dorsal L-strut. Even when previous surgery results in an excessive reduction in dorsal length, the entire septum can be rotated by 90° so that the surgically shortened dorsum becomes the new caudal septum and the unaltered bony cartilaginous junction becomes the new dorsal septum.

A 23-year-old female presented for revision surgery after suffering childhood nasal trauma. Corrective surgery was attempted (elsewhere) during adolescence but proved unsuccessful. At the time of revision surgery, a severe septal deformity was found, obstructing the nasal airway. Absence of the anterior septum also resulted in inadequate tip support with tip ptosis and formation of a pseudo-hump. Treatment involved removing the residual septum and rotating the specimen 90° so that the bony cartilaginous junction became the new dorsum and the existing dorsum became the new caudal septum. After fixation of the new septal partition, the nasal dorsum was covered with a single layer of allogenic fascia lata for camouflage. Overresected lateral crural were reconstructed using batten grafts fashioned from the concha cymba (Fig. 2.22a–e).

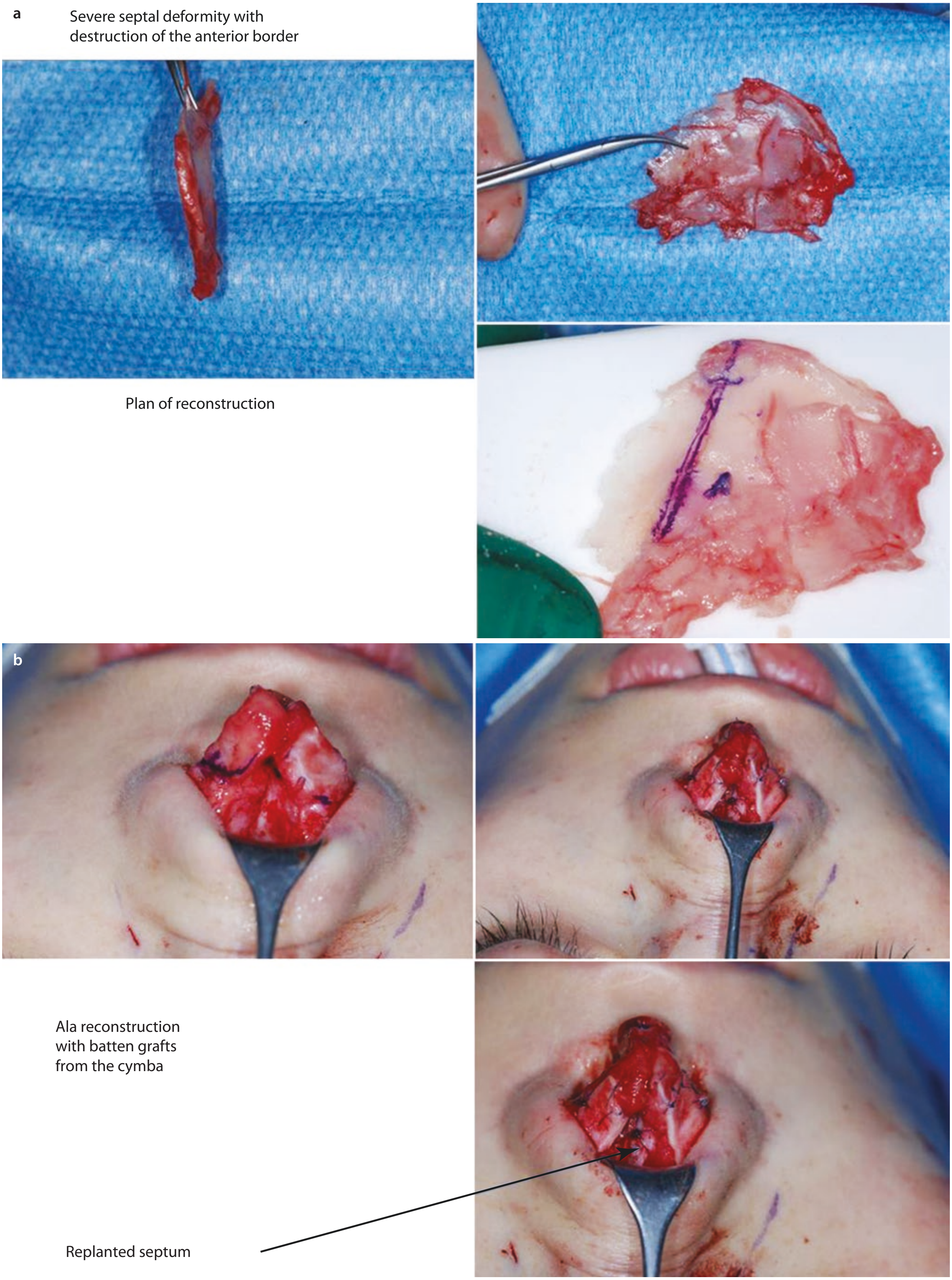
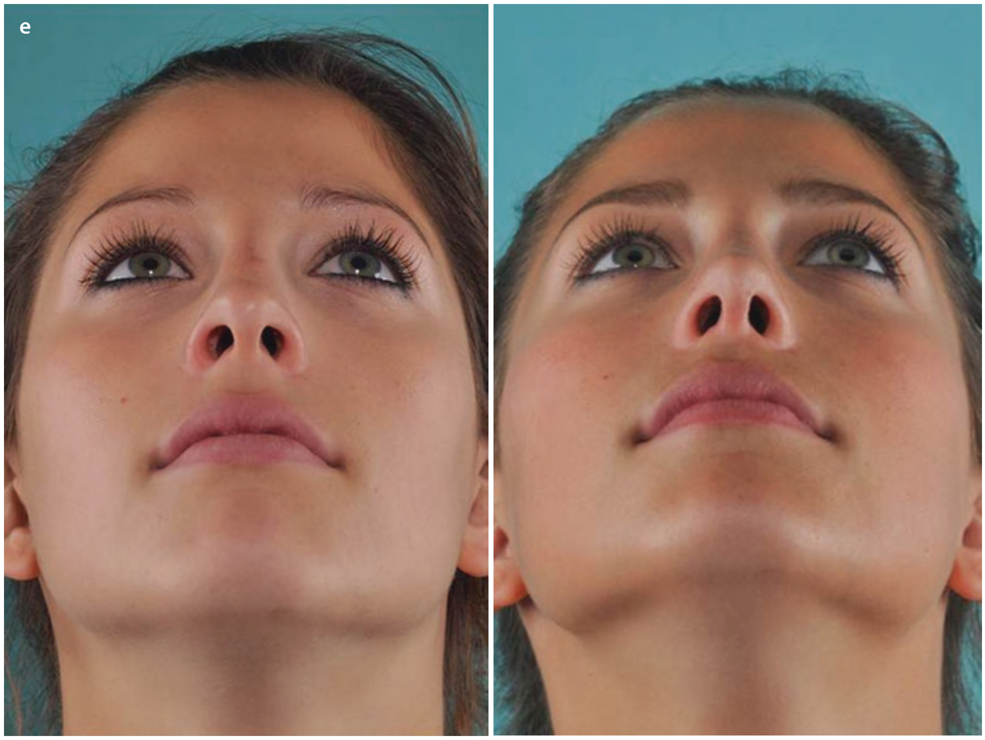


Fig. 2.22 **(a)** Extracorporeal septal reconstruction of an anteriorly overresected septum by rotating the explanted septum by 90°. **(b)** The overresected lateral crura are reconstructed using batten grafts. **(c–e)** Front view, profile view, base view pre-op/post-op

■ **Fig. 2.22** (continued)

Fig. 2.22 (continued)



2.2.9 Case 9: Technique: Reconstruction of a Neoseptum with Ethmoid Bone Grafting

A 20-year-old male presented after three rhinoplasties with a C-shaped dorsal deviation to the right, an overprojected dorsum with a hump deformity and both palpable and visible irregularities, and an acute nasolabial angle with a partial columellar retraction. On basal view alar asymmetry and a left seagull deformity were seen.

The patient also complained about right-sided nasal airway obstruction. On examination, a severe rightward deviation of the residual septum accounted for the unilateral airway obstruction. Hypertrophy of the left lower turbinate was also found. The deviation of the residual septum was corrected by splinting with a thinned and perforated splinting graft from the perpendicular ethmoid plate. Multiple drill holes helped to make fixation easy. In addition, the caudal septum was also splinted with a perforated ethmoid bone graft. After harvesting conchal cartilage, a sandwich graft was constructed to support the tip and improve the nasolabial angle. For straightening the bony pyramid, percutaneous paramedian, transverse, and low-to-low osteotomies were all performed. After creating a straight line with spreader grafts taken from the concha, the neoseptum was replanted and fixed to the upper lateral cartilage as well as to the anterior spine. The conchal sandwich graft was then positioned in front of the neoseptum to serve as a columellar strut. The medial crura was then sewn to the sandwich graft. For narrowing the domes, transdomal sutures were applied just above the sandwich graft. The tip was contoured with spanning sutures, and the position of the tip was secured by tip suspension sutures. For camouflaging minor irregularities that could be seen through the thin skin, we then placed two layers of allogenic fasciae (■ Fig. 2.23a–f).

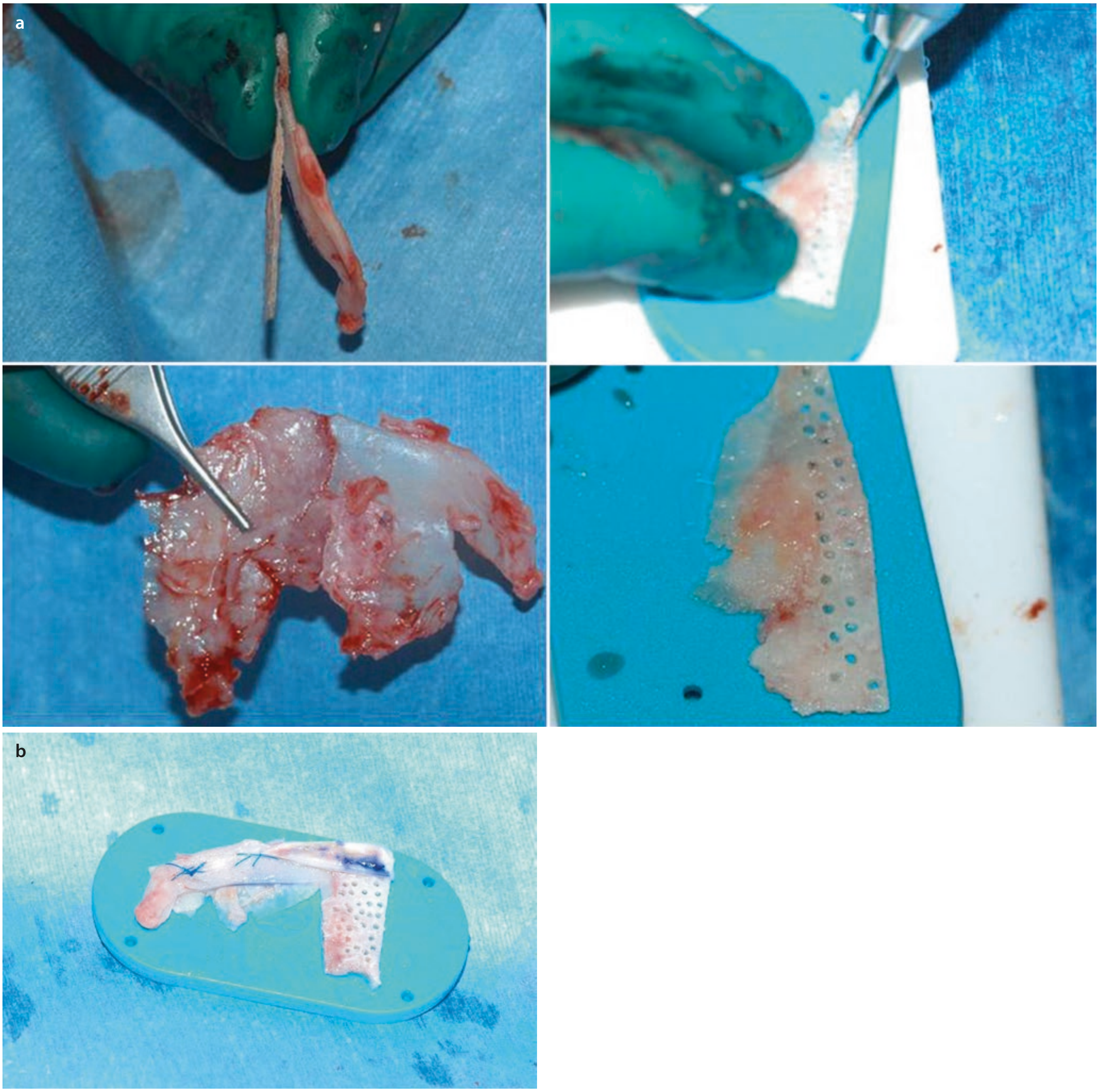


Fig. 2.23 **(a)** Extracorporeal septal reconstruction with ethmoid bone grafting. **(b)** The L-shaped, mainly bony neoseptum. **(c)** Preparing a double-layered sandwich graft from concha used as columellar strut. **(d–f)** Front view, profile view, base view pre-op/post-op

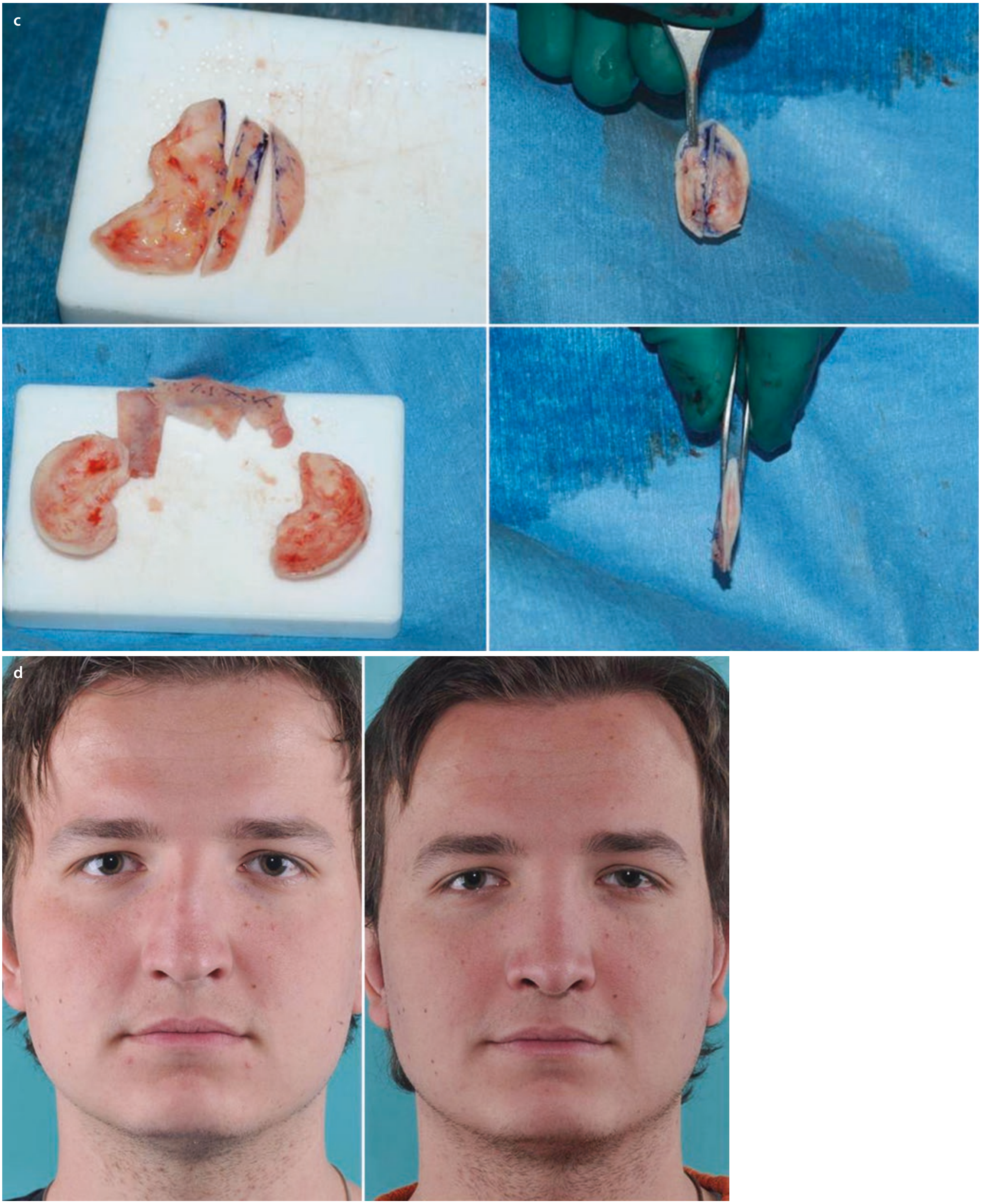


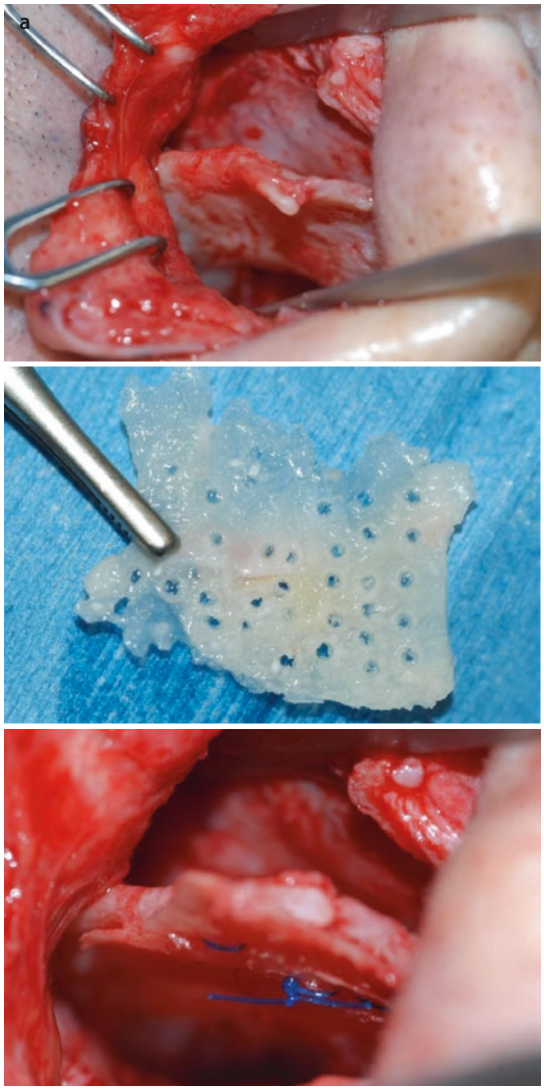
Fig. 2.23 (continued)

Fig. 2.23 (continued)

2.2.10 Case 10: Septal Correction with Ethmoid Splinting Graft, Septal Extension Graft from Double-Layered Conchal (Sandwich) Graft, and Maxillary Augmentation

A 42-year old patient presented after severe nasal trauma and previous rhinoplasty. Examination revealed a widened dorsum with a saddle nose deformity, and a retracted and oblique columella following loss of the anterior septum. The premaxilla was also deficient with a nasolabial angle of only 60°, and the tip was overly broad with asymmetric nostrils.

Using the external rhinoplasty approach, surgical exploration revealed a severely deformed caudal septum with a sharp angulation located 6 mm below the anterior septal angle. Large portions of the quadrangular septum were also missing, but a large ethmoid (splinting) graft was harvested from the bony septum and thinned using a cylindrical drill bit. Multiple drill holes were then added for easier fixation, and the graft was used to straighten and stabilize the deformed caudal septum. Paired spreader grafts fashioned from conchal cartilage were also used to reinforce the narrow and weak dorsal L-strut. The widened bony pyramid was then narrowed using paramedian medial osteotomies created with a Lindeman bur, followed by transverse and (low-to-low) lateral osteotomies using the percutaneous technique. The premaxilla was then augmented with multiple layers of Mersilene^{R} mesh. (5 years later the Mersilene was replaced with a DC-F graft fashioned from allogenic fascia lata and autologous rib cartilage). The opposite concha was then harvested to create a double-layered septal extension graft which was positioned anterior to the reconstructed caudal septum on top of the Mersilene mesh. The tip was then contoured using transdomal and spanning sutures and then covered with a layer of allogenic fascia lata. A DC-F graft, fashioned from diced residual ear cartilage wrapped in allogenic fascia lata, was then used to correct the saddle deformity (Fig. 2.24).



Anterior septum deformed and weak

Harvesting and thinning of the perpendicular plate

Straight and strong anterior septum

Fig. 2.24 (**a**–**c**) Stabilizing of the anterior septum with ethmoid bone splint. (**b**) Double layered conchal graft used as septal extension graft. (**c**) Manufacturing a DCF graft from ear cartilage and allogenic fascia lata. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 2.24 (continued)

Fig. 2.24 (continued)

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Fig. 2.24 (continued)

Fig. 2.24 (continued)

2.2.11 Case 11: Technique: Extracorporeal Septal Reconstruction with Double-Layered L-Strut

A 36-year-old female presented after previous septoplasty with left-sided nasal airway obstruction. In addition, she complained of an overprojected dorsum and a bulbous tip.

Using an external rhinoplasty approach, an extramucosal septal dissection was performed with bilateral tunnel dissection both high and low, followed by release of both ULC from the septum. After exposing the dorsum, paramedian osteotomies were created with the Lindeman bur. The bur was also used to cut the vertical ethmoid plate (at the level of the intercanthal line) at a 60° downward tilt in order to avoid injury to the overlying skull base. The remaining soft-tissue and skeletal attachments to the septum were then released and the entire septal partition was removed en bloc. From the explanted septal tissue a new septal L-strut was created. A cartilage splinting graft was placed on the right side to simultaneously strengthen both the caudal and dorsal struts. A spreader graft was then added to the left side to improve airway function. Next, the bony pyramid was straightened and narrowed using percutaneous low-to-low lateral and transverse osteotomies. The neoseptum was then placed back into the septal pocket and sutured to the ANS, and to the nasal bones/ULC complex, using osseous drill holes. Following a cephalic trim and columellar strut placement, the bulbous tip was contoured using a combination of transdomal and lateral crural spanning sutures. Owing to thick nasal tip skin, a supratip suture of 5-0 Vicryl was placed, and finely diced cartilage was used for final contour refinement (▣ Fig. 2.25).

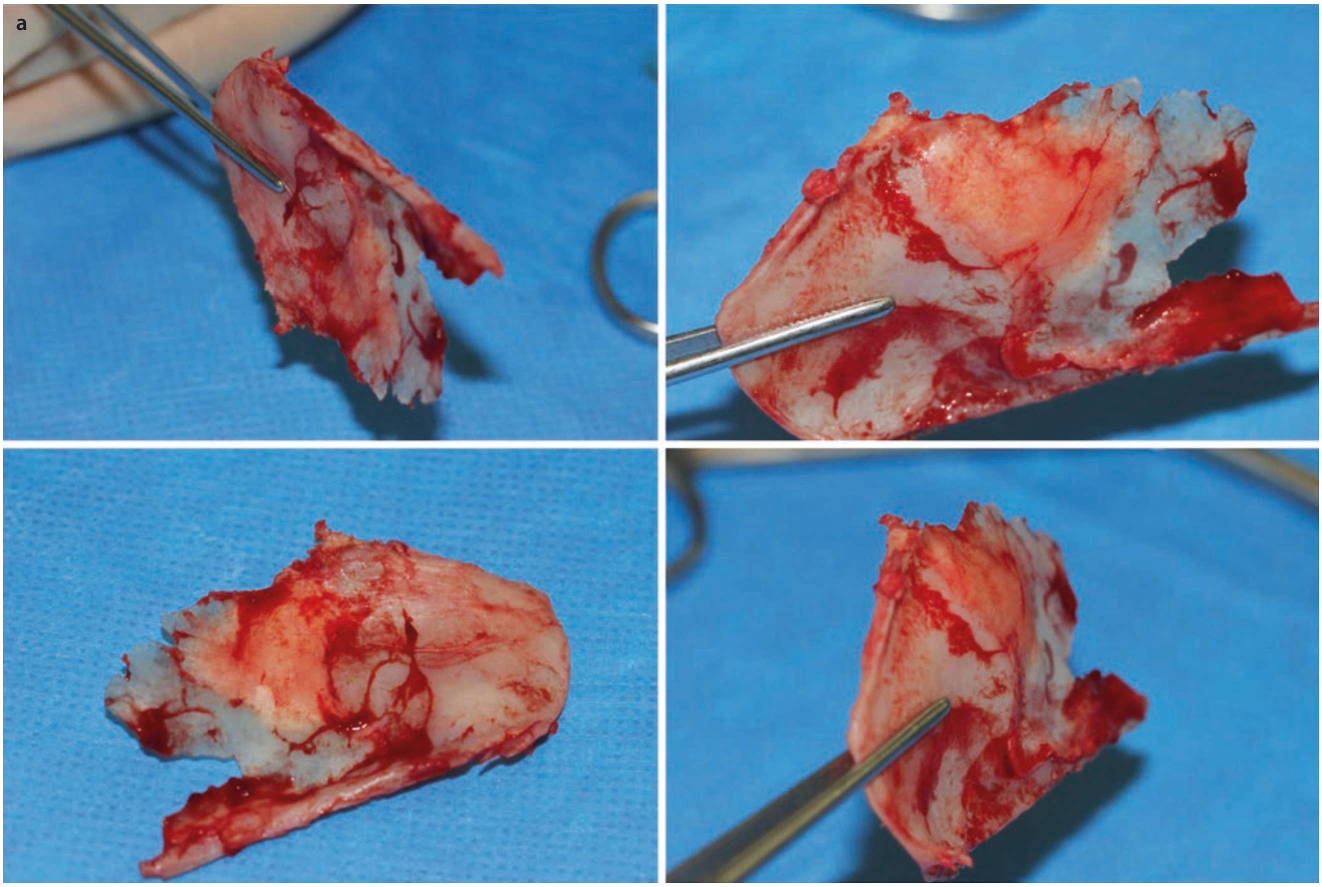
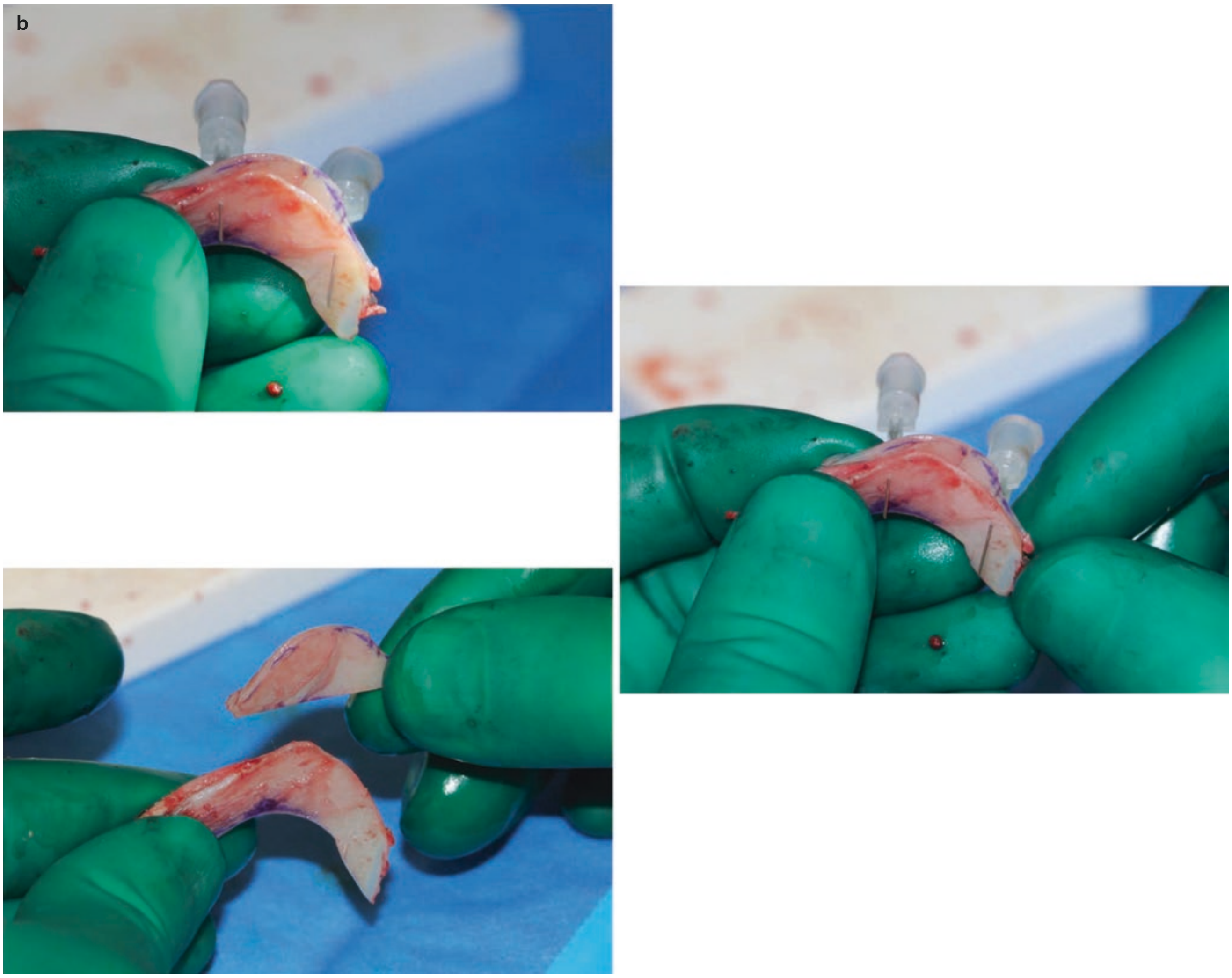


Fig. 2.25 (**a**–**c**) Explanted septum and reconstruction of a straight double-layered L-strut. (**d**) Remaining septal cartilage,which was diced for final refinements. (**e**–**g**) Front, profile, and base views before revision surgery and 1 year postoperative

b



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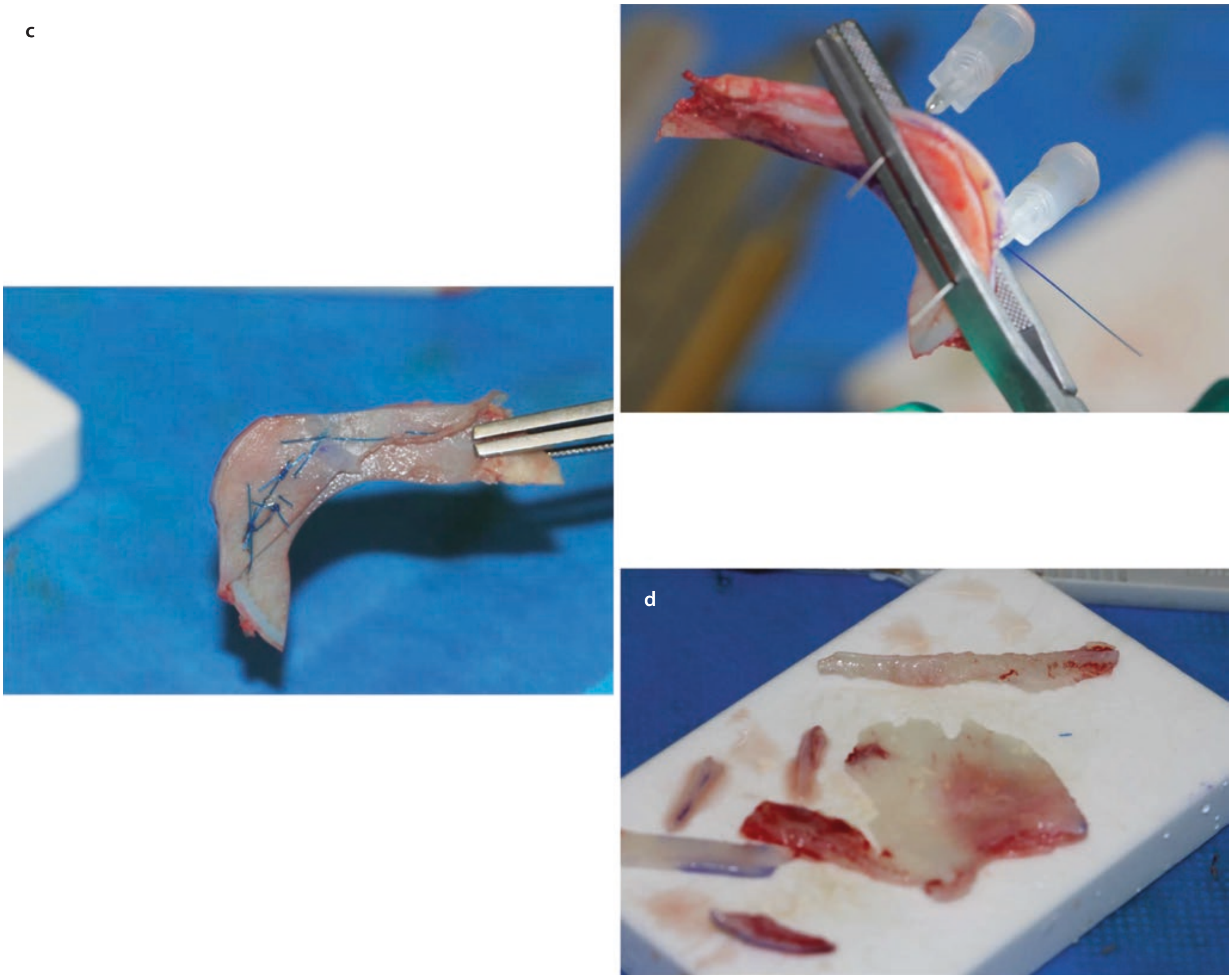

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Fig. 2.25 (continued)

2.2.12 Case 12: Technique: Extracorporeal Septal Reconstruction and Repositioning of the Anterior Nasal Spine

If there is only a minor dislocation and the ANS is wide, it can be reduced from one side so that the residual bone rests in the midline. If the dislocation is more severe, we cut the bone horizontally at its base with a Lindemann fraise so that this bone is pedicled to the maxilla. We reposition the ANS into the midline and secure it with an angled 4-hole microplate, using two 3-mm or 5-mm microscrews. Usually the repositioned spine is not large enough to allow a drill hole for suture fixation of the replanted septum. Therefore, the septum is usually fixed directly to the microplate.

A 40-year-old male presented after previous rhinoplasty for revision nasal surgery. Examination revealed a severely deviated nose with an oblique columella and airway obstruction caused by dislocation of the caudal septum into the left nasal vestibule. In addition, concave deformities were present in both lateral crura, and the tip was asymmetrical. Surgical exploration using the external rhinoplasty approach revealed a dislocation of the caudal septum from the anterior nasal spine, causing a leftward septal deviation.

To return the caudal septum back to the midline, the anterior nasal spine was first osteotomized, repositioned, and fixated in the midline with microplates and microscrews. The caudal septum was then sutured directly to the microplates for secure stabilization. Spreader grafts harvested from the posterior septum were used to widen the internal nasal valves, and cephalic fold-under flaps were used to correct concave deformities of the lateral crura. At the conclusion of surgery, a straight nasal axis with a straight caudal septum and an attractive tip contour with improved nostril symmetry were achieved (Fig. 2.26a–d).

Fig. 2.26 Transposition of the dislocated anterior nasal spine (ANS) and osseus fixation using microplate and microscrews. **(a)** Dislocated anterior nasal spine implemented dislocation of the caudal septal border. After transposition and fixation of the ANS, the caudal border of the septum sits in the midline. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 2.26 (continued)

2.2.13 Case 13: Technique: Reconstruction of the Inner Valve with PDS Foil

One option for improving internal nasal valve width is the use of PDS foil. The perforated version of PDS foil is cut to the appropriate dimension and fixed to the dorsal septum. The foil is then folded laterally, creating a spring-like effect that lifts and widens the ULC in order to widen the internal nasal valve.

A 24-year-old male presented 2 years after previous rhinoplasty with a C-shaped deviation to the right side, an overprojected dorsum with a ptotic nasal tip, and an acute nasolabial angle. Very broad lower lateral cartilage (LLC) with retracted columella was also seen.

Intraoperatively, we found a severe septal deformity with multiple scoring incisions that failed to correct the C-shaped deformity. Large portions of the central septum had also been removed during the first procedure. Consequently, we removed all of the remaining residual septal cartilage, thinned it, and straightened it using a splinting graft fashioned from perforated ethmoid bone. Because there was no cartilage left for spreader grafts, we reconstructed the internal nasal valve using PDS foil as a supporting beam. The foil was folded so that a triangularly shaped cross section resulted, analogous to a butterfly graft. At the same time, the PDS foil also served to straighten and stabilize the long axis of the nose. The hanging tip was corrected by a tongue-in-groove fixation of the medial crura to the new anterior septal border as well as with tip suspension sutures (◘ Fig. 2.27a–e).

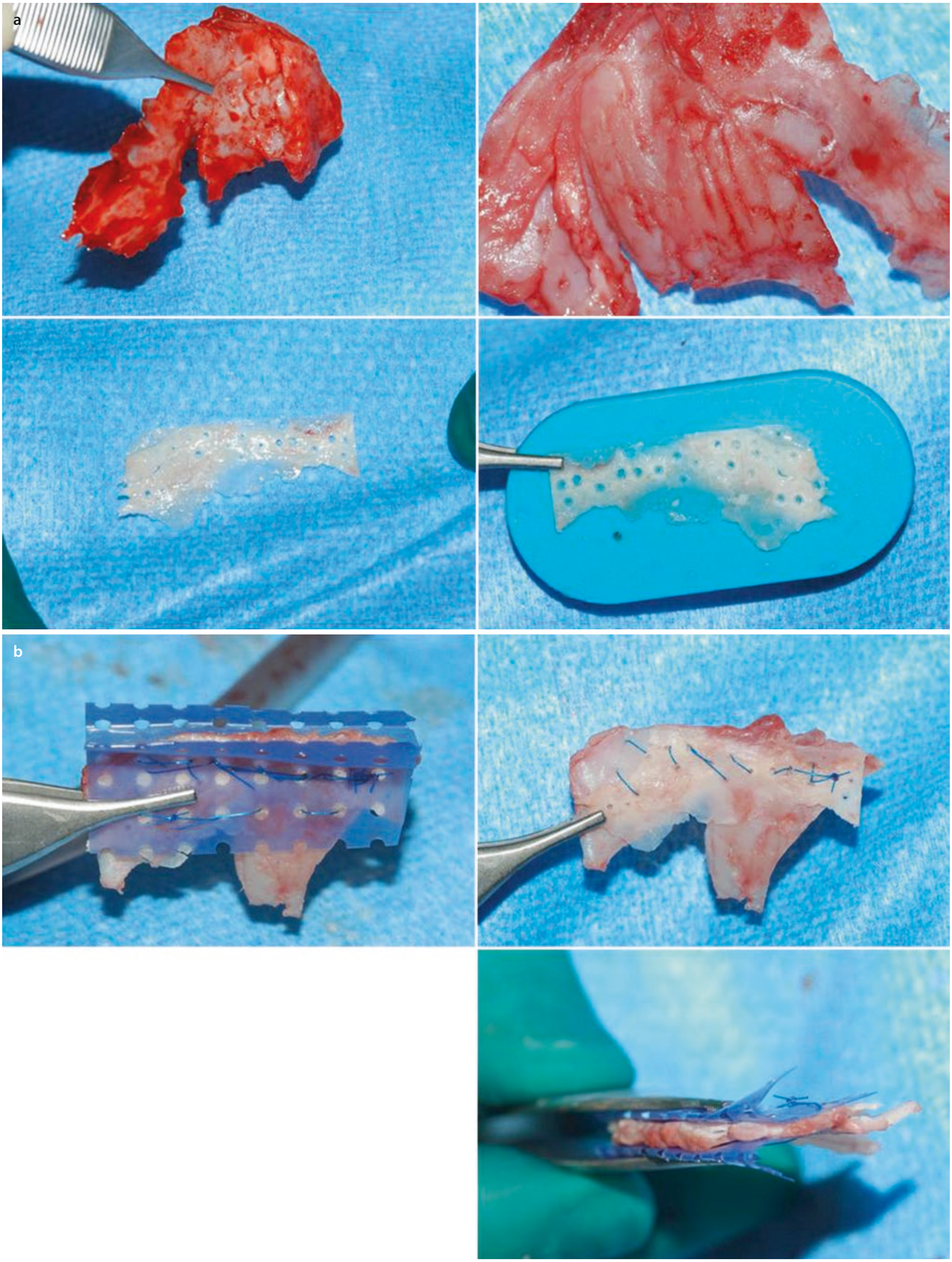


Fig. 2.27 Extracorporeal septal reconstruction with perpendicular plate and PDS foil. **(a)** The septum has been scored, but not splinted during previous operation. **(b)** The deformed septum is splinted with thinned ethmoid bone graft. Folded PDS foil is used for reconstruction of the internal nasal valve. (**c**–**e**) Front view, profile view, base view pre-op/post-op

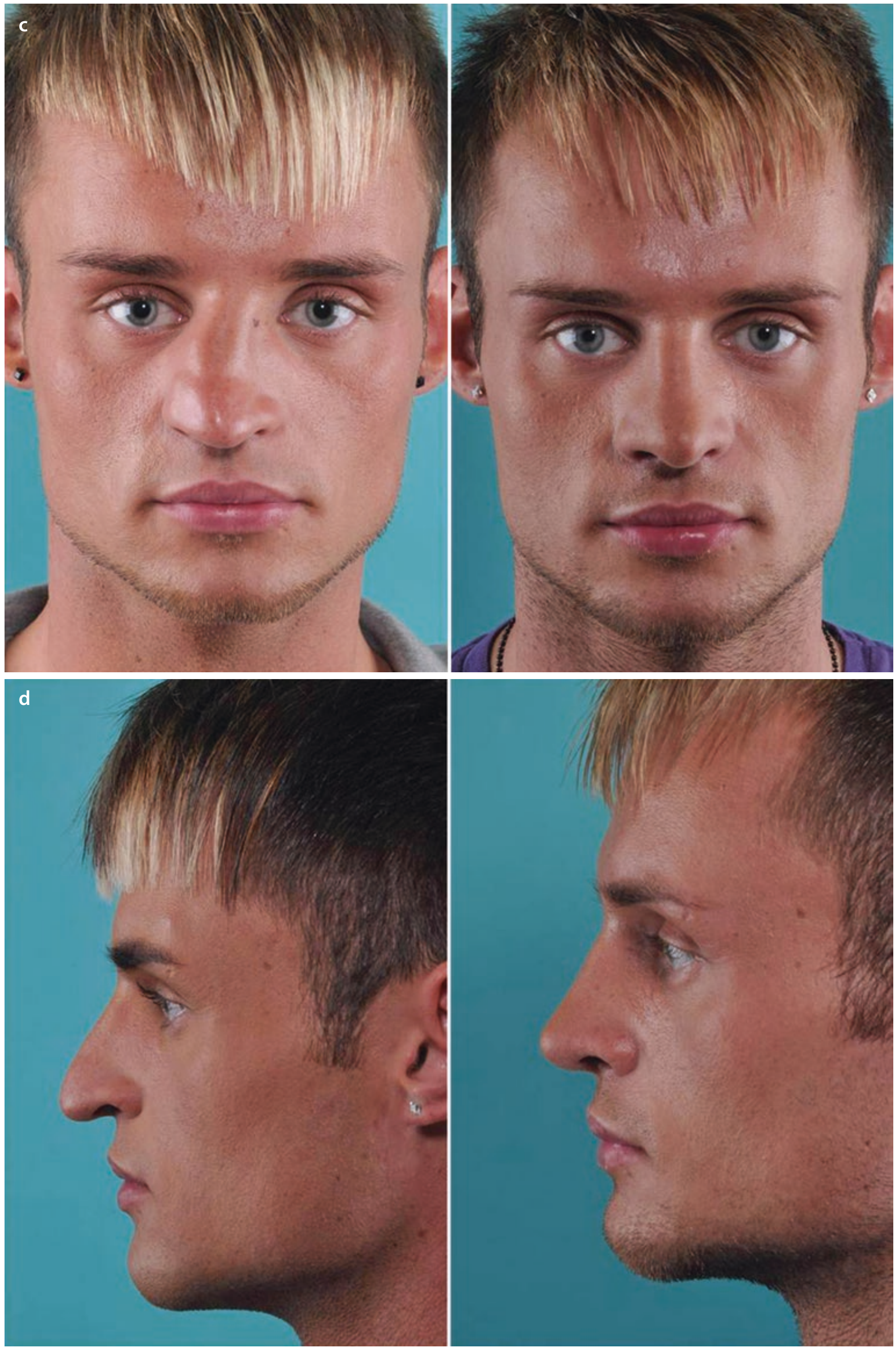


Fig. 2.27 (continued)

Fig. 2.27 (continued)

2.2.14 Case 14: Technique: Total Reconstruction of the Septum with Both Conchae

If there is insufficient local material to create a sturdy L-strut for septal reconstruction, both conchae can be used. The entire concha on each side is harvested, and the convex sides are sutured against each other with several lines of continuous running sutures. These are best applied when the conchae are immobilized using a modified Aiach clamp. With the Aiach clamp, the cartilage is held perfectly flat during suture placement to ensure a flat construct. After the graft is sutured, the construct can be refined to create smooth edges. The central part can also be resected and used for other purposes, or it can be thinned out, since this portion is not necessary for the stabilization,

In a situation of total septal reconstruction using both conchae, a 26-year-old woman was seen after two previous septal corrections. Malformation of both lower lateral cartilages with concavity of both lateral crura and an overly pointed tip from both the frontal a basal view were observed. In profile, a pseudo-hump resulted from overresection of the cartilaginous dorsum. According to the patient, she previously had had a slightly overprojected dorsum. Intraoperatively a small residual piece of cartilage with severe deviation was found despite cross-hatching from the concave side. This remnant piece of septal cartilage was very unstable and could not be used in the reconstruction. Additionally, we found a small residual dorsal strip of cartilaginous septum that appeared to have buckled following overresection of the central part. These minor residual pieces of septal cartilage did not provide enough stability for a sound reconstruction; therefore, we decided in favor of a total L-strut reconstruction using both conchae. After harvesting both conchae, we sutured the opposing convexities using a modified Aiach clamp and three parallel suture lines in both a horizontal and vertical orientation. We then shaved the newly stabilized graft and replanted it after lowering the bony dorsum. For narrowing of the bony nasal pyramid, we performed a paramedian as well as transverse and low-to-low lateral osteotomies. We also drilled holes in the upper edge of both nasal bones and suture-fixated the replant to the nasal bones and to the upper lateral cartilages. Caudally, we also suture-fixated the neoseptum through a drill hole placed in the anterior nasal spine. Malformations of the lower lateral cartilages were corrected using a modified upside-down technique, preserving a small strip of cartilage at the anterior-most border to make refixation of the flipped cartilage easier.

Postoperatively we achieved a nice dorsum with good aesthetic dorsal lines from brow to tip. The axis of the nose was straightened, and in profile we obtained a harmonious dorsal line with a good tip contour (◘ Fig. 2.28a–e). (► See Chap. 13, “Malformation,” case 5.)

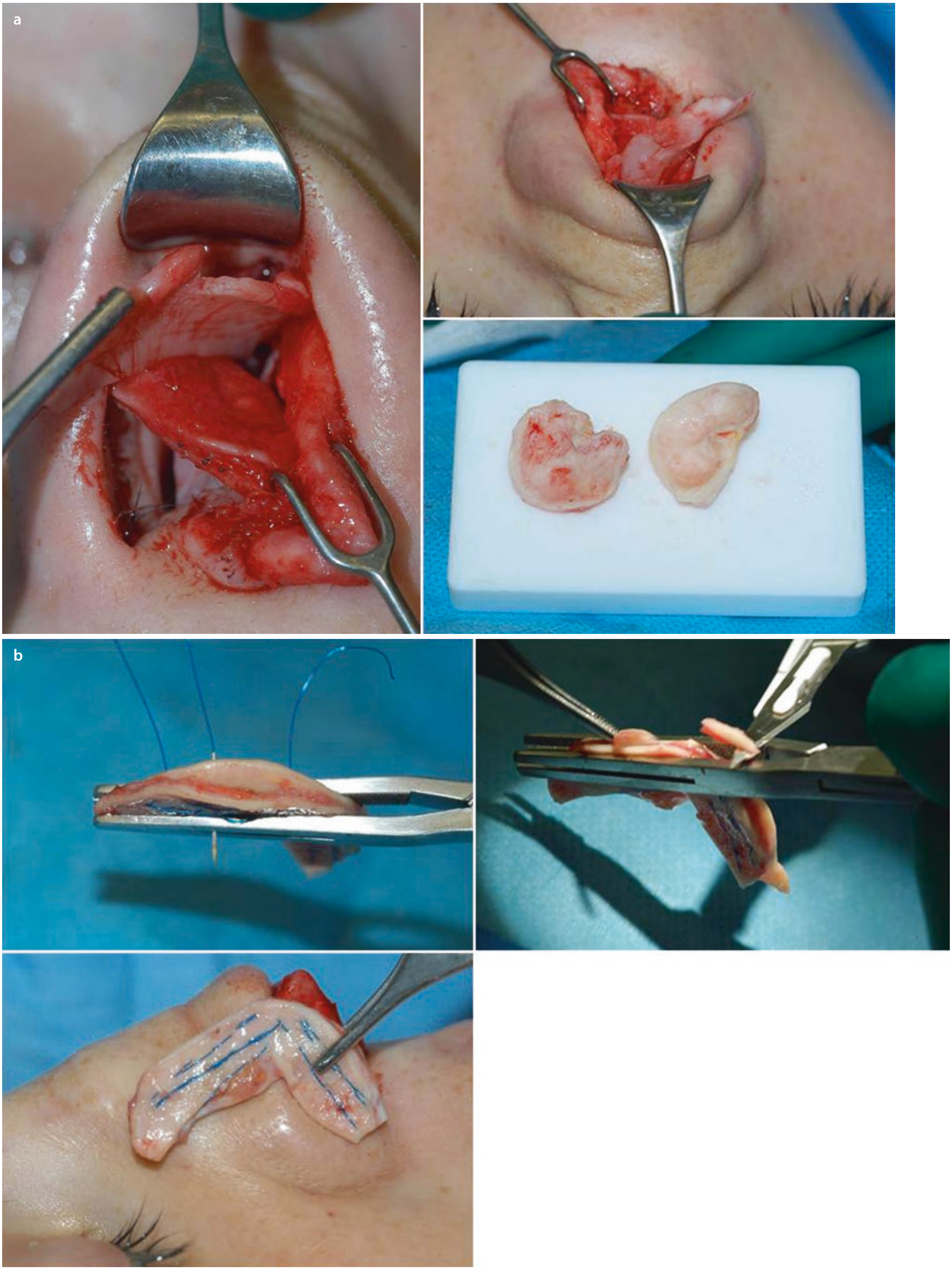


Fig. 2.28 Total septal reconstruction using both conchae, because the residual septum was not sufficient to rebuild a strong L-shaped framework. **(a)** The insufficient septal remnants and both conchae are harvested. **(b)** Construction of a double-layered, strong, L-shaped septal framework, using a modified Aiach clamp. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig. 2.28** (continued)

Fig. 2.28 (continued)

2.2.15 Case 15: Technique: Total Septal Reconstruction with Both Conchae, Reconstruction of the Dorsum with DC-F

A 34-year-old male was seen after two previous operations. Findings included collapse of the septum with a large septal perforation, deformity and destruction of both lower lateral cartilages, and an overly low dorsum with an underprojected nasion.

We removed the entire residual septum, but the remnant was too weak to create a strong, well-shaped frame for satisfactory reconstruction. Therefore we harvested both conchae and created a neoseptum by suturing opposite curvatures to one another. We reconstructed only an L-shaped frame in order to use the remaining cartilage as batten grafts as well as diced cartilage. The batten grafts were used to strengthen and supplement the lateral crura. For reconstruction of the L-strut, the convex sides of the conchae were sutured together using three layers of running sutures while immobilized with a modified Aiach clamp.

This newly created neoseptum was secured to the upper lateral cartilages as well as to drill holes within the anterior nasal spine. Additionally, a columellar strut was placed anterior to the L-strut. After grafting the lower lateral cartilages, the tip was contoured using transdomal sutures, followed by placement of lateral crural spanning sutures and multiple tip suspension sutures. Finally, a diced cartilage-fascia graft was constructed by sewing a 7 × 4 cm piece of deep temporalis fascia around a tuberculin syringe and then filling the newly constructed fascial sleeve with residual diced conchal cartilage. The graft was placed over the dorsum in order to raise dorsal height and create a smooth dorsal contour (▪ Fig. 2.29a–h).

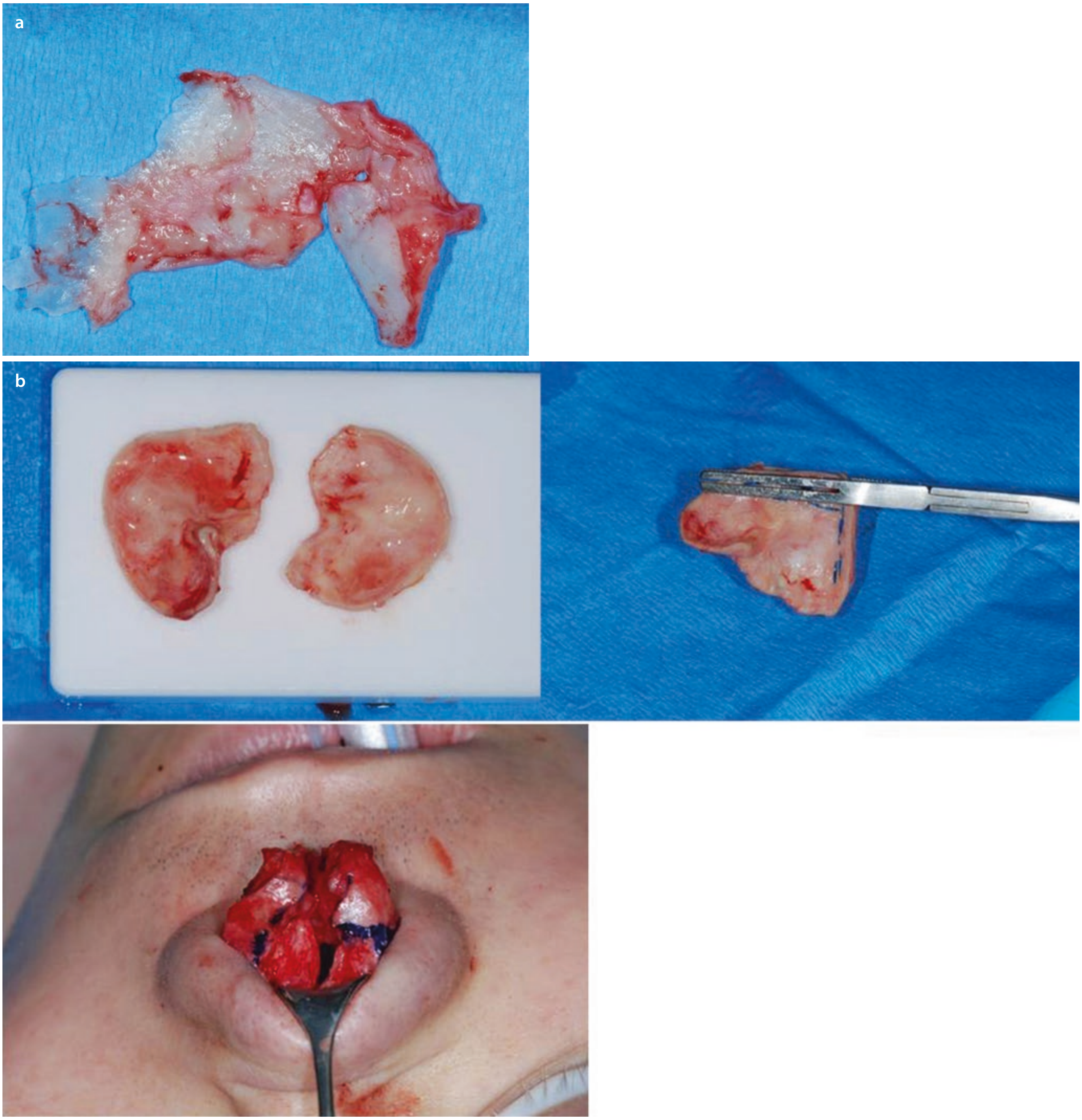
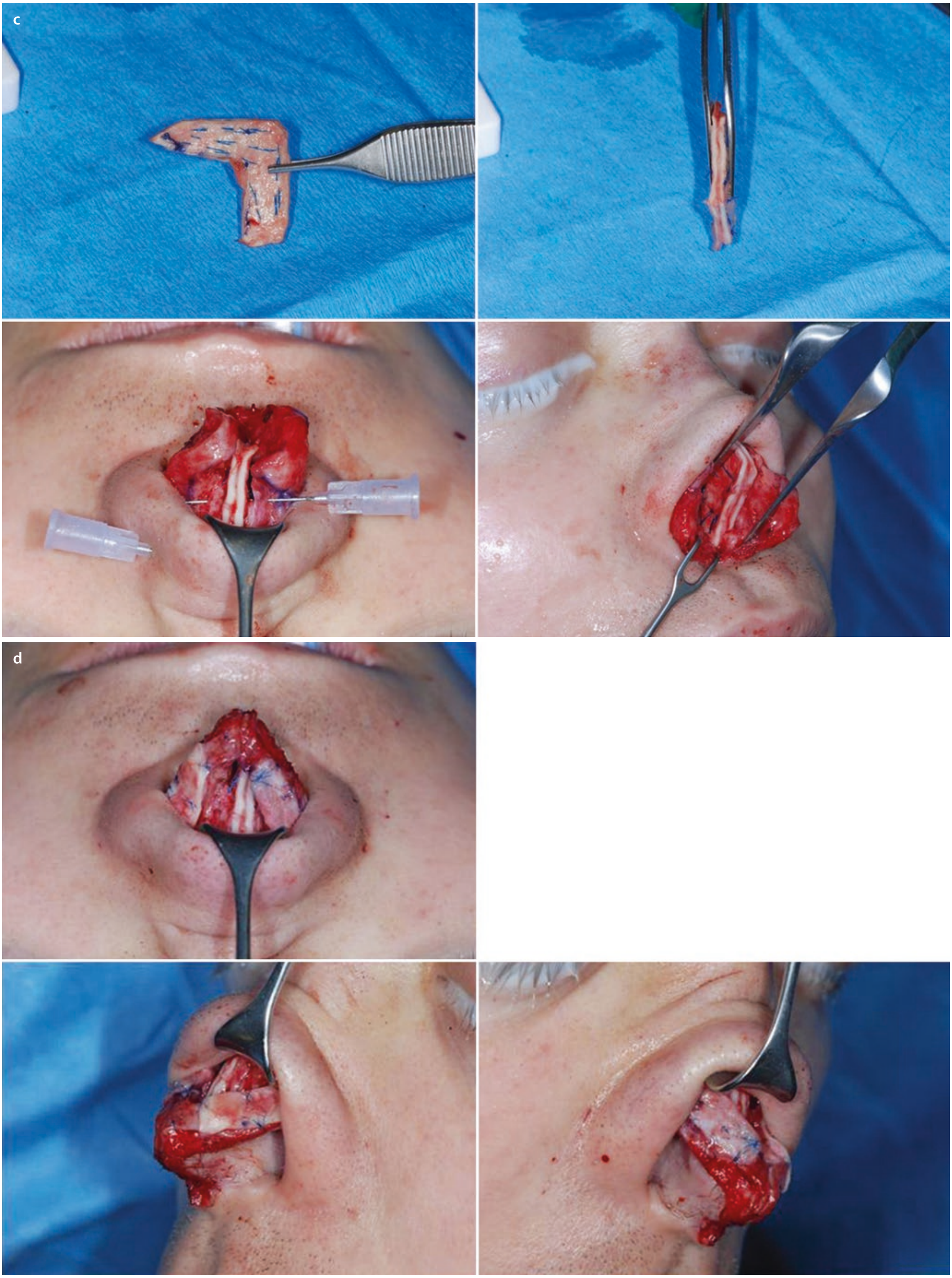


Fig. 2.29 Total septal reconstruction using both conchae, reconstruction of the dorsum with DC-F. **(a)** The removed weak septum. **(b)** Both conchae are sutured together to a strong double-layered neoseptum. **(c)** Replantation and fixation of the straight neoseptum. **(d)** Reconstruction of the destroyed tip framework. **(e)** Harvesting deep temporalis fascia for constructing a DC-F, the concha is already harvested. (**f**–**h**) Front view, profile view, base view pre-op/post-op



■ **Fig. 2.29** (continued)

Fig. 2.29 (continued)

■ **Fig. 2.29** (continued)

2.2.16 Case 16: Technique: Augmentation of the Maxilla with a DC-F Graft

Retraction of the columellar base with an acute nasolabial angle can be corrected using a diced cartilage-fascia graft (DC-F graft). This technique was developed for saddle-nose correction and augmentation of the dorsum, but it can also be used for augmentation of the maxilla.

The DC-F can be constructed from rib or ear cartilage; however, septal cartilage with its unique physical characteristics seems too precious to use in this manner. It is important to dice the cartilage as finely as possible but to avoid crushing it. Therefore, we use a dermatome blade.

To create the fascial tube, autogenous tissue from the deep temporalis fascia or allogenic fascia lata (Tutoplast) can be used. The fascia is sutured into a cylinder while wrapped around a small tuberculin syringe.

After opening up the nose, we dissect the maxilla and put the DC-F graft via this approach onto the bone. In this case we close the fascia tube on both sides. In the case of simultaneous extracorporeal septal reconstruction, the septum is put back onto the DC-F.

A 55-year-old man presented following septal surgery with a severely deformed septum and deviation of the outer nose. An overresected anterior septum with drooping of the tip and an acute nasolabial angle were also observed. This nasal base deformity was worsened by retrognathia. Finally, an overprojected dorsum combined with an overprojected tip (partially compensated for by retropositioning of the maxilla) was also noted.

The treatment plan included augmentation of the canine fossae with a DC-F graft and removal of the residual septum, replacing it with a newly constructed neoseptum.

After opening up the nose via the external approach and dissecting the membranous septum, it was noted that only a small residual septum was present. Therefore, it became evident that additional cartilage was needed to create a proper neoseptum, and we harvested conchal cartilage to supplement the reconstruction. The ear cartilage was doubled to create a sandwich graft and then integrated into the straightened residual septum. The opposite concha was then harvested to create diced cartilage. After harvesting autogenous deep temporalis fascia, a DC-F graft was created. However, the volume of cartilage from the concha was insufficient; therefore, rib cartilage was also harvested. A sufficiently sized DC-F was created out of the mixed diced cartilage concha as well as the rib. This enabled us to augment the maxilla. The neoseptum with an integrated double layered conchal graft was then placed and the medial crura were sutured to it. Furthermore, two rim grafts were implanted, and a batten graft was put onto the right lateral crus. In the end, both soft triangles were augmented by the cephalic portion of the lower lateral crura (◘ Fig. 2.30a–f).

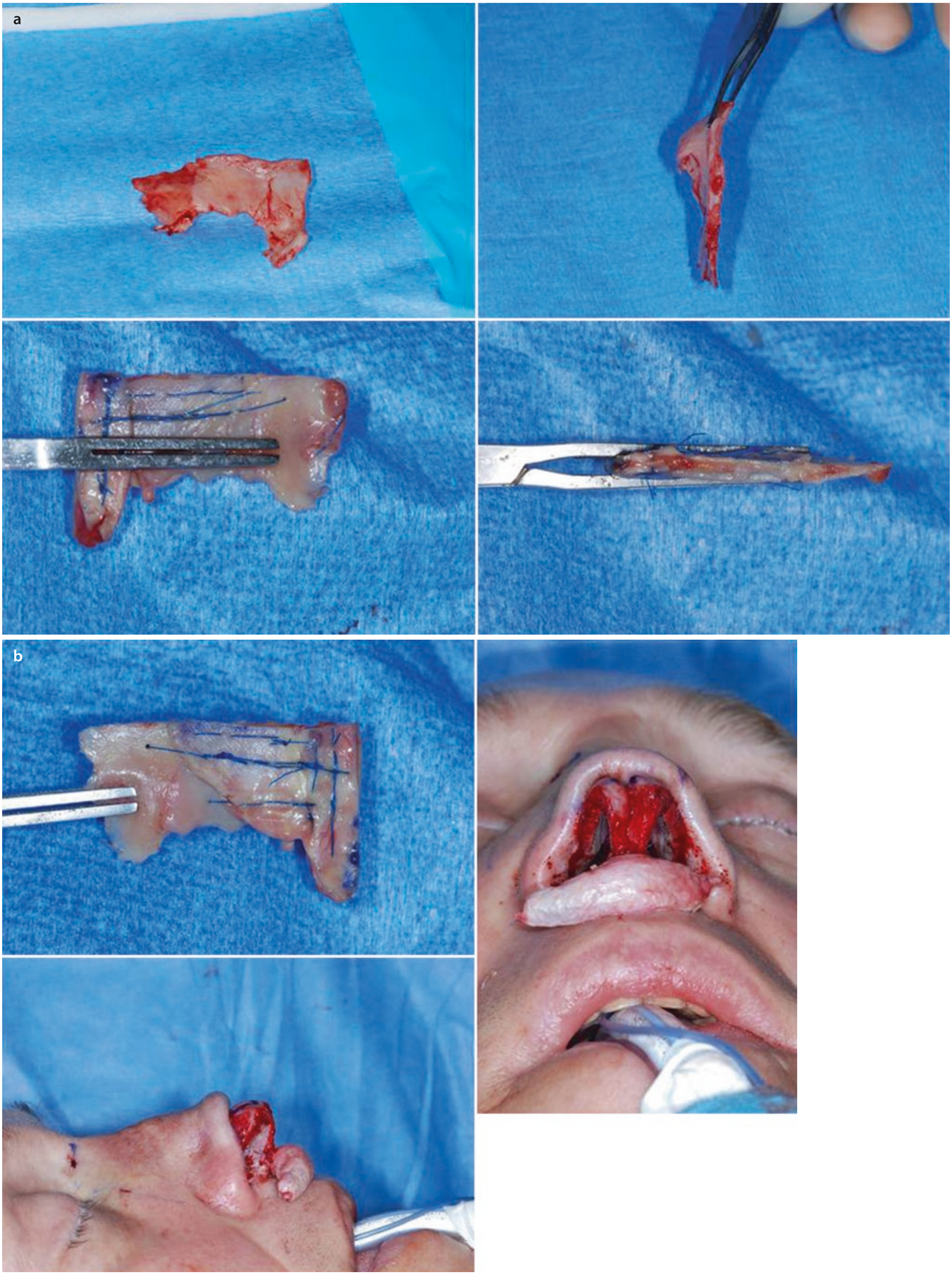


Fig. 2.30 Extracorporeal septal reconstruction combined with DC-F for premaxillary augmentation. (**a**) The explanted deformed septum and the reconstructed straight neoseptum. **(b)** The neoseptum before replantation, DC-F for maxillary augmentation. **(c)** The neoseptum is put on top of the DC-F. (**d**–**f**) Front view, profile view, base view pre-op/ post-op

Fig. 2.30 (continued)

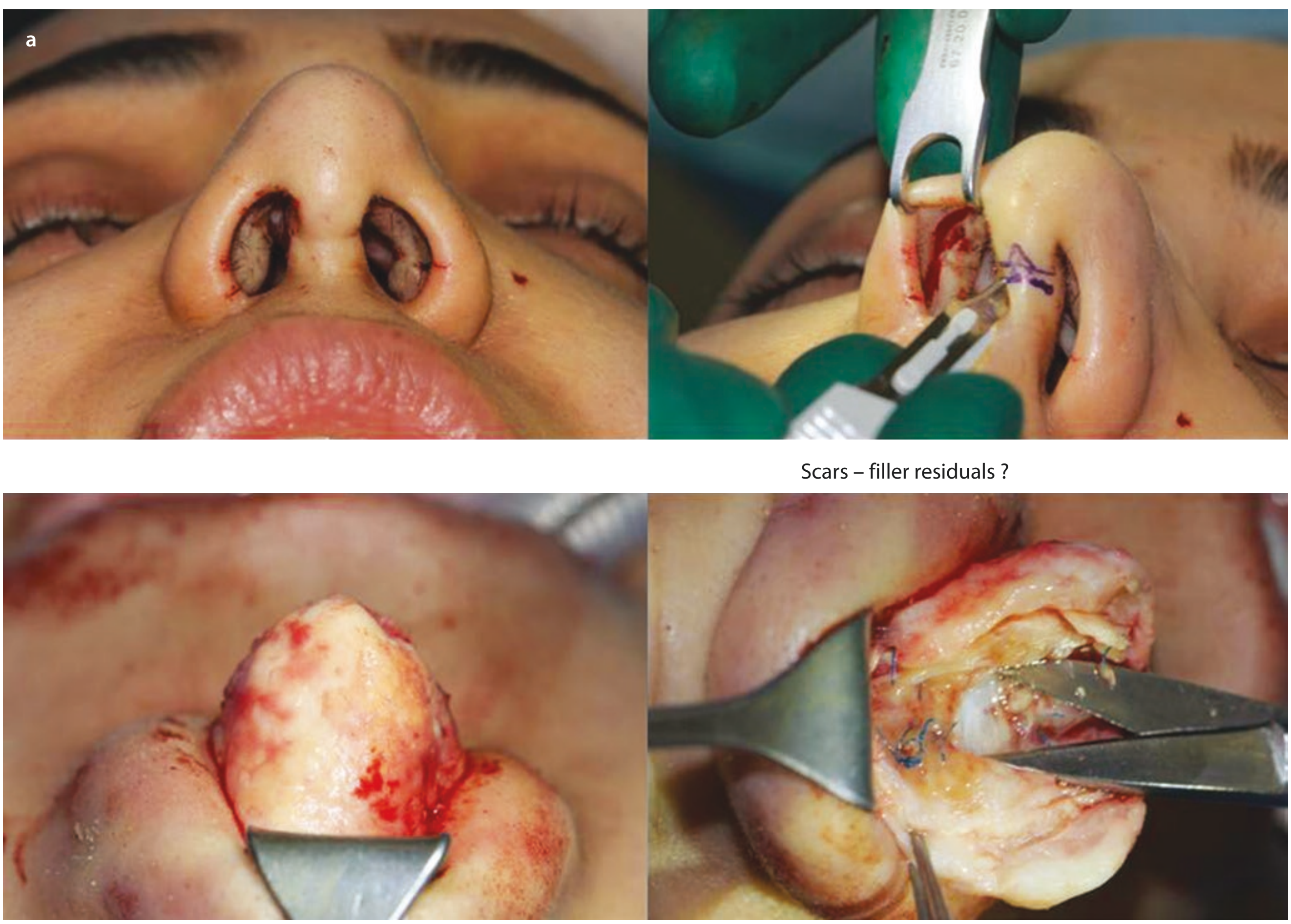
Fig. 2.30 (continued)

2.2.17 Case 17: Technique: Reconstruction of the Septal Framework Using Rib Cartilage

Total loss of the nasal septum, coupled with depletion of auricular graft material, necessitates L-strut reconstruction using rib cartilage to achieve a strong and stable nasal framework. Following graft harvest, the rib is sectioned into multiple longitudinal (2-mm thick) slices oriented perpendicular to the superficial rib surface. Dorsal augmentation is begun by creating drill holes in the nasal bones for suture fixation of the dorsal augmentation grafts. Paired strips of rib cartilage are then sutured together and secured to the nasal bones and upper lateral cartilages with multiple fixation sutures. A second graft is then created to replace the missing caudal septum. The caudal replacement graft is positioned anterior to the nasal spine and secured through a transverse drill hole placed through the anterior nasal spine. After determining optimal graft angulation, the caudal septal replacement graft is sutured to the dorsal replacement graft to recreate the anterior septal angle.

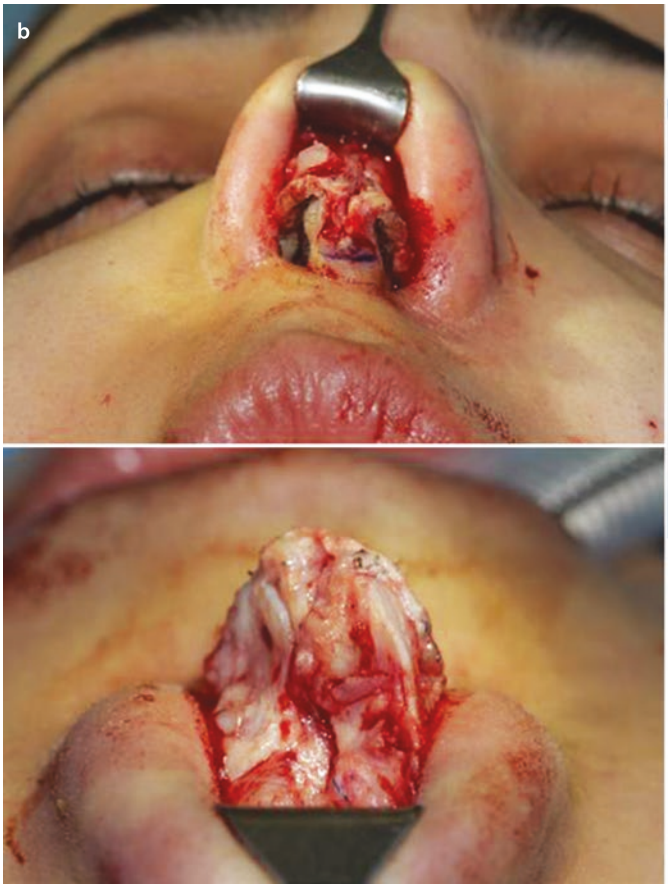
A 33-year-old female presented after 12 previous rhinoplasties for revision. Examination for revision rhinoplasty. Examination revealed a polly-beak deformity with a ptotic tip, an overresected dorsum, and a retracted columella. Cutaneous scars were evident from multiple prior nasal surgeries and from abscess formation following treatment with injectable filler material. Both conchal cartilages had been previously harvested. Surgical exploration using the external approach began with excision of the retracted columellar scar. Subcutaneous collections of abnormal tissue, likely resulting from previous filler treatment, were encountered interspersed among small fragments of septal cartilage and were causing obstruction of both nasal passages. The lower lateral cartilages had also been removed.

The dorsal septum was reconstructed using a double-layered structural graft fashioned from rib cartilage. Similarly, the caudal framework was also reconstructed with solid rib cartilage, and an electrical drill with a cylindrical bit was used to thin the cartilage and permit bending of the graft. After fixation, the solid rib graft was covered with a DC-F graft fashioned from rib cartilage and allogenic fascia lata. The DC-F graft was initially digitally molded to the desired contour, and the excess cartilage was "milked" from the caudal end and removed with suction (◘ Fig. 2.31a–g).

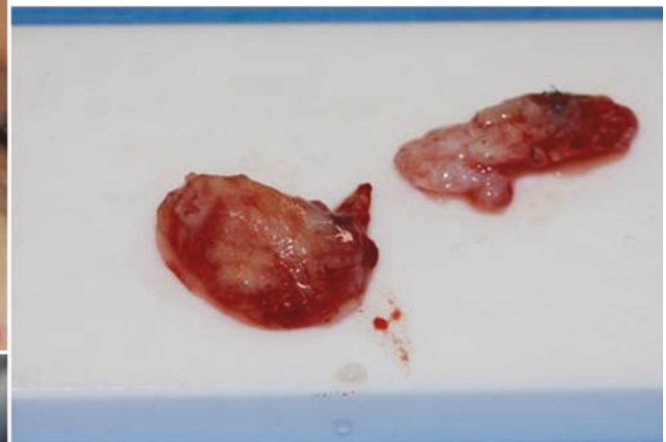


◘ **Fig. 2.31** Reconstruction of the septal framework using rib cartilage. **(a)** Correction of the bad columella scar, severe scaring of the tip with unknown implants. **(b)** Destruction of the tip framework. **(c)** Stabilization of insufficient septal remnants with rib grafts. **(d)** Reconstruction of the tip framework with rib cartilage. (**e**–**g**) Front view, profile view, base view pre-op/post-op

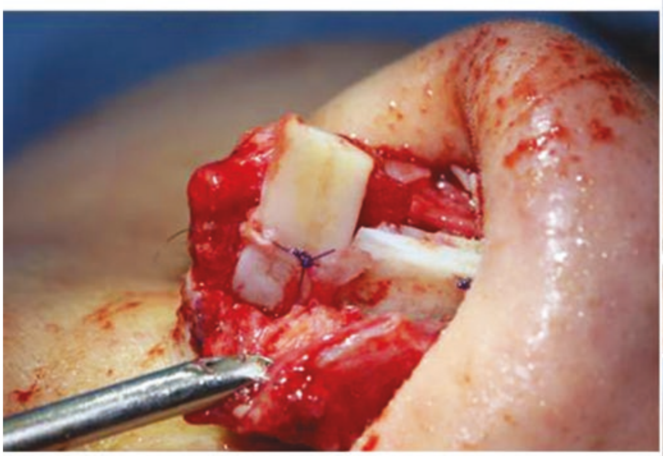
b



Caudal framework destroyed
unknown implants – lyo-cartilage ?



c Septum destroyed, deformed and weak
therefore spreader grafts from the rib



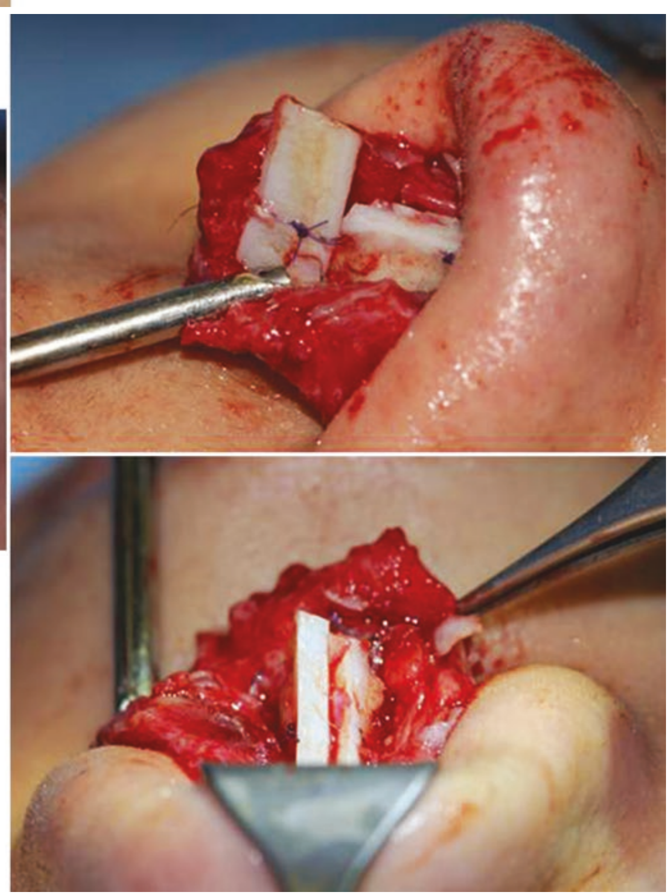
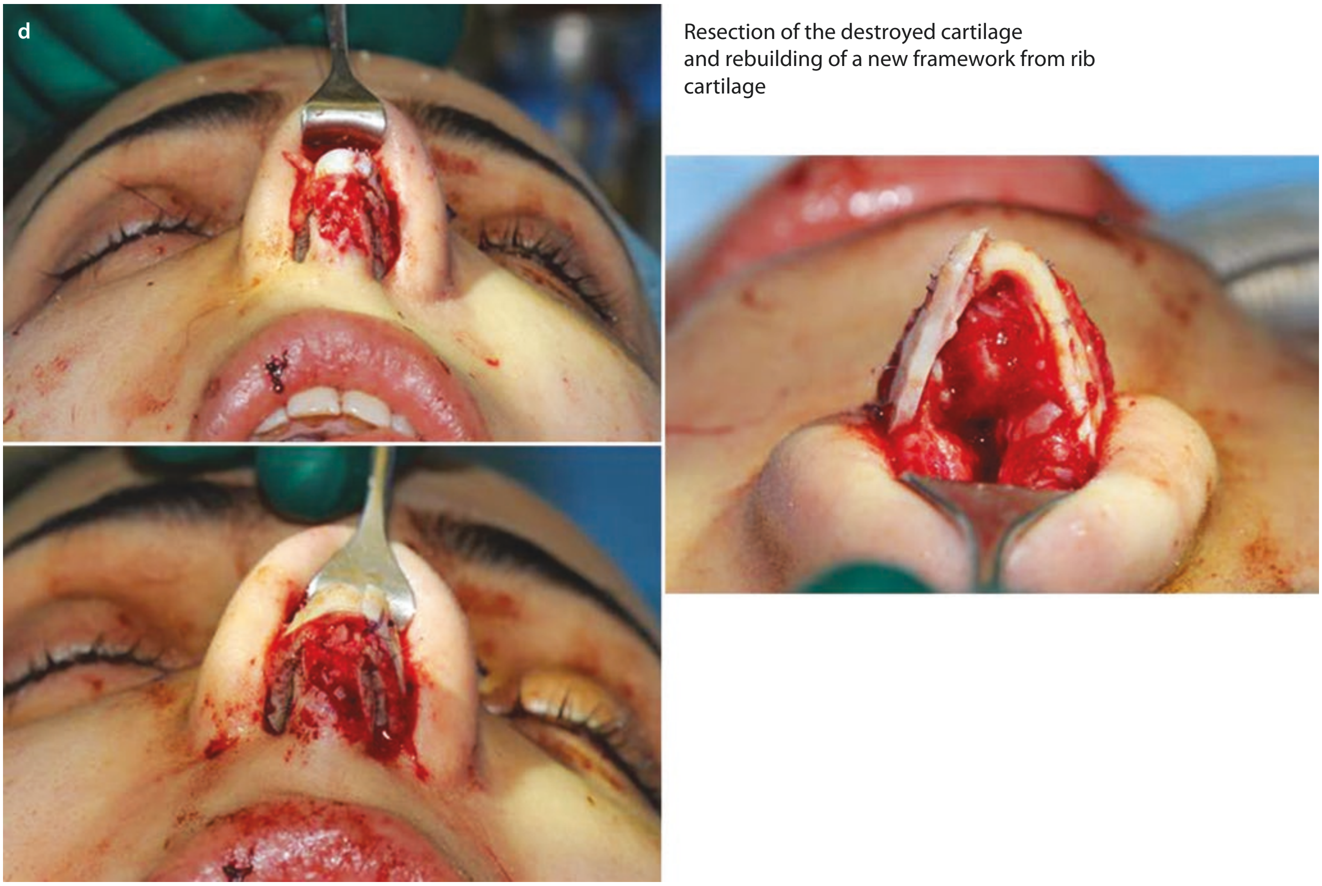


Fig. 2.31 (continued)



Resection of the destroyed cartilage and rebuilding of a new framework from rib cartilage

Fig. 2.31 (continued)

Fig. 2.31 (continued)

Suggested Reading

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Functional Aspects in Primary Rhinoplasty

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W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_3

Most primary rhinoplasties are intended to reduce a dorsal hump or overall nasal size. Although reduction rhinoplasty may seem a simple task, the nose is neither a solid nor a uniform physical structure, and reshaping the nose is commonly regarded as among the most challenging of all cosmetic procedures. Not only is the nose a delicate and complicated three-dimensional structure composed of dissimilar tissues, but it is also an important component of the human airway. As such, satisfactory cross-sectional airway dimensions must be maintained in all segments of the nasal airway despite cosmetic reductions of the outer skeletal framework. This must be accomplished without incurring excessive skeletal rigidity, structural compromise, or distortion from the potent forces of soft-tissue contracture.

In many noses, reduction rhinoplasty may inadvertently decrease the cross-sectional area of the anterior nasal airway, particularly at the naturally narrowest and most vulnerable segment of the human nose, the internal nasal valve. Unless this narrowing is recognized and compensated for with reconstructive surgical techniques, symptomatic nasal airway obstruction may ensue. This chapter reviews our approach to preventing and/or treating functional disturbances associated with primary cosmetic rhinoplasty.

Accurate preoperative analysis is fundamental to successful nasal airway preservation. Particular attention is paid to the preoperative functional status and the presence of anatomic airway deformities, features of latent airway obstruction, or indications of valvular dysfunction. When we consider performing a reduction rhinoplasty in which cross-sectional airway dimensions are likely to decrease, we must first answer the following questions:

- Can the airway reduction be adequately compensated for by compensatory treatment measures like thinning the septum or the premaxillary crest?
- Is there a need for turbinate reduction?
- Is there an increased risk of nasal congestion for any reason?
- Is there an increased risk of mucosal dryness?
- Is there an objective tolerance and a corresponding subjective acceptance for widening an overly narrow nasal dorsum to preserve adequate nasal airway function?

Care must be taken to identify the rhinoplasty reduction patient who simultaneously seeks functional improvement but who will not permit modest increases in width needed to ensure adequate airway function. Alternatively, some patients with normal airway function may fraudulently claim functional disturbances in order to provide justification for health insurance coverage, and these patients must also be identified.

3.1 Physical Examination

Physical examination of the nose, at rest and during the respiratory cycle and with and without a nasal speculum is a critical first step in assessing nasal airway function. Inspection of the outer nose will reveal pinching *or* collapse of the middle vault, the supra-alar side walls, the lobule, and/or the external nasal valves. Palpation of the nasal side walls and lobule will also reveal baseline cartilage rigidity and cartilage recoil—two important parameters of nasal airway support. Pinching, deviation, or twisting of the lower middle vault, deep supra-alar indentations, severe lobular pinching, recurvature of the lateral crura, and slit-like nostril openings are all visible manifestations of static airway impingement, and these deformities are particularly detrimental in noses with unusually weak nasal cartilage and/or in noses with concomitant septal or turbinate-mediated airway obstructions. In severe cases, gentle inspiration will also lead to dynamic inspiratory valve collapse, causing additional but transient obstruction to nasal airflow. Although speculum examination will artificially eliminate collapse of the internal or external valves by stenting the collapsed nasal side walls (except in patients with fixed obstructions such as cicatricial epithelial stenosis), such examination is essential for the diagnosis and characterization of anatomic deformities involving the nasal septum and inferior and middle turbinates and for identification of lesions such as nasal polyps or neoplasia. Various adjunctive tests such as the Cottle maneuver, computed tomography, or rhinomanometry are sometimes used for confirmatory diagnosis, but the experienced nasal surgeon can easily recognize anatomic nasal airway obstruction in the overwhelming majority of cases.

Figure 3.1a–e shows a patient with an oversized nose seeking both reduction rhinoplasty and improved nasal airway function. Premature valvular collapse is observed on gentle inspiration, and the patient is demonstrating relief using the Cottle maneuver, thus indicating her existing valvular problem.

However, there are limitations to the Cottle maneuver. Maximal inspiration will cause dynamic valve collapse in all noses, even those with normal airway function. Similarly, the Cottle maneuver will improve nasal airflow in healthy noses and obstructed noses alike, making the test of questionable utility. Also, a nose with internal valve collapse (from an anterior septal deformity) and very strong tip cartilage may have an unusually high threshold for dynamic collapse despite fairly severe nasal dysfunction. Finally, the Cottle maneuver will show no improvement in airflow for patients with fixed airway deformities such as cicatricial (epithelial) stenosis despite severe airway obstruction. Overall the Cottle maneuver is often misused and misinterpreted. It is like a guide leading to a focus but not a solution.

Simulation of spreader grafts by an ophthalmologic glass stick improves the airflow (spreader graft test) (Fig. 3.1f–h). The alar support test at the lateral segment of the lateral crus produces maximal functional improvement in this case (◘ Fig. 3.1i, j) by support at the area of the lower lateral cartilage (LLC) recurvature.

Our conclusion: Given the straight septum in this patient's nose, opening the internal valves and stabilizing the alae are the most important goals of rhinoplasty, which by necessity will limit the extent of nasal size reduction in this individual.

In a separate case, the sequence of functional assessment in a unilateral airway collapse is shown (◘ Fig. 3.2a–d). The patient demonstrates left alar collapse by inspiration but also has complained that the contralateral side is obstructed.

Occasionally, patients with unilateral alar collapse mistakenly identify their problem as being on the side of alar collapse. Initially, it might be concluded that there is pathologic weakness of the external valve needing structural reinforcement, but endonasal examination in these patients often reveals a septal deviation obstructing the contralateral nasal airway—sometimes of only modest severity. Moreover, in a significant number of these cases, correction of the septal deformity is needed to restore a satisfactory nasal airway. Palpation and/or rhinomanometry may sometimes yield the correct diagnosis, but in many cases a conclusive diagnosis is difficult to establish by current diagnostic means, especially when the septal deviation is mild.

Figure 3.3 shows another patient in whom the obstruction was found on the side opposite the narrow external valve (subluxation of the anterior septal border into the left vestibule). Examination of the contralateral airway revealed severe septal deviation obstructing the right internal nasal valve. Right-sided airway obstruction was confirmed by rhinomanometry.

Unilateral symptoms of sinusitis mostly are located on the side of reduced ventilation and not on the side of the narrow external valve, as this alone does not cause a significant limitation in nasal airflow.

Symptomatic nasal airway dysfunction is often multifactorial. The patient in Fig. 3.4 has nasal airway obstruction and a saddle-nose deformity resulting from previous nasal trauma. Excessive width of the columella and alar collapse (greater on the right side) were also observed. The columella pinch test contributed to significant airflow improvement (◘ Fig. 3.4d).

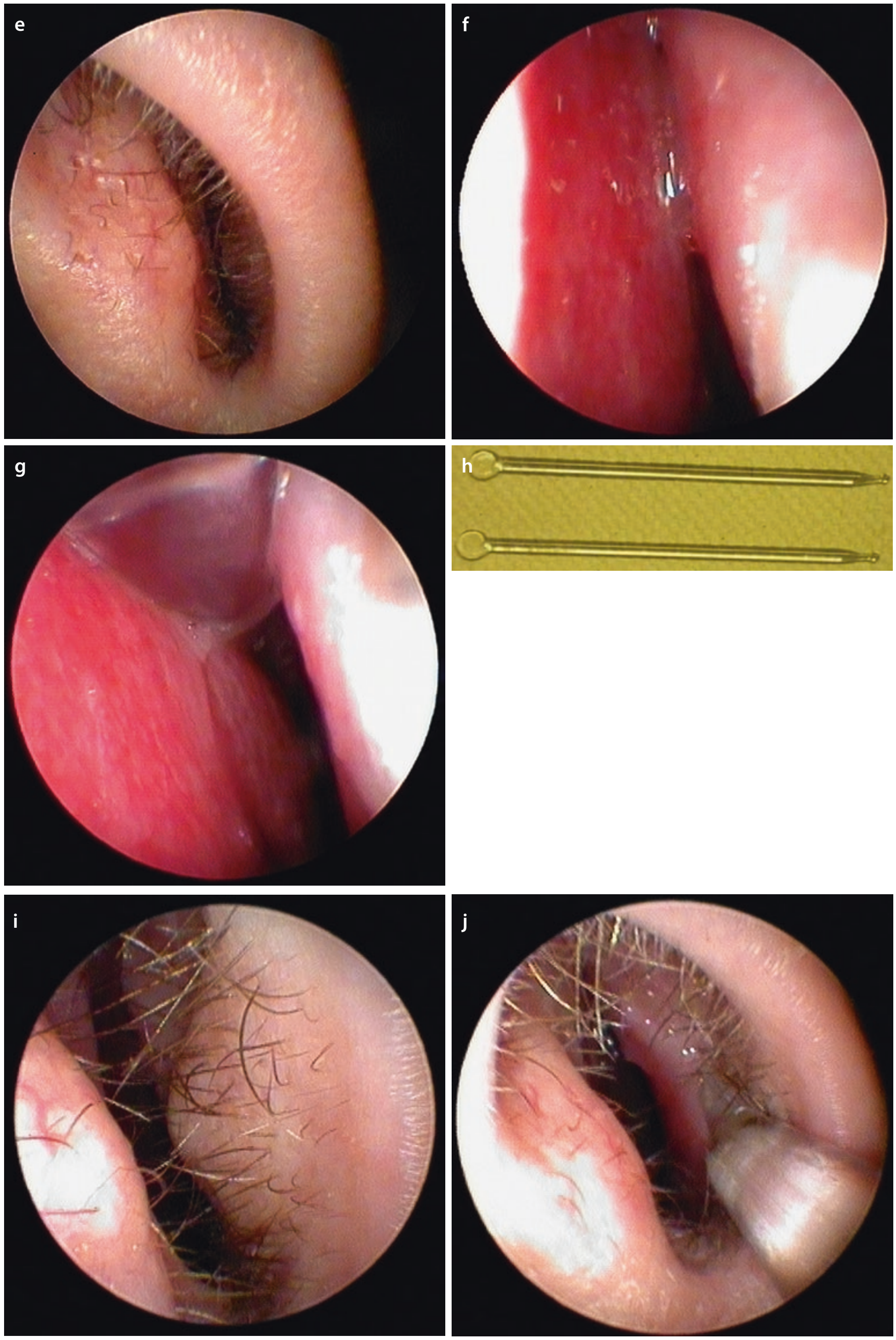
However, temporarily eliminating the left nostril obstruction did not eliminate dynamic collapse of the right alar rim (Fig. 3.4e, f). Endoscopy then revealed a hidden left-sided septal deviation presumably resulting from prior nasal trauma (◘ Fig. 3.4h). To qualify its impact on the patient's breathing impairment, we applied a pair of silicone tubes (◘ Fig. 3.4g) over some weeks and involved the patient in reevaluation of the functional situation, which significantly improved. Thus, the septal deviation proved to be of secondary (downstream) importance, although it had to be corrected simultaneously.

When contralateral turbinate hypertrophy is suspected of contributing to nocturnal nasal valve dysfunction, silicone nostril stents (NasiVent tube, Vital Health Products, The Hague, the Netherlands) can be worn overnight to increase diagnostic accuracy. By eliminating nasal valve stenosis, nostril stents provide additional information regarding the potential role of turbinate hypertrophy and/or mucosal congestion as a potential cause of nocturnal nasal airway dysfunction.

Figure 3.4 shows a patient in whom we planned a reduction of columellar width, septoplasty, and augmented structural support for the cartilaginous vault using spreader grafts to increase septal height and upper lateral cartilage flaring sutures to increase valve patency. This resulted in a functional saddle-nose correction compared with mere aesthetic onlay grafting for profile enhancement. Figure 3.4j–o shows the clinical results for this particular patient.

Fig. 3.1 Patient with valvular collapse (**a**) at rest; (**b**) mildly forced inspiration; and (**c**) Cottle maneuver. Endoscopic view of left nostril and internal valve area (**d**) at rest; and (**e**) collapsing under forced inspiration. Endoscopic view of the spreader graft test: (**f**) narrow inner valve at rest, (**g**) opening the valve with a glass stick (spreader graft test), and (**h**) glass sticks for endonasal examination (originally ophthalmologic device). Endoscopic view of lateral alar support test (**i**) at rest; (**j**) support with glass stick at the lateral aspect of the inner valve, here at the area of the LLC recurvature

Fig. 3.1 (continued)



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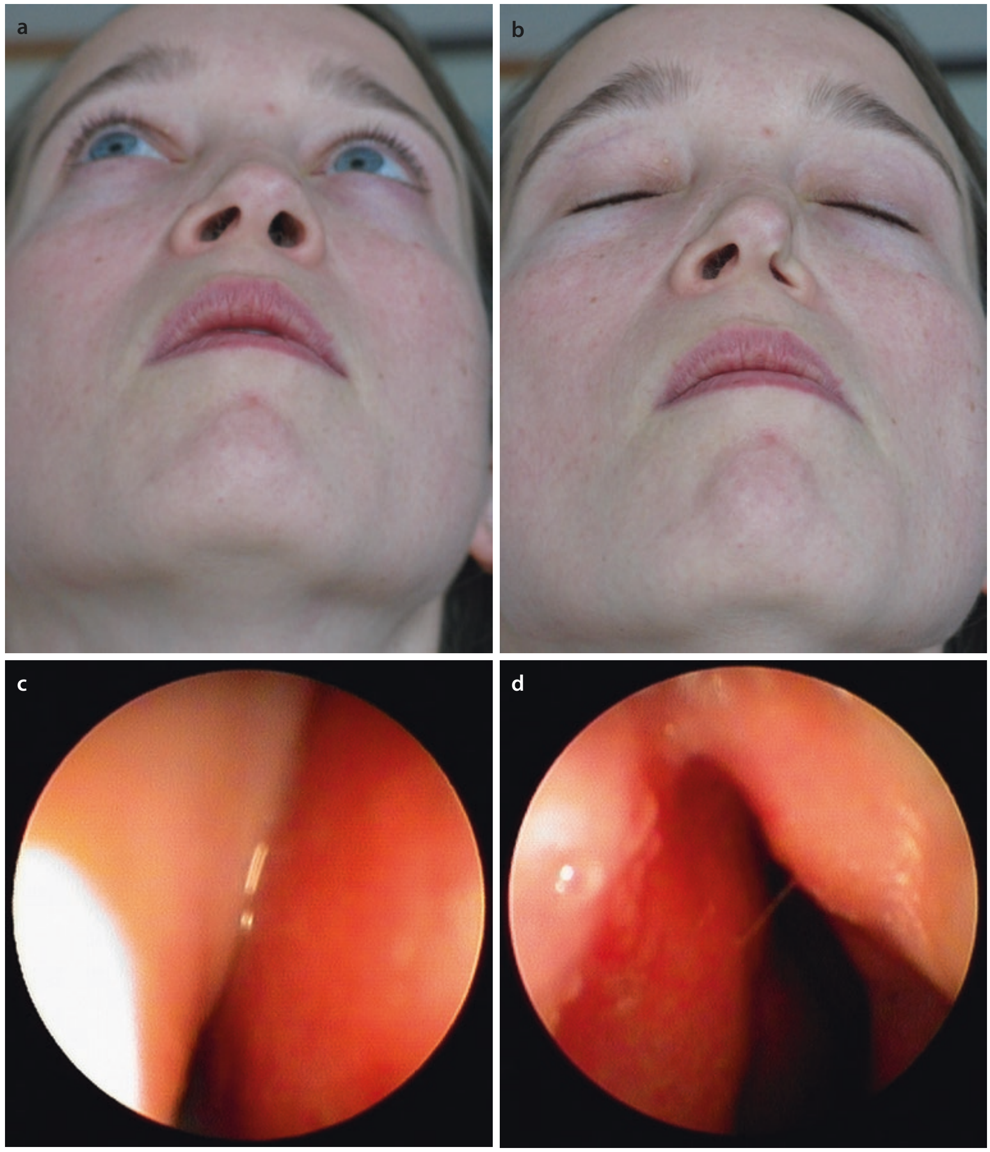


Fig. 3.2 Left-sided alar collapse caused by right-sided airway obstruction from septal deviation, (**a**) at rest and (**b**) under gentle forced inspiration. Endonasal view of (**c**) right and (**d**) left of internal valve. (**e**) Completely harvested septum. Note narrowing of the right nasal valve from septal impingement. Septal deviation corrected by extracorporeal septoplasty and replantation. Base view (**f**) preoperative and (**g**) postoperative

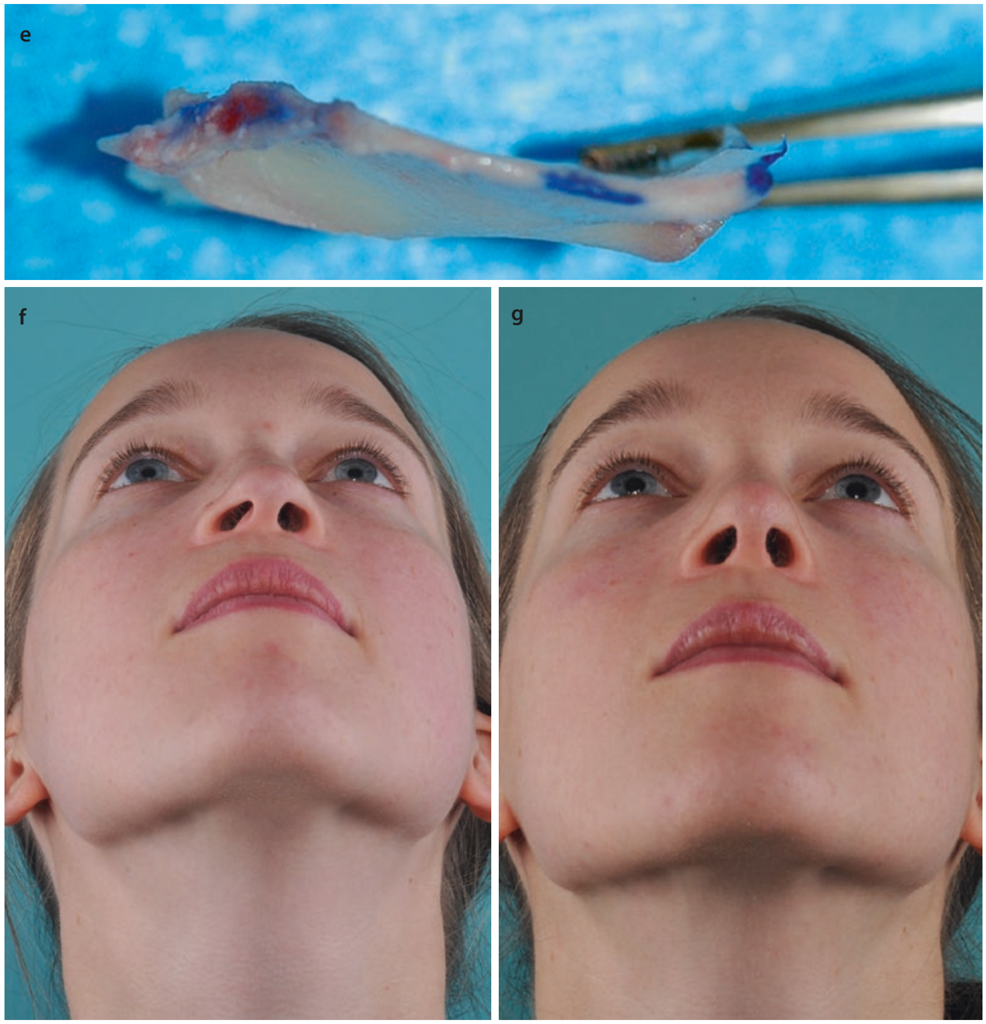


Fig. 3.2 (continued)

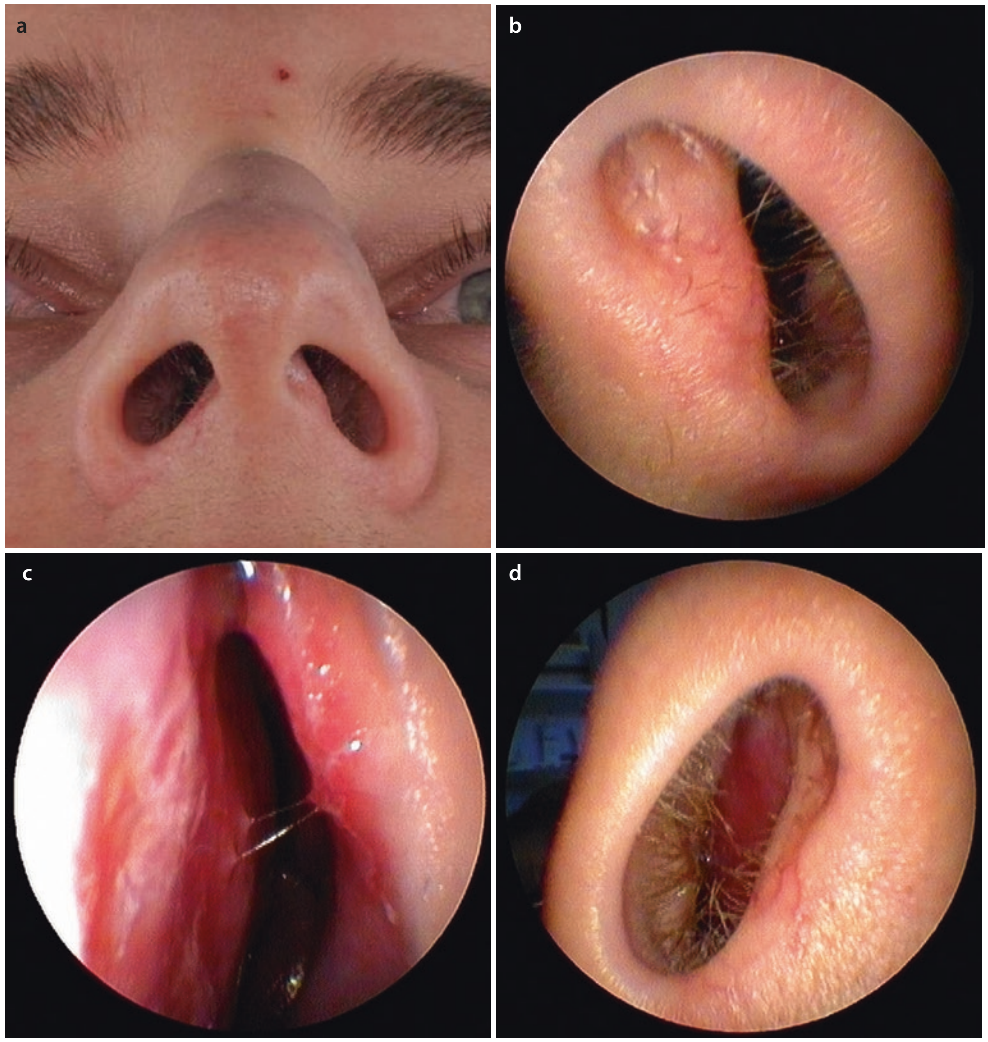


Fig. 3.3 Example of obstruction on the side opposite the narrow external valve. (**a**) Base view; (**b**) endoscopic view of left nostril; (**c**) internal nasal valve area. Subluxation of the anterior septal border into the left vestibule is not the reason for the patient's breathing impairment, which is located at the right side. Examination of the patient's contralateral (*right*) airway revealed severe septal deviation obstructing the right internal nasal valve area. (**d**) Endoscopic view of right nostril, and (**e**) internal nasal valve subtotally obstructed. Endonasal septoplasty, osteotomies for axial realignment, and spreader flap technique for cartilaginous vault reconstruction result in normal airflow bilaterally upon reexamination. (**f**) Preoperative and (**g**) postoperative base view

Fig. 3.3 (continued)

Fig. 3.4 Examination of the influence of columellar width on the airflow. (**a**) Left profile; (**b**) base view at rest, and (**c**) under forced inspiration. (**d**) Columella pinch test revealed the influence of columellar width and nostril cross section on the airflow. Examination of the influence of increasing nostril cross section by alar support on the left side—the right nostril still collapsed as a deeper left side obstruction was not corrected by this maneuver. (**e**) At rest, and (**f**) under gentle forced inspiration. (**g**) Long-term test with a pair of silicone tubes to assess the functional importance of the subsequent anatomic airway structures downstream in the nostrils (external nasal valves). Endoscopic view (**h**) of a patent right airway, and (**i**) left-sided airway obstruction from septal deviation. The turbinates appeared normal in size at the time of examination. Frontal view (**j**) preoperatively and (**k**) postoperatively. Profile view (**l**) preoperatively and (**m**) postoperatively. Base view (**n**) preoperatively and (**o**) postoperatively

Fig. 3.4 (continued)

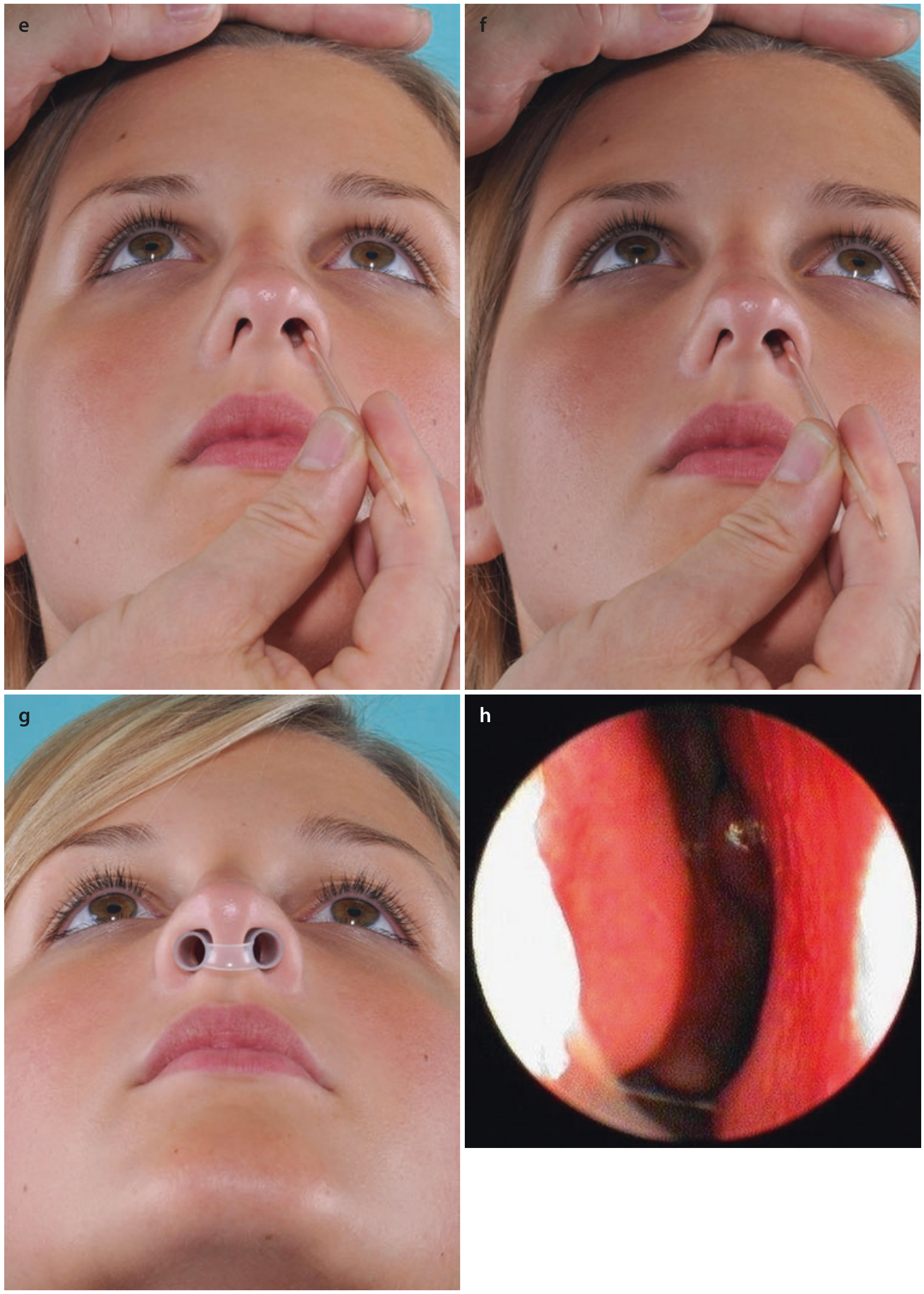


Fig. 3.4 (continued)

Fig. 3.4 (continued)

3.2 Surgical Principles

3.2.1 Septoplasty

Eliminating septal deformities is a critical aspect of both functional and cosmetic nasal surgery, and in many noses both simultaneous functional and cosmetic enhancement is required. Preoperative evaluation of the entire septal partition, from the caudal and dorsal margins to the posterior bony segment, is a prerequisite for accurate diagnosis and effective surgical management.

The functional and cosmetic importance of the anterior septum is increasingly recognized in contemporary nasal surgery. However, surgical correction of anterior septal deformities is among the most difficult tasks in both functional and cosmetic rhinoplasty. Moreover, the importance of septal support cannot be underemphasized, since it is pivotal to the support, symmetry, and patency of the cartilaginous nasal framework. Minor septal deviations in the area of the internal nasal valve—which is the natural isthmus of the nasal airway—may also have a disproportionately negative impact on nasal airflow and may be exacerbated by anatomic abnormalities and structural deficiencies of the adjacent alae and nasal side walls. Moreover, traditional techniques used to straighten a deformed anterior septum are often doomed to failure, since scoring, curfing, and morselizing may compromise long-term structural support and lead to progressive skeletal distortion as the nose gradually seeks a new structural equilibrium. And while contemporary rhinoplasty techniques can be used to both strengthen and reshape the cartilaginous nasal framework to produce a well-functioning and attractive nose, overaggressive reduction rhinoplasty will severely impair nasal airway function and should be avoided. The following sections address functional aspects of individual skeletal elements impacted by cosmetic nasal surgery.

3.2.2 Spreader Grafts and Upper Lateral Cartilage (ULC) Suture Techniques

Reduction of the typical dorsal hump for profile enhancement obligates the surgeon to consider reconstruction of the nasal dorsum in order to prevent both functional and cosmetic complications caused by surgical destabilization. Preventing "pinched" upper lateral cartilages (◘ Fig. 3.5c) is a fundamental goal of hump reduction, and in our hands spreader grafts, suture techniques, and/or a combined approach was the preferred means of middle vault reconstruction after hump reduction (◘ Fig. 3.5d–f) before the spreader flap era. Conventional spreader graft techniques are now familiar to most nasal surgeons. After obtaining satisfactory graft material from the cartilaginous hump resection and/or from cartilage harvest of the posterior quadrangular cartilage, spreader graft thickness is carefully adjusted to preserve middle vault width, thereby preventing an inverted-V deformity while simultaneously avoiding excessive middle vault width from overcorrection. Spreader grafts are first sutured flush with the newly created cartilaginous dorsum to form a three-layered reconstruction (► *see* Fig. 3.5d). The upper lateral cartilages are then sutured to the construct in a symmetrical fashion (► *see* Fig. 3.5f). This is accomplished by temporarily displacing the tip cartilages caudally and then applying equal tension to the ULCs so they are held symmetrically while being reattached.

In some patients, thin nasal skin and a large open roof resulting from bony hump reduction necessitate extending the spreader grafts cephalically to avoid bony side wall collapse with lateral osteotomies. Prophylaxis of bony vault collapse will often prevent both functional and cosmetic deformities of the upper nasal vault. A large clinical experience with revision rhinoplasty also attests to the benefits of prophylactic spreader grafts.

In patients with weak cartilaginous side walls, a personal modification of the spreader graft technique is sometimes preferable. Using the modified technique, the upper lateral cartilages are sutured to the top of the dorsal septum rather than to its sides (◘ Figs. 3.6b and 3.7c). This minor change in cartilage placement improves side wall support in noses with weak upper lateral cartilage and functions much like a ULC flaring suture. However, we feel that this technique provides better long-term support in our hands when compared to flaring sutures. In order to prevent overprojection of the dorsum, the spreader grafts must also be recessed slightly below the dorsal line so that the ULC remains flush with the newly established profile line (◘ Figs. 3.6 and 3.7). Suture techniques can also be used in the absence of spreader grafts by lowering the septum approximately 1 mm to compensate for the ULC width (► *see* Fig. 3.5e). However, care must be taken to adjust the profile line precisely to prevent polly-beak deformity. When functional considerations prevent adequate lowering of the cartilaginous dorsum in order to prevent a polly-beak type deformity, onlay grafts of cartilage or fascia must be used to augment the adjacent bony vault and create an aesthetically pleasing dorsal profile. Spreader graft and suture techniques are equally effective for both primary and revision cases.

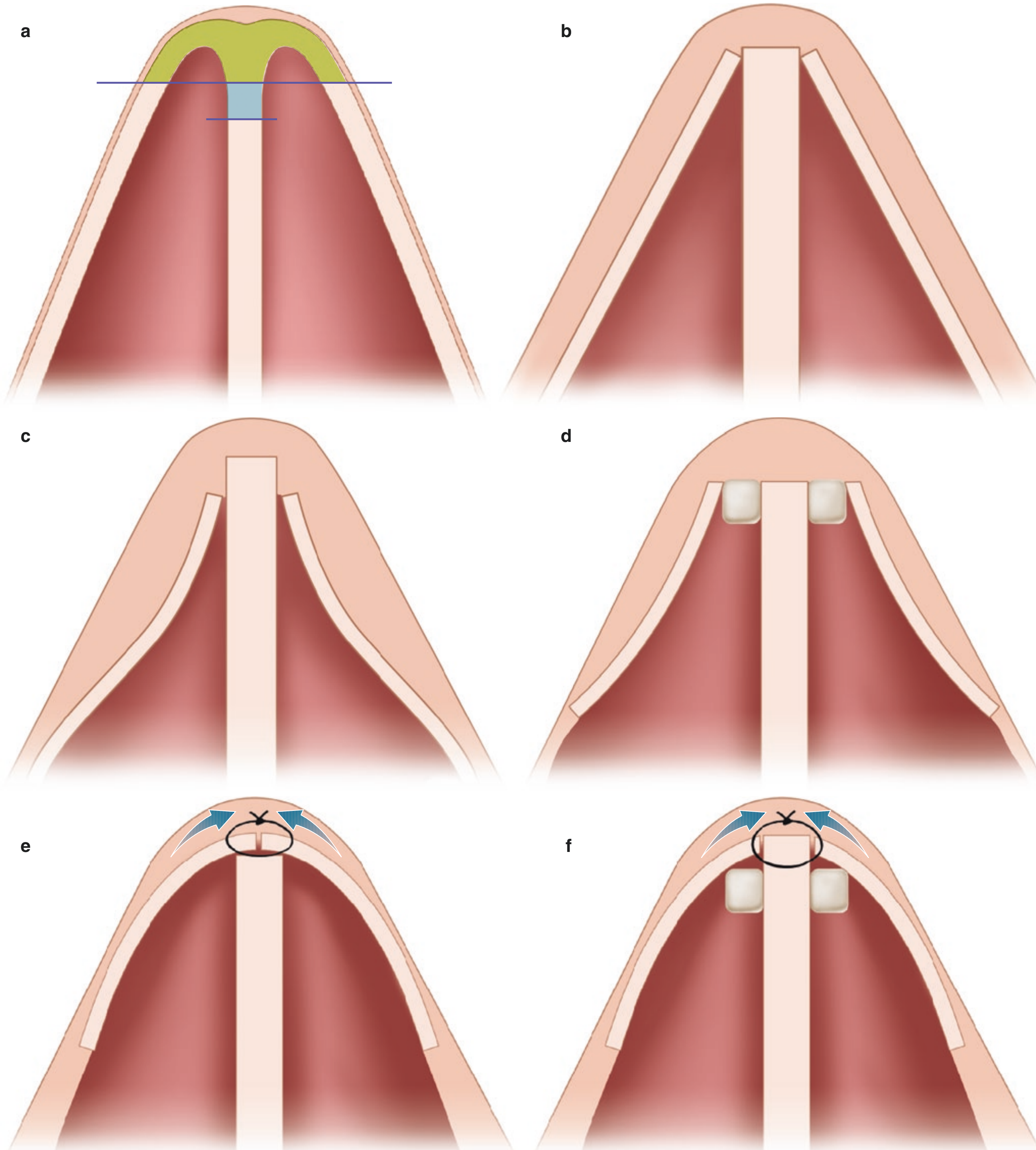


Fig. 3.5 Schematic drawings of classic reduction rhinoplasty technique: (**a**) monoblock hump reduction and additional septal reduction for dorsal alignment; (**b**) without cartilaginous vault reconstruction, early situation; (**c**) not rarely later side wall collapse occurs. Some alternatives to Hump reduction with cartilaginous vault reconstruction: (**d**) spreader grafts, (**e**) suture techniques, (**f**) combination of spreader grafts and suture techniques

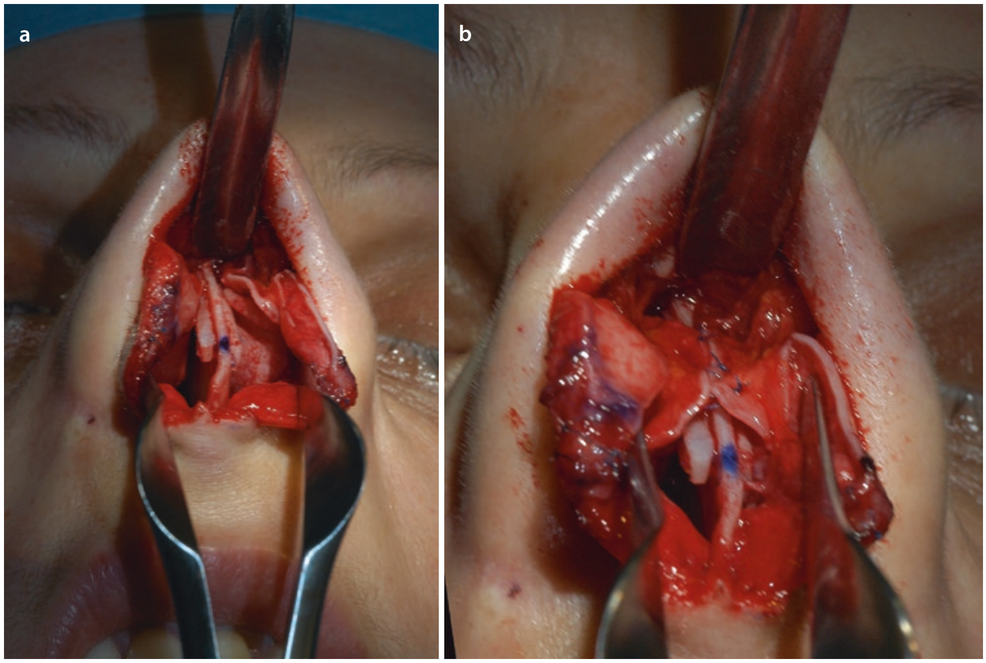


Fig. 3.6 Intraoperative examples of (**a**) spreader grafts and (**b**) additional ULC suture suspension for vault reconstruction on top of the dorsal septal rim widened with spreader graft

Fig. 3.7 A patient for primary reduction rhinoplasty surgically managed with a similar technique to that shown in Fig. 3.6. (**a**) Profile view preoperatively; (**b**) spreader grafts in place 1 mm lower than the dorsal septal border; (**c**) ULCs sutured at the septum over the spreader grafts. The septum had to be lowered adequately to avoid a parrot-beak formation. (**d**) Profile view 8 months postoperatively. Frontal view (**e**) preoperatively and (**f**) 8 months postoperatively. Note: despite the applied technique of cartilaginous vault reconstruction, the dorsum is not overly widened. Base view (**g**) preoperatively and (**h**) postoperatively

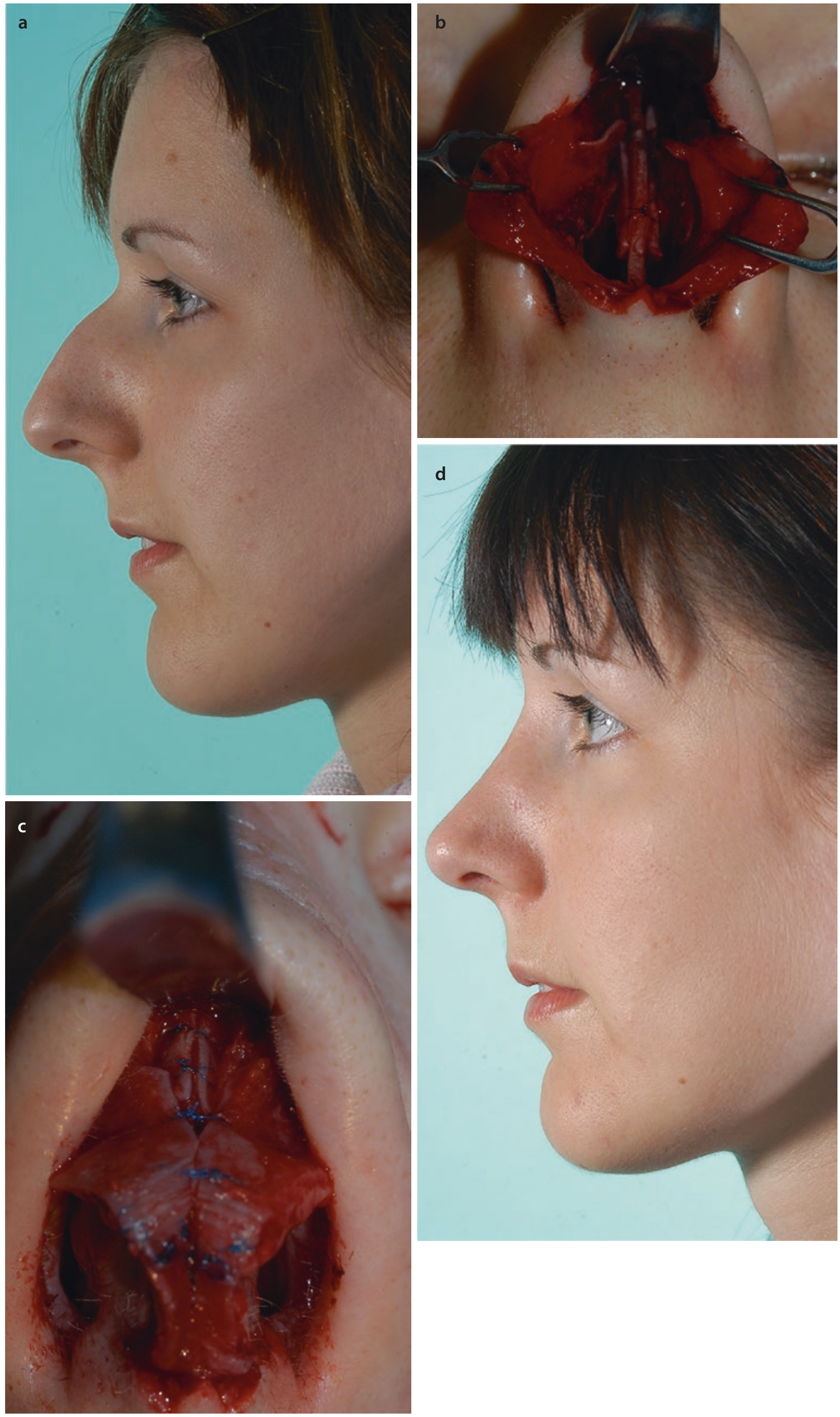


Fig. 3.7 (continued)

3.2.3 Spreader Flaps and Anatomic Details of the Nasal Dorsum

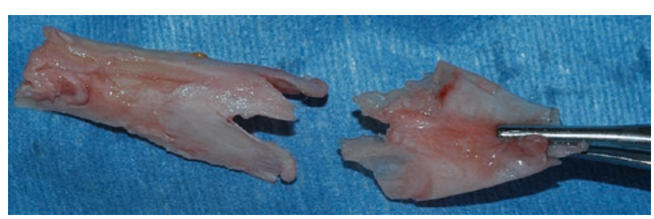
In primary hump reduction, spreader *flaps* are becoming an increasingly popular means of reconstituting middle vault support, particularly since they don't require additional cartilage for reconstruction. However, not all noses are well suited to spreader flaps. Noses with long nasal bones and/or overly short ULCs are poor candidates for spreader flap reconstruction, since invagination of the ULCs is often impossible. Conversely, some ultra-long and narrow middle vaults have cartilage that is too thin or soft to use as spreader flaps. Various other anatomic variations must also be considered. Of primary importance is the extension of the ULC beneath the nasal bones, since the overlap between cartilage and bone varies widely in length, width, and strength. Long extensions of the ULC can fill an open roof deformity created by nasal hump reduction—the ideal configuration—whereas in other cases there may be little if any cartilage to conceal an open roof deformity. Nasal bones also show distinctive features in the bony cartilaginous transition zone of the dorsum. These are displayed by separating the bone from the ULCs in a previous case of composite (en bloc) hump reduction (◘ Fig. 3.8).

Important anatomic variations exist in the distance between the central bony extension and the lateral bony extensions as well as in their length and symmetry. One of the most important variables is the height of the lateral bony extensions. In some noses the lateral extensions are equal in height to the dorsum, while in others the lateral extensions may be considerably lower. These skeletal variations are critical considerations in extracorporeal septoplasty because they determine fixation techniques. In noses with high lateral bony extensions, bones perforated with drill holes can be used for secure suture fixation of the reimplanted septal construct, whereas in the underprojected caudal nasal bones, extreme care must be taken not to disrupt the bony cartilaginous interface because the ULCs must be used for suture fixation. And while underprojected lateral extensions are not amenable to drill hole fixation, they are usually well suited to the application of spreader flaps.

To create spreader flaps, the ULCs must be released from the undersurface of the bony hump with blunt dissection. Once the ULCs have been divided from the dorsal septum (Fig. 3.9a), we initiate the dissection by scoring the caudal margin of the bony hump with a no. 15 blade (◘ Fig. 3.9b) and then continue the dissection using either a semisharp (Haraldsson) suction dissector or some type of periosteal elevator such as a Freer, McKenty, or Cottle elevator. Care must be taken not to dissect below the desired profile line so that the remaining ULC/nasal bone attachments are preserved. Next, the cartilaginous dorsal hump is sharply resected (◘ Fig. 3.9c), and submucosal pockets are developed on both sides of the dorsal septum to accommodate the spreader flaps. When necessary, such as with large cartilaginous humps, the ULCs are trimmed to avoid excessive bulk within the internal nasal valves (◘ Fig. 3.9d, e). Finally, the ULCs are folded into the submucosal pockets and temporarily secured with small-bore needles (◘ Fig. 3.9f). With the ULCs safely repositioned just below the desired profile line, elimination of the bony hump can proceed. We prefer to resect the bony hump using a thin and ultrasharp chisel (◘ Fig. 3.9g) and to fine-tune the bony contour with a carbide rasp. Hump refinement with a carbide rasp is preferred because it removes bone effectively with little or no trauma to the underlying cartilage extensions.

Once hump reduction is complete, spreader flaps are secured with slowly resorbing 5-0 monofilament sutures (Fig. 3.9h, i). By using resorbable suture material, complications stemming from permanent suture material penetrating the nasal cavity are minimized, and extensive elevation of mucosa from the ULCs becomes unnecessary. It is also important to remember that while suturing the spreader flaps, they should be kept under constant symmetrical downward tension using a double-skin hook. Care must also be taken to ensure correct sagittal alignment, and in cases of pre-existing deformity, slight overcorrection of septal alignment is often needed to overcome intrinsic tissue memory. In addition to septal alignment, suture fixation can also be used to control dorsal width. Cranially, suture fixation can be used to control the width of the bony cartilaginous junction and reduce bony flaring. When bony drill holes are available, a cerclage suture can be used to aggressively narrow the bony cartilaginous junction and/or close a persistent open roof deformity. Excess middle vault width stemming from overly rigid ULCs can also be treated by perforating, scoring, or incising the spreader flaps for increased narrowing. Depending upon the site of cartilage modification, narrowing can be limited to the upper, central, or lower middle vault or combinations thereof. Furthermore, the kind of suture technique can be altered in weak cartilages (◘ Fig. 3.9j, k).

In summary, spreader flaps are an effective technique for creating a natural-appearing nasal dorsum with attractive dorsal aesthetic lines in most noses. Spreader flaps are also easily fine-tuned using suture techniques, and they frequently obviate the need for spreader graft harvest. In our hands, the need for camouflage (fascia) grafts has also greatly diminished with the advent of spreader flaps. Unfortunately, intraoperative adjustments to middle vault projection require redoing flap fixation—a significant limitation of this otherwise user-friendly technique. Likewise, noses with ultra-pliable ULCs make poor candidates for spreader flap reconstruction since cosmetic and functional deformities may result.



◘ **Fig. 3.8** Anatomy: dissection of the hump resected as a monobloc of bone and cartilage. Note the shape of bone and cartilage; the bone originally overlapped the cartilage

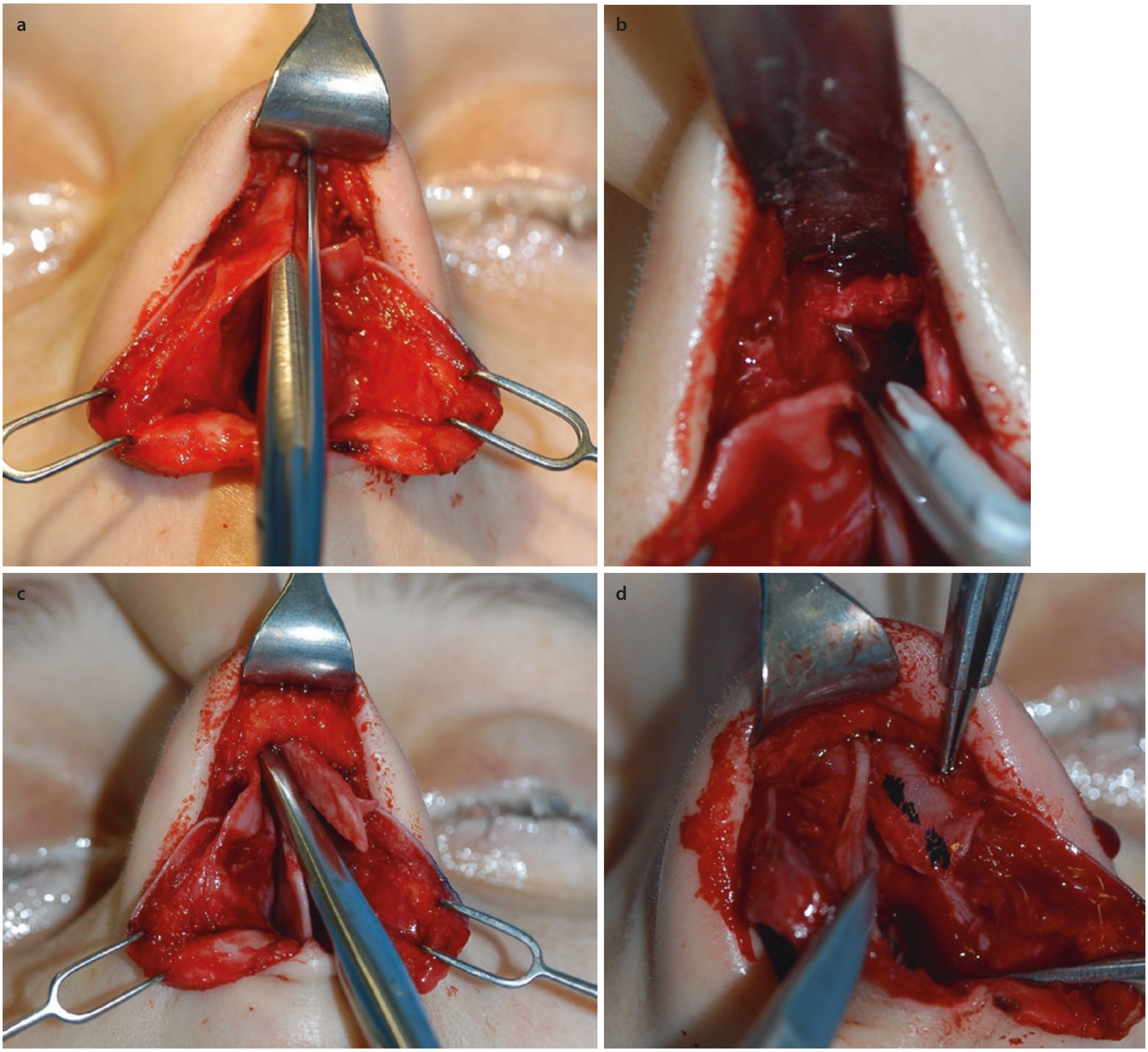


Fig. 3.9 Spreader flap technique. (**a**) ULC separation off the septum, and (**b**) from underneath the bony vault. (**c**) Reduction of the septal component of the cartilaginous hump. (**d**) Marking and (**e**) resection of the surplus of ULC to avoid partial upper airway obstruction. (**f**) Intermediate infolding of the ULCs for better access to (**g**) bony hump reduction with an extremely sharp chisel for the major part of the hump (and a rasp for residual adjustment, not shown). Spreader flap suturing with 5.0 PDS (**h**) horizontal mattress sutures, and (**i**) adjusting dorsal width by the degree of tension. Incisions or scoring on the apex of the vault is an option in very rigid cartilage or in the distal third of the dorsum (valve area). Spreader flap suturing with 5.0 PDS. (**j**) Alternatively, in very weak cartilage vertically double U-shaped sutures can be applied and (**k**) knotted over the septum provided that the dorsal height must not be further reduced

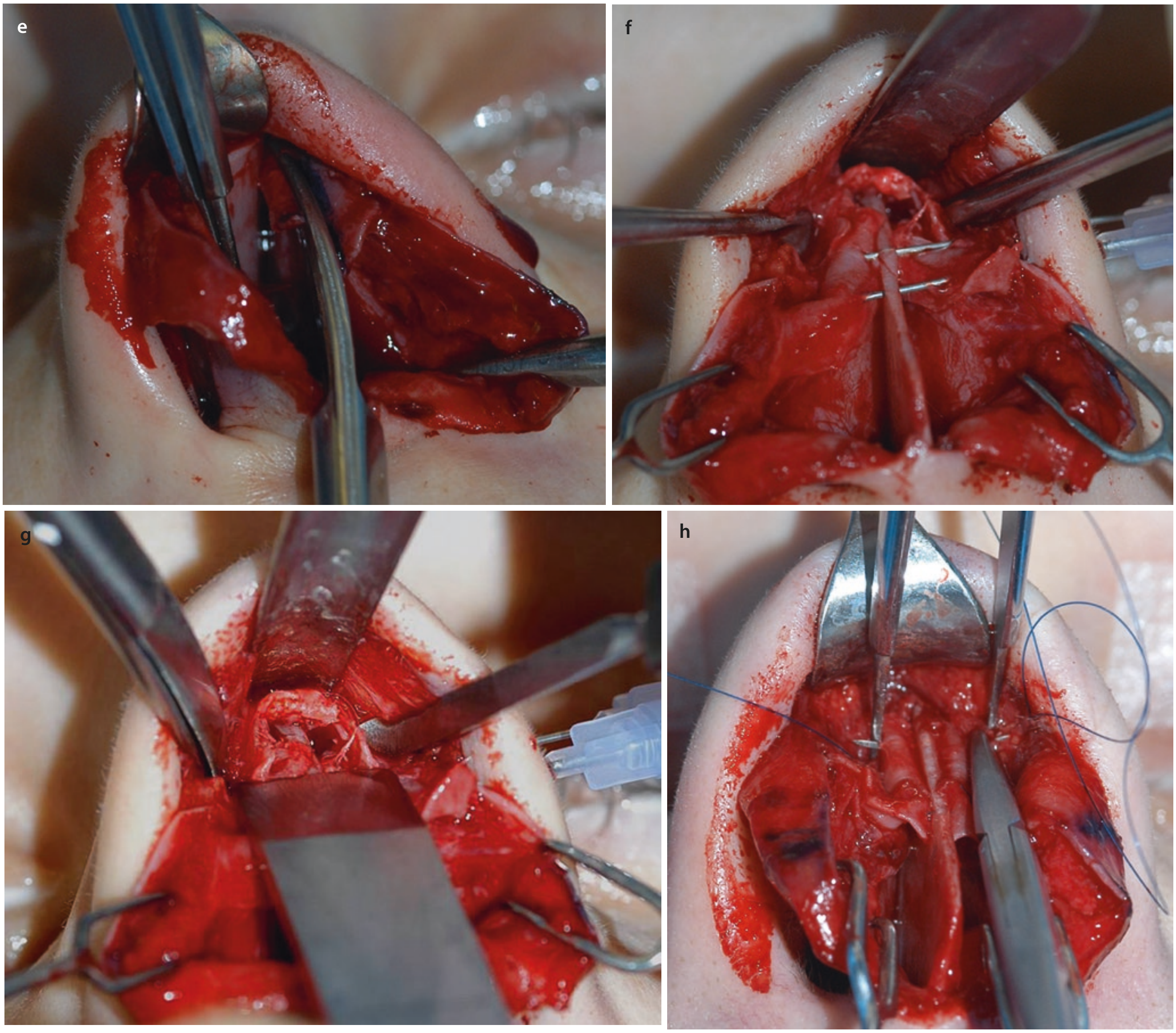


Fig. 3.9 (continued)

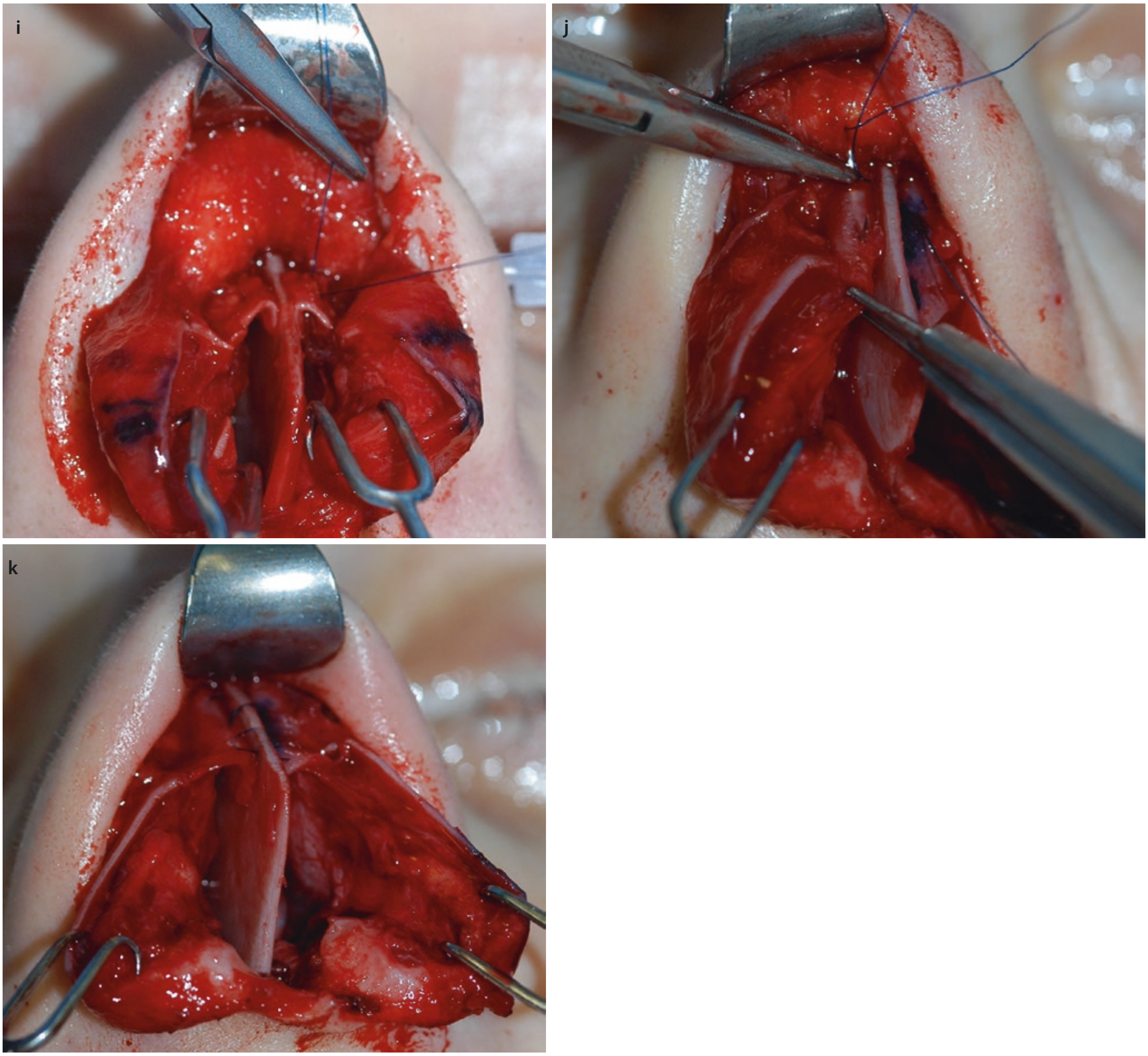


Fig. 3.9 (continued)

3.2.4 Batten Grafts or Lateral Crural Strut Grafts

Batten grafts are used mostly in revision rhinoplasty. They are indicated to strengthen lateral crura weakened by cephalic trimming and/or to strengthen collapsed (concave) lateral crura. Battens can be placed in pockets either superficial to the LLC (over the batten graft) or deep to the LLC (under the batten graft), or they can be sutured directly to the exposed overlying LLC (lateral crural strut graft). By adding rigidity to the lateral crura, batten grafts stabilize the lower nasal side wall against premature inspiratory collapse. Batten grafts are also especially useful in boxy tip correction (Fig. 3.10) to prevent exacerbating lateral crural recurvature deformity caused by tip sutures.

There are more techniques for correction of alar concavities or malformations with aesthetic as well as functional impact.

Fig. 3.10 (**a**) Boxy tip deformity; (**b**) simulation of tip correction and impact on alar position. Strut grafts are planned for straightening the LLCs and prevent medial displacement. (**c**) Early postoperative base view. Resection of the deviated lateral segment of the LLC: (**d**) incision at the line of deviation, (**e**) resection of the small segment. The gap is bridged with the lateral crural strut (and simultaneously extension) graft. Alternatively, strong cartilage can be straightened by horizontal mattress sutures in ideal cases. Lateral crural strut graft (**f**) demonstrating and (**g**) fixating the position. Vestibular view (**h**) before resection of the lateral LLC segment and (**i**) after fixation of the lateral crural strut graft

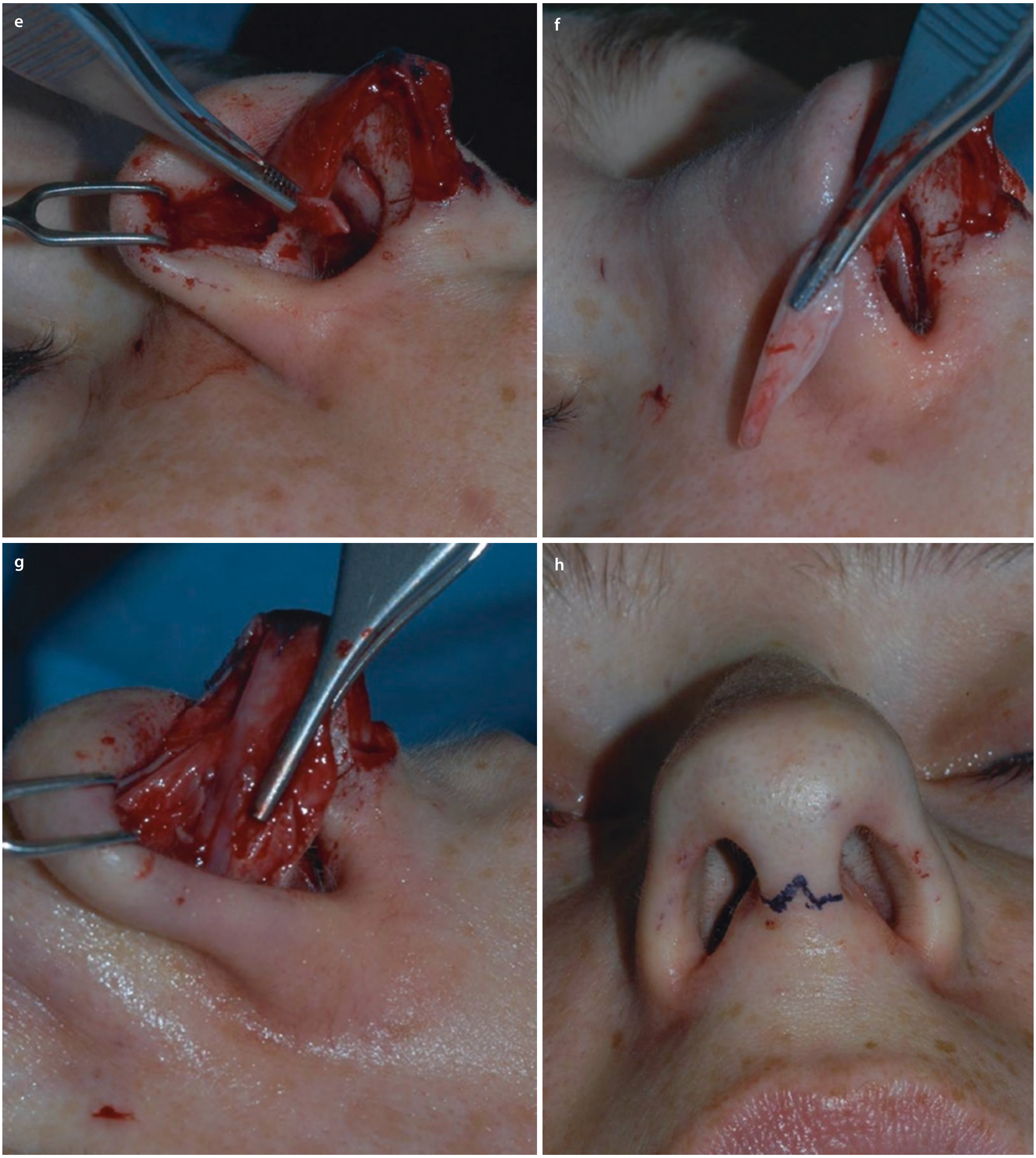


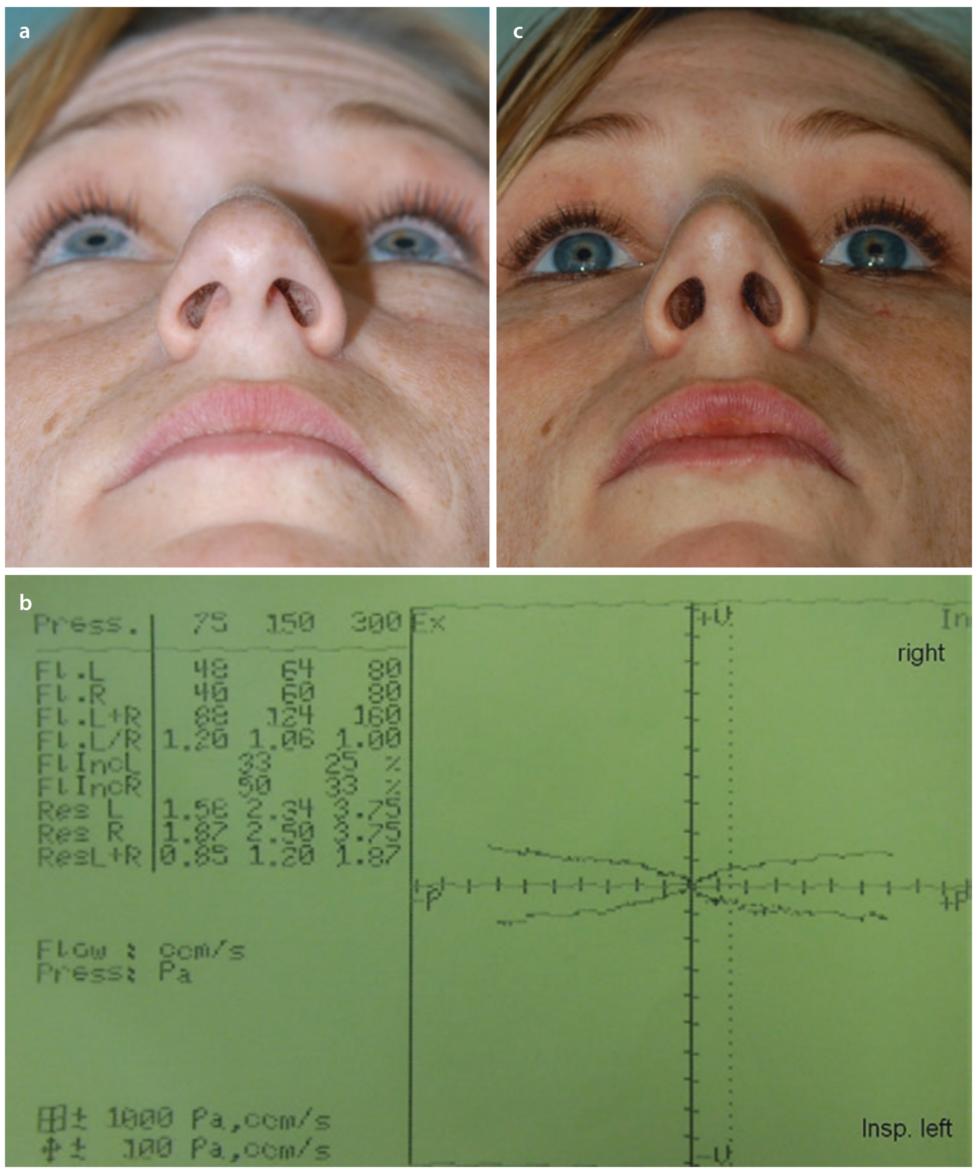
Fig. 3.10 (continued)

Fig. 3.10 (continued)

3.2.5 Reduction of Columellar Width

In most noses, the columella widens gradually toward its base—the columellar pedestal. However, excessive width of the columellar pedestal can also become pathologic. An extremely wide columellar pedestal can contribute to nasal airway dysfunction, and in rare cases this may be the sole cause of nasal airway obstruction (▶ *see* Fig. 3.5a). An important part of the physical examination includes the columellar pinch test. In healthy noses, manual compression of the columellar pedestal makes no difference in nasal airflow. However, a small subset of patients have reported a dramatic improvement in symptomatic nasal obstruction after columellar compression. For these patients, surgical narrowing of the columella is indicated, if only as part of a larger septorhinoplasty.

Various surgical techniques for columellar narrowing have been described, including permanent buried sutures, medial crural footpod resection, or combined footpod transection and suturing. Resection of the intercrural soft tissues followed by transcolumellar mattress suture placement using slowly resorbable monofilament sutures is our preferred method for achieving safe and reliable columellar narrowing (◘ Fig. 3.11). When suitable, this procedure can also be combined with a tongue-in-groove imbrication to further enhance tip support.



◘ Fig. 3.11 (**a**) Wide columella base and breathing impairment bilaterally, (**b**) as confirmed by rhinomanometry (Atmos Company; Lenzkirch, Germany) showing nearly horizontal curves (R and L). The functional impact recorded by the columella pinch test (*see* Fig. 3.4d). (**c**) Result after thinning the columella and tip projection by the lateral steal technique. (**d**) Resection of depressor muscle in a different patient. (**e**) As a result, the medial crura and footplates become exposed

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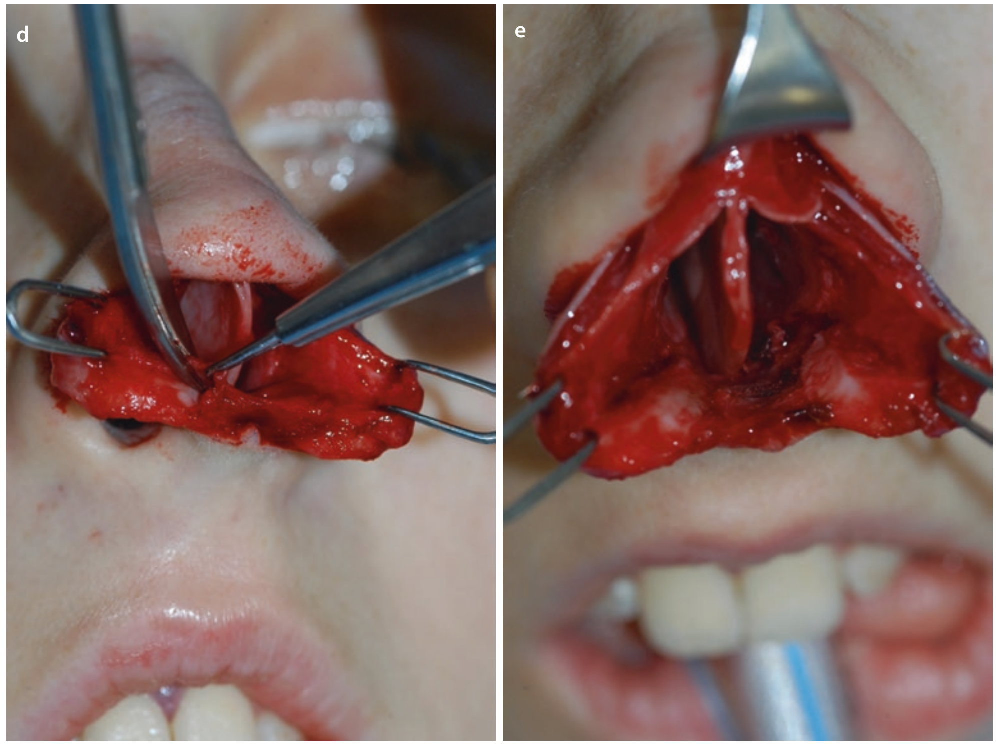

■ **Fig. 3.11** (continued)

3.2.6 Turbinate Reduction

In the presence of long-standing septal deviation, such as may occur following childhood nasal trauma, compensatory hypertrophy of the inferior and/or middle turbinate (on the side of septal concavity) is commonplace. Often the hypertrophy is substantial, with turbinate enlargement extending well beyond the sagittal midline. In the presence of significant compensatory turbinate hypertrophy, turbinate repositioning and/or turbinate reduction is necessary to allow return of the deviated septum to the midline. Variation in conchal bone size is an important determinant in surgical management of compensatory turbinate hypertrophy. A thin turbinate bone can be easily out-fractured for lateralization, but long-term outcomes are often poor because postoperative swelling may lead to recurrent malposition during healing. However, for significant cases in inferior turbinate hypertrophy, we prefer partial resection of the conchal bone using a submucosal technique (Fig. 3.12). Submucosal turbinate reduction is begun by creating a small incision along the leading edge of the turbinate over the anterior-most portion of the conchal bone. Medial and lateral flaps are then developed using a Cottle elevator to lift mucosa off the underlying conchal bone. Often the conchal bone must be in-fractured to facilitate dissection of the lateral mucosa. The anterior conchal bone is then resected, preserving the turbinate mucosa for continued humidification, warming, and filtration of inspired air. When necessary, the mucosal edges are lightly cauterized for hemostasis.

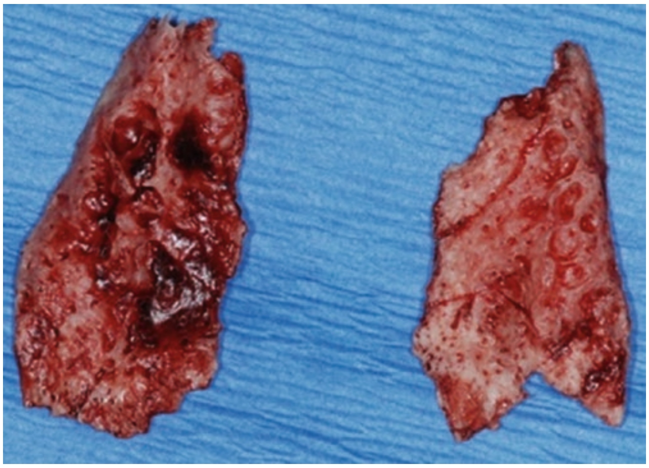

Fig. 3.12 Pieces of turbinate bone resected from the anterior part of the lower turbinates via longitudinal incisions on the lower borders. Note: there is no turbinate soft tissue attached

3.3 Functional Aspects in Primary Rhinoplasty: Case Studies

3.3.1 Case 1: Spreader Grafts

The spreader graft technique is widespread and well known. Case 1 concerns a unilateral spreader graft application in combination with several other measures (► *see* Fig. 3.6a–e).

A 31-year-old former boxer with a history of repeated nasal trauma presented with a deviated nose, severe septal deviation, and nasal airway obstruction. A dorsal hump was also present, but the patient declined treatment for this. Examination revealed short nasal bones with a depressed left nasal bone. A septal fold of the anterior quadrangular cartilage, together with left dorsal side wall collapse, produced subtotal obstruction of the left internal valve. On the right side, a protruding maxillary crest and compensatory hypertrophy of the inferior turbinate led to contralateral nasal airway obstruction as well. Rhinomanometric measurements confirmed the functional impairment: (150 Pa) R 192 mL/s, L 16 mL/s and after decongestion R 232 mL/s, L 52 mL/s—highly pathologic compared with the normal measurement of 300 mL/s.

Opening the left internal nasal valve using a unilateral spreader graft was the primary objective of surgical treatment. Spreader graft placement and additional procedures are described below.

Surgical Steps

1. Endonasal septoplasty: excision of a large scar from the concave side of the anterior septal deviation, mild scoring, and placement of a flattening suture on the convex side. Creation of a midline sagittal groove in the nasal spine and reattachment of the caudal septum.
2. Submucous resection of the inferior turbinates.
3. Osteotomies: paramedian, transverse, and lateral (high-low-low).
4. Spreader flaps.
5. Infolding of the cephalic rim of lower lateral cartilages (LLC).
6. Tip rotation with the lateral crural overlap technique, tongue-in-groove setback, and septal suspension suture.
7. Profile-plasty by placement of supratip and radix augmentation grafts.

Result

The patient reported elimination of nasal airway obstruction at 9 months follow-up examination. Examination revealed a straight nose with improved profile and nostril contour and a straight nasal septum. Increased columellar show could have been avoided by placement of alar rim grafts (◘ Fig. 3.13).

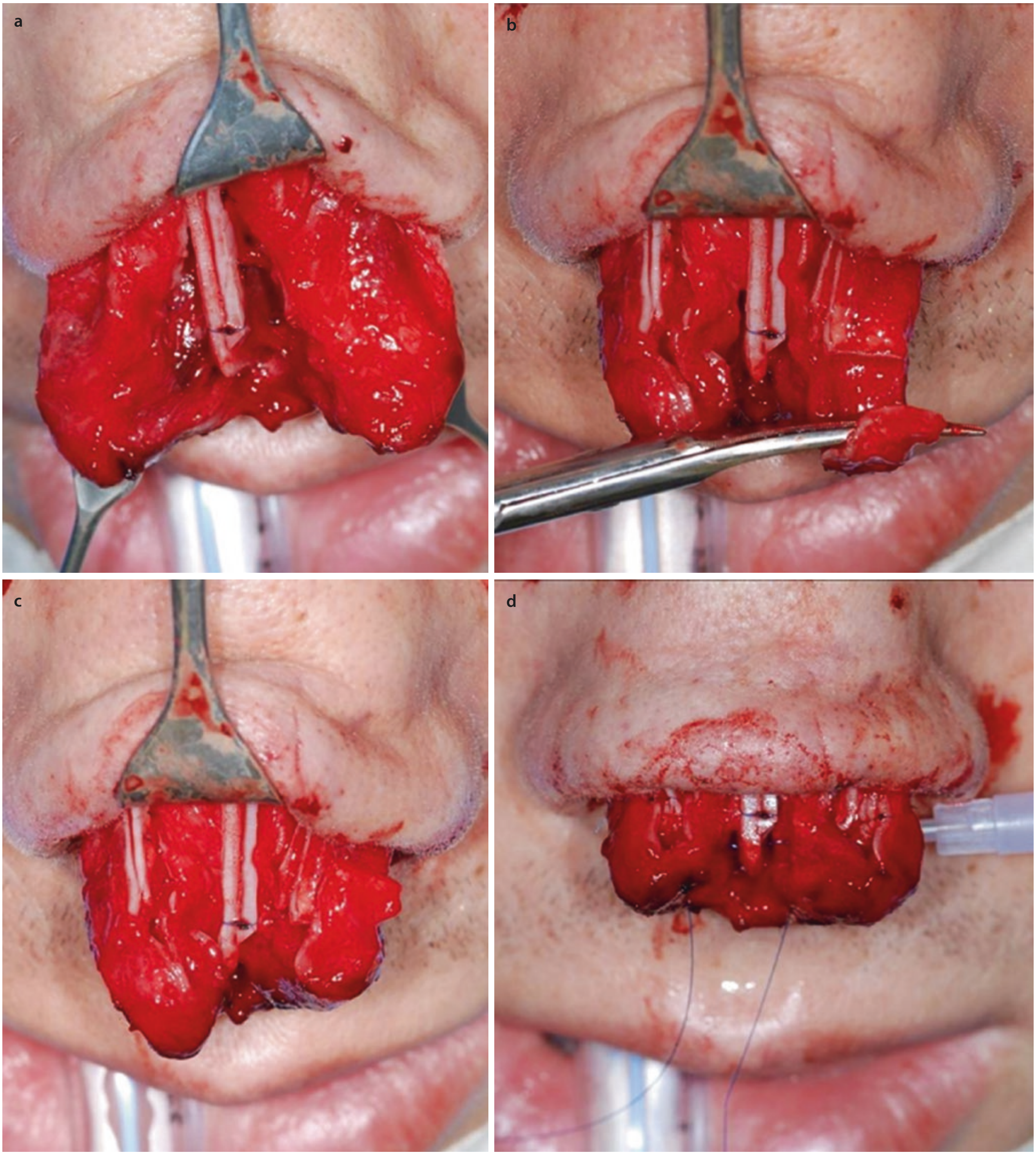

Fig. 3.13 (**a**) Unilateral spreader graft for left cartilaginous side wall support. Additional techniques applied: (**b**) left LLC transection, (**c**) overlapping 5–6 mm (our lateral sliding technique), (**d**) performed bilaterally, resulting in tip rotation. Thirty-one-year-old patient from Case 1: (**e**) frontal view showing septal deviation, left side wall impression, and LLC concavity. (**f**) Result 6 months after unilateral spreader graft on the left side. Additional procedures: septoplasty, turbinate reduction (*see* Fig. 3.12), LLC infolding, spreader flaps. Left profile view (**g**) preoperatively and (**h**) postoperatively. Base view (**i**) preoperatively and (**j**) postoperatively

3

Fig. 3.13 (continued)

Fig. 3.13 (continued)

3.3.2 Case 2: Spreader Grafts

A 45-year-old female presented with nasal airway obstruction and a post-traumatic nasal deformity resulting from a horseback riding accident. Physical examination revealed a widened nasal pyramid with depression of the middle vault and nasal tip, foreshortening of the septum, and deviation of the nose to the right (◘ Fig. 3.14). The turbinates were also hypertrophic, and scarring of the nasal sill was observed. Septal reconstruction, spreader graft placement, and increased tip projection were performed to enlarge the internal nasal valves.

▪ Surgical Steps

1. Harvesting of bilateral conchal cartilage.
2. Septoplasty and removal of a scarred mass of deviated cartilage. Insufficient cartilage was available for total extracorporeal septoplasty.
3. Replacement of the caudal septum with a double-layered conchal cartilage graft. Fixation of the graft via nasal spine drill hole and three-point suture placement.
4. Saddle-nose reconstruction with extended (bilateral) conchal spreader grafts to buttress the caudal septal replacement graft. Grafts were also positioned above the dorsal line to restore middle vault projection.
5. Submucous resection of the inferior turbinate bone.
6. Parasagittal medial osteotomies with bone excision to enlarge the osteotomy line.
7. Percutaneous transverse osteotomies and high-low-low lateral osteotomies.
8. Supratip conchal onlay graft placement and three layers of allogenic fascia lata onlay graft to offset the increase in tip projection.
9. Transdomal and interdomal sutures.
10. Lateral crural steal procedure for tip rotation and increasing projection.
11. Right nostril sill scar revision.

Postoperatively satisfactory nasal function was achieved, but visibility of the spreader grafts within the nasal vestibule tainted the cosmetic outcome. However, the patient declined minor revision surgery.

Fig. 3.14 (**a**) Patient from Case 2, many years before her nasal trauma. (**b**) Post-traumatic deformity immediately before and (**c**) after delayed septal reconstruction, spreader grafts, and tip correction. Left profile (**d**) preoperatively and (**e**) postoperatively. Base view (**f**) preoperatively and (**g**) postoperatively

Fig. 3.14 (continued)

3.3.3 Case 3: Spreader Flaps

A 45-year-old female with an overprojected dorsum and a bulbous/ptotic nasal tip presented with nasal obstruction and dynamic nasal valve collapse (◘ Fig. 3.15; same patient as in ◘ Fig. 3.1). Examination revealed a tension-nose deformity with hypertrophic inferior turbinates. Rhinomanometry before and after topical decongestion revealed a symmetrical *reduction* of nasal airflow (over baseline) after topical decongestion. This paradoxical finding was most likely a measurement artifact resulting from inconsistent mask placement or poor mask fit causing constriction of the nasal valves. Additionally, we have occasionally observed increased dynamic valve collapse following decongestion caused by reduced support of the lower nasal side wall from a shrunken turbinate. However, based upon strongly positive results of the alar support test conducted in this patient (► *see* Fig. 3.1d), surgical reinforcement of the lower nasal side wall and enlargement of the internal valve were performed. The limitations of conflicting treatment objectives of an aesthetically smaller nose with functionally enlarged nasal passages were first discussed with the patient prior to informed consent. The patient agreed to conservative dorsal height reduction in order to preserve the internal valve cross-sectional area.

■ Surgical Steps

1. Turbinate bone resection was deferred because of unusually thin bone. Out-fracture of the inferior turbinate bone and conservative bipolar cauterization of the inferior turbinate mucosa were performed to reduce turbinate size.
2. Resection of a large vomerine spur.
3. Conservative cephalic trim and lateral crural sliding (a lateral crural overlay technique) to stabilize the lateral crura and improve tip rotation.
4. Lateral crural strut graft placement with suture fixation to correct recurvature.
5. Hump reduction with chisel and rasp.
6. Percutaneous transverse osteotomies and high-low-low lateral osteotomies for preservation of the lower piriform aperture.
7. Bilateral spreader flaps for middle vault reconstruction and increased valve width.
8. Tongue-in-groove setback for increased tip rotation.
9. Nasal tip suspension suture between the caudal septum and the medial crura.
10. Lateral crural spanning sutures for supratip refinement.
11. Allogenic fascia for dorsal smoothing.

Postoperative follow-up revealed a satisfactory functional improvement and a very satisfied patient. The patient was also pleased with the tip stabilization on robust smiling.

Fig. 3.15 Patient in Case 3 (**a**) before and (**b**) after reduction rhinoplasty with spreader flaps. (**c**) Profile, and (**d**) plan for reduction. (**e**) Postoperative result at rest and (**f**) at animation. The stability of tip projection with the tongue-in-groove technique was accepted or appreciated by most of the patients after informed consent. Base view (**g**) preoperatively and (**h**) postoperatively

Fig. 3.15 (continued)

3.3.4 Case 4: Spreader Flaps

A 38-year-old male presented with nasal obstruction. Although he denied prior nasal trauma, the patient reported progressive nasal airway dysfunction during adulthood and desired both functional and cosmetic enhancement. Physical examination revealed an oversized tension nose with bony vault deviation (Fig. 3.16). Endonasal examination revealed obstruction of the left internal nasal valve from a hinge-like septal deviation. Examination of the right nasal cavity revealed a severe septal concavity of the posterior septum. Rhinomanometry at 150 Pa: R 248 mL/s, L 16 mL/s indicated nearly no airflow on the left side. The preoperative treatment plan included septoplasty (most likely extracorporeal), dorsal reduction as permitted by functional limitations, spreader grafts, and osteotomies.

Surgical Steps

1. Endonasal septoplasty with central submucous resection and right-sided cartilage scoring (near transsection).
2. Reinforcement of the L-strut with an ethmoid bone graft applied to the caudal septum and a left-sided spreader graft applied to the dorsal septum. The perpendicular ethmoid graft was created by first thinning the graft with a power drill and then placing multiple drill holes to permit suture fixation.
3. Resection of the deviated maxillary crest and vomerine spur.
4. Submucous turbinate cauterization with out-fracture.
5. Scissors resection of the cartilaginous hump after release of the ULCs.
6. Bony hump reduction with chisel and rasp.
7. Medial (parasagittal), transverse, and low to-low lateral osteotomies.
8. Bilateral spreader flaps for middle vault reconstruction and additional valve support.
9. LLC cephalic resection and asymmetrical lateral sliding (LLC overlap technique) for increased tip rotation and improved symmetry.
10. Intradomal and interdomal tip sutures.
11. Lateral crural spanning sutures.
12. Tongue-in-groove setback.
13. Dorsal camouflage with allogenic fascia.

Result

At 15-month follow-up, the patient was pleased with the cosmetic result but complained of right-sided nasal obstruction. Examination revealed septal deviation into the right internal valve. The most likely explanation was excessive scoring of the septum outside the area of surgical splinting. Focal resection of the septum beneath the L-strut eliminated the airway obstruction.

Fig. 3.16 Patient in Case 4, frontal view (**a**) preoperatively and (**b**) postoperatively. Profile view (**c**) preoperatively and (**d**) postoperatively. Base view (**e**) preoperatively and (**f**) postoperatively

3

Fig. 3.16 (continued)

3.3.5 Case 5: Functional Correction of Complex Alar Deformities

A 47-year-old female presented with nasal airway obstruction. Physical examination revealed a twisted and collapsed nasal base with dynamic nasal valve collapse (Fig. 3.17). The lateral crus revealed asymmetrical concavities with pinching of the lobule. The columella was twisted and displaced to the right, while caudal deviation of the septum resulted in displacement of the left crural footpod into the adjacent nasal vestibule. Surgical treatment required repositioning of the columella and widening of the collapsed lower nasal side walls. Functional objectives were prioritized over cosmetic goals.

Surgical Steps

1. Septal graft harvest.
2. Columellar strut for increased central tip support.
3. LLC cephalic trim.
4. Vertical dome division.
5. Sliding advancement of the lateral crus overlapping the dome by approximately 8 mm. This serves to tighten and suspend the collapsed lateral crus and to stabilize the tip tripod by creating symmetrical opposing tensions between the right and left lateral crura.
6. Onlay batten grafting of the lateral crus using the previously excised cephalic margin for contour refinement, improving symmetry, and additional LLC reinforcement.
7. Hump reduction.
8. Spreader grafts.

Postoperatively the functional and cosmetic results were excellent (► *see* Fig. 3.10f). However, we have since modified our surgical technique to include Gruber-type horizontal mattress sutures to enhance flattening and stabilization of the lateral crus.

3

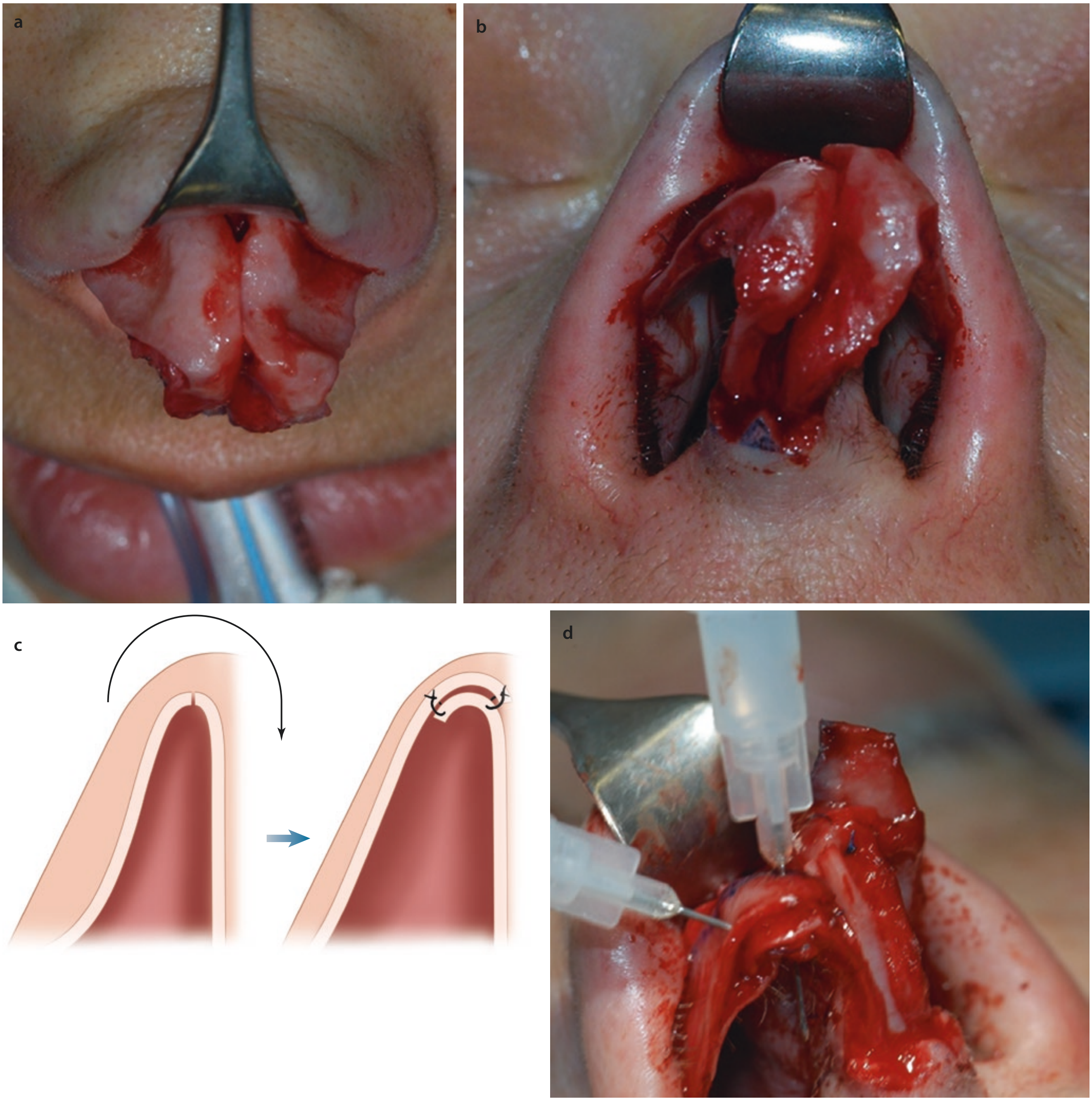

Fig. 3.17 Patient in Case 5 with severe alar deformities. (**a**) Frontal view and (**b**) base view. (**c**) Concept of dome reconstruction by overlapping the intermediate crus by the lateral crus, simultaneously improving tension, opening the dome, and deprojecting the tip. (**d**) Sliding the lateral crus over the dome to overlap the intermediate crus, thus creating a wide stable and rigid dome and contributing to the lateral crural concavity correction. (**e**) Dome overlap finished with permanent sutures. (**f**) Trimmed LLCs before and (**g**) after placement of additional batten grafts in cephalic portions correcting the concavity and strengthening the lateral crura. (**h**) Same patient's frontal view before and (**i**) after surgery. Profile view (**j**) preoperatively and (**k**) postoperatively. Base view, complex tip and alar deformity. (**l**) Preoperative view at rest, and (**m**) under forced inspiration. (**n**) Postoperative result

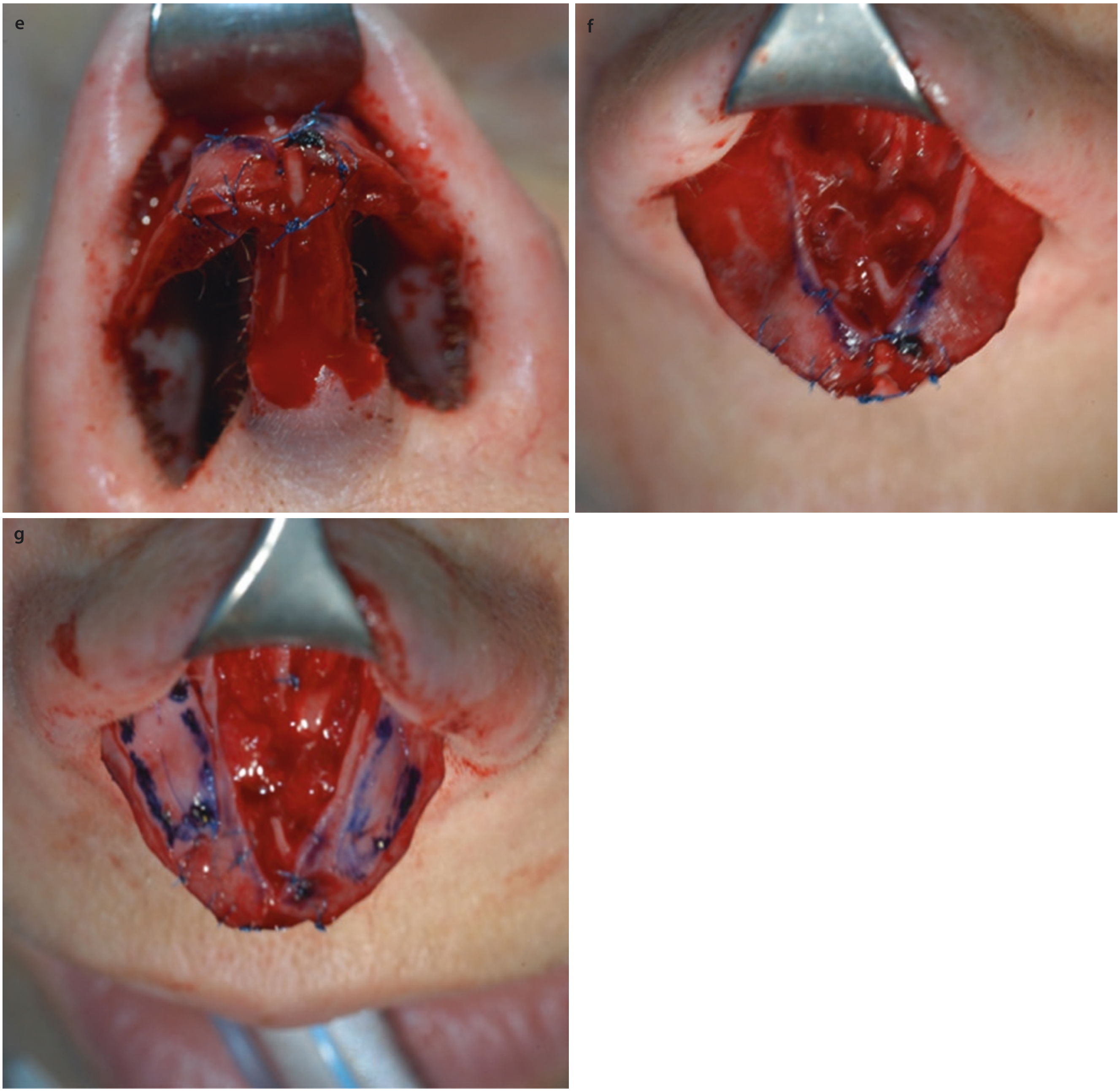

Fig. 3.17 (continued)

Fig. 3.17 (continued)

Fig. 3.17 (continued)

3.3.6 Case 6: Functional Correction of Severe Deviation of the Anterior Nasal Spine (ANS)

A 16-year-old female presented with complete left-sided nasal obstruction, a dorsal hump, and deviation of the bony pyramid to the left side following childhood trauma (▣ Fig. 3.18). Examination revealed total blockage of the left nasal passage caused by a hinge-like deviation of the anterior septum. Right inferior turbinate hypertrophy was also observed. Palpation of the anterior nasal spine revealed deviation to the left of the sagittal midline. The Cottle maneuver normalized left-sided nasal breathing, indicating the absence of further anatomic obstruction in the left nasal cavum. Rhinomanometry at 150 Pa: right 184 mL/s, left 24 mL/s according to complete left-sided obstruction. Normal values would be 300 mL/s.

Surgery to straighten the nose was recommended, and restoring a midline caudal septum/nasal spine relationship was anticipated.

■ Surgical Steps

1. Hump reduction including radix deprojection.
2. Extracorporeal septal reconstruction in which the lower septal border becomes the new dorsal septum.
3. Spreader grafts are affixed to the septal construct prior to reimplantation. The keystone area is reconstituted with bilateral suture fixation of the reimplanted septum using drill holes in the distal edge of the nasal bones.
4. Submucous resection of the inferior turbinates (greater on the right side).
5. Repositioning of the malpositioned nasal spine after osteotomy with a 5-mm flat chisel. The repositioned spine was then stabilized in the midline using a four-hole microplate and microscrew fixation.
6. Low-low lateral and transverse osteotomies. Medial osteotomies were obviated by the large open roof created by extended hump reduction.
7. Domal and interdomal sutures for tip refinement.
8. Tongue-in-groove setback with soft-tissue debulking for narrowing of the columellar pedestal.

Postoperative follow-up revealed midline sagittal realignment of the nose, including the columella and columellar pedestal. Marked functional improvement was also achieved.

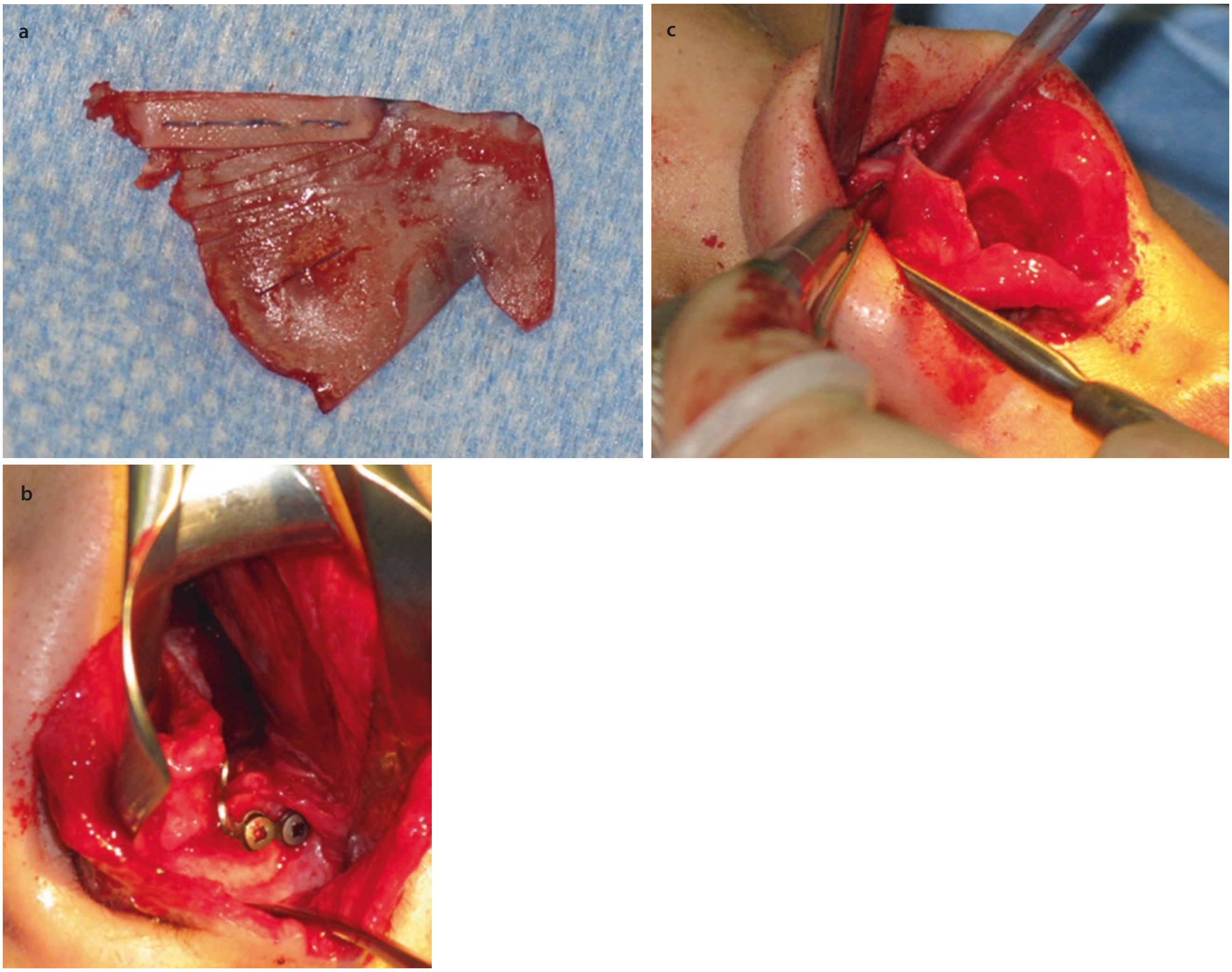

Fig. 3.18 Case 6, intraoperative photographs. (**a**) The straightened septum with spreader grafts is already sutured, ready for replantation. (**b**) Anterior nasal spine (ANS) repositioned in the midline and fixed by a microplate, two screws in the bony floor of the nose, and one screw in the ANS. (**c**) Drilling a hole into the tip of the right nasal bone for reliably anchoring the septum in the keystone area. Frontal view (**d**) preoperatively and (**e**) postoperatively. Left profile (**f**) preoperatively and (**g**) postoperatively. Base view (**h**) preoperatively and (**i**) postoperatively

■ **Fig. 3.18** (continued)

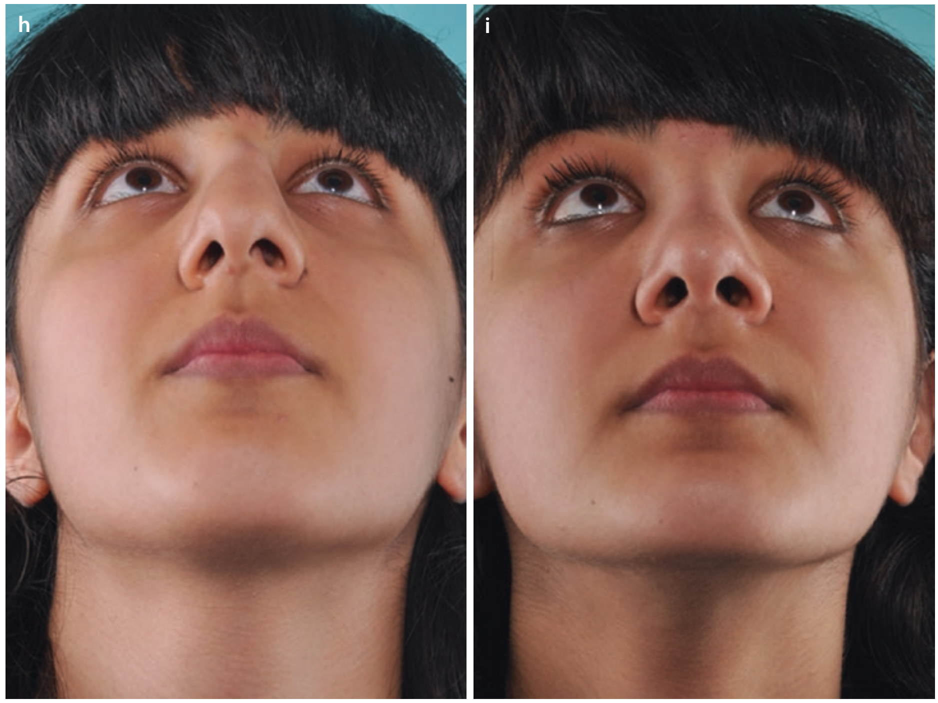

Fig. 3.18 (continued)

3.3.7 Case 7: Balancing Airway Cross Section and Nasal Aesthetics

A 25-year-old male complaining of right-sided nasal obstruction and an overly broad nasal tip was seen (Fig. 3.19). Examination revealed a wide nasal tip, an underprojected nasal dorsum, and a depressed right nasal bone. Endonasal examination revealed septal deviation to the right side and compensatory hypertrophy of the left inferior turbinate. Rhinomanometry confirmed right-sided airway dysfunction. Treatment recommendations included out-fracture of the right nasal bone, extracorporeal septal reconstruction with application of spreader grafts, and dorsal augmentation to improve profile aesthetics and to maintain a slender-appearing dorsum.

Surgical Steps

1. Extracorporeal septal reconstruction with resection of bony septal spurs. Spreader graft placement. Creation of a drill channel in the midnasal spine using a Lindemann crosscut burr to facilitate midline suture fixation of the reimplanted caudal septum. Reimplantation of the septal construct in a more caudal position to allow fixation of the medial crura.
2. SMR of the left inferior turbinate to compensate for midline septal repositioning.
3. Osteotomies for sagittal realignment of the bony pyramid.
4. Suture fixation of the neoseptal/spreader graft construct to the ULCs.
5. Dorsal augmentation using a diced (left) conchal cartilage-(allogenic) fascia graft.
6. Cephalic trim (very strong cartilage, no fold-under flaps).
7. Intradomal and interdomal tip sutures.
8. Tip suspension suture between the dorsal septum and the infratip.
9. Tongue-in-groove fixation of the medial crural footpods with transfixion mattress sutures.

Two years follow-up revealed elimination of nasal airway obstruction and a favorable cosmetic outcome. Mild supratip fullness was acceptable to the patient.

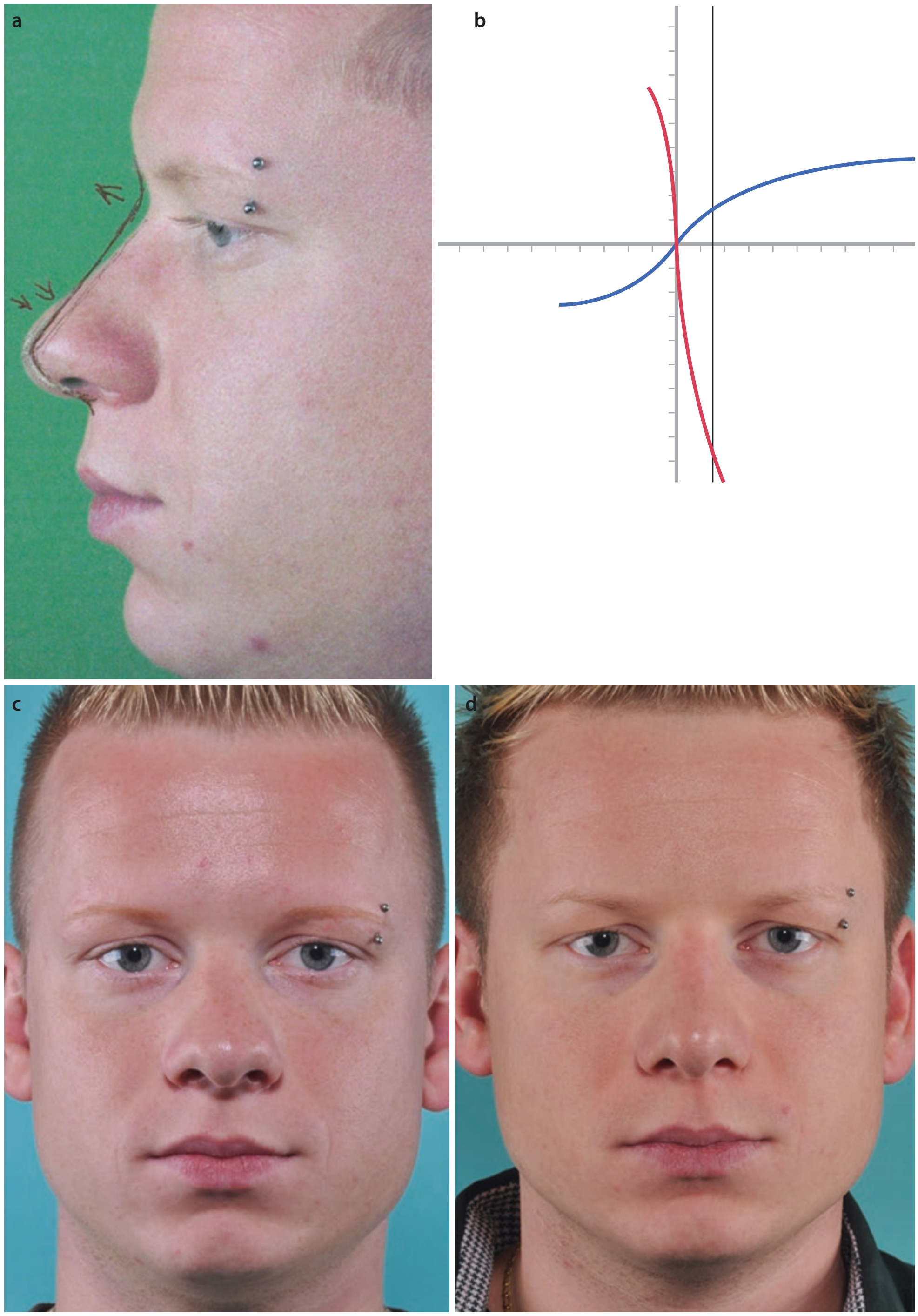

Fig. 3.19 Patient in Case 7. (**a**) Planning only mild tip/supratip deprojection and augmentation of the cephalic profile to avoid reduction of the inner valve and further airway cross-sectional area and to improve aesthetics. (**b**) Rhinomanometry shows a right-sided curve turning horizontally with increasing pressure displaying severe breathing reduction according to the right sides' anterior septal deviation. The left airway was open despite an existing compensatory lower turbinate hypertrophy. Frontal view (**c**) preoperatively and (**d**) postoperatively. Left profile view (**e**) preoperatively and (**f**) postoperatively. Base view (**g**) preoperatively and (**h**) postoperatively

■ **Fig. 3.19** (continued)

Suggested Reading

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Functional Aspects in Secondary Rhinoplasty

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W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_4

Flexibility of the lower nasal framework permits both temporary changes in nasal shape and a reliable return to normal resting contour once the forces of deformation are withdrawn. This skeletal "memory" is fundamental to normal nasal physiology. Partial collapse of the nasal valve on deep inspiration—a phenomenon seen in all healthy noses—converts the normally (resting) laminar airflow into a more turbulent flow for better mixing of the inspired air with the highly vascular nasal mucosa during periods of increased ventilatory demand. In turn, the increased mucosal contact results in more effective filtration, humidification, and warming of the inspired air. Variations in mucosal congestion, coupled with variations in dilator muscle activity, function to further regulate the balance between the rate of airflow and the efficiency of air purification. However, this delicate equilibrium is often inadvertently disrupted by cosmetic nasal surgery. In many instances the newly reshaped and often smaller nose functions adequately at first, only to slowly deteriorate as the forces of healing begin to progressively distort the surgically weakened skeletal framework. Although symptoms of nasal obstruction may be present throughout the day, symptoms are most severe during sleep when the nose naturally congests owing to supine posture and reduced activity levels. The result is often severe nocturnal nasal dysfunction, typically manifested by obligate nocturnal mouth breathing, consistently dry throat, excessive thirst, and frequent sleep disruption.

4.1 Diminished Side Wall Support

Without question, the recoil and structural "memory" of a well-functioning nose may be compromised as a consequence of cosmetic nasal surgery. Perhaps the most common cause of nasal dysfunction is the cephalic trim procedure in which a large (cephalic) segment of the lateral crus—including the nasal scroll—is surgically resected for cosmetic enhancement of the tip and supratip. Because the nasal scroll is an anatomically reinforced junction between the upper later cartilages (ULC) and the lower later cartilages (LLC), it adds strength to the lower nasal side wall and helps to resist premature collapse of the nasal valve. Overaggressive resection of the cephalic margin, including the nasal scroll, can lead to concave (medial) collapse of the lower nasal side wall, resulting in devastating valvular dysfunction that often worsens with time. Batten grafts are intended to eliminate sagging of the lateral crus and to reinforce the weakened nasal side wall against premature inspiratory collapse. However, batten grafts, especially thicker grafts fashioned from the ear or rib cartilage, often greatly increase the thickness and mass of the lower nasal side wall, producing inadvertent impingement of the internal valve and increased susceptibility to premature inspiratory collapse, particularly when the graft fails to provide a bridging effect between the tip and piriform aperture. Although thin and lightweight alloplastic materials have been used in an attempt to circumvent these problems, we have encountered numerous complications stemming from the use of synthetic materials such as high-density porous polyethylene (HDPP). Scarring and inflammation resulting from foreign-body reactions serve only to add difficulty to already challenging revision cases.

Finally, the intricate yet delicate nasal airway is also easily prone to dysfunction with aggressive nasal hump reduction. Excessive narrowing of the bony piriform aperture and/or cartilaginous side walls can be cosmetically desirable but functionally so severe that even spreader grafts cannot offset the loss of airway size. Revision patients who have experienced this type of iatrogenic nasal airway dysfunction are often far more willing to accept a somewhat larger nose in exchange for a properly functioning nasal airway, but circumspect primary hump reduction is always preferable.

4.2 Surgical Principles

Techniques for surgical revision of the functionally impaired nose are often similar to the preventive techniques used in primary cosmetic rhinoplasty. These include spreader grafts and/or suture techniques for increased valve patency, batten or lateral crural extension grafts for increased support at the piriform aperture, domal reconstruction to widen pinched domes, and septal reconstruction for residual deformities or inadequate anterior septal support. However, increasing the valvular cross-sectional area often includes not only increasing valvular width but also restoring lost septal height. Enlarging the entire L-strut when necessary or using projecting spreader grafts above the existing dorsal (septal) line improves valvular patency far more effectively than dorsal onlay grafting alone. And while septal cartilage graft material may be preferable for airway reconstruction, prior depletion of surplus quadrangular cartilage may necessitate alternative sources of cartilage such as conchal or rib cartilage. Additionally, secondary enlargement of the nasal valve may be limited by fibrosis and contracture of the internal lining. In severe cases in which release and unfurling of the internal lining is not possible, insertion of a composite (auricular chondrocutaneous) graft is necessary to restore valvular patency. Alternatively, a free buccal mucosal graft can be used when the overlying framework is sufficiently stable, but prolonged postoperative graft stenting (for approximately 6 months until the risk of contracture has subsided), followed by delayed skeletal reconstruction, is required when structural stability is lacking. In rare cases, musculocutaneous island flaps can also be tunneled through the alar base to repair cicatricial stenosis of the nasal vestibule.

4.3 Case Studies

4.3.1 Case 1: Spreader Grafts and Extended Alar Batten Grafts

A healthy young female presented after prior rhinoplasty with a complaint of severe nasal airway dysfunction. Physical examination revealed a severe saddle-nose concavity with overly deep supra-alar grooves (Fig. 4.1). Palpation revealed ultrashort nasal bones with an open roof deformity in which the central ethmoid complex projected above the overresected nasal bones. Endonasal examination revealed bilateral internal valve collapse, more on the left side, and mild nasal inspiration produced total dynamic valve collapse. Previous reduction of the inferior turbinates was also noted.

Rhinomanometry (150 Pa): R 16 mL/s, L 34 mL/s after decongestion showed R 19 mL/s, L 50 mL/s. This is interpreted as near total obstruction.

Several causes for nasal airway dysfunction must be considered for this patient: (1) overresection of the lateral crura with flaccid concave collapse as the primary cause of internal valve dysfunction and (2) overresection of the nasal dorsum with saddle-nose collapse of the middle vault (disrupting the tent-like side wall stability). Surgery was recommended to reconstruct the LLCs, internal valves, and cartilaginous vault, to increase tip projection, and to augment and conceal the nasal dorsum.

Surgical Steps

1. Extracorporeal septal reconstruction with application of cephalically extended spreader grafts.
2. Reimplantation and suture fixation of construct via nasal bone drill holes.
3. Bilateral conchal cartilage harvest.
4. Harvest of right tragal cartilage.
5. Partial alar batten grafts for increased side wall support at piriform aperture.
6. Tip-plasty with vertical dome division and suture reapproximation.
7. Shield graft placement.
8. Harvest of temporalis fascia.
9. Dorsal augmentation with DC-F onlay graft.

Nasal breathing was fully restored, and the patient was pleased despite a modest increase in outer nasal dimensions.

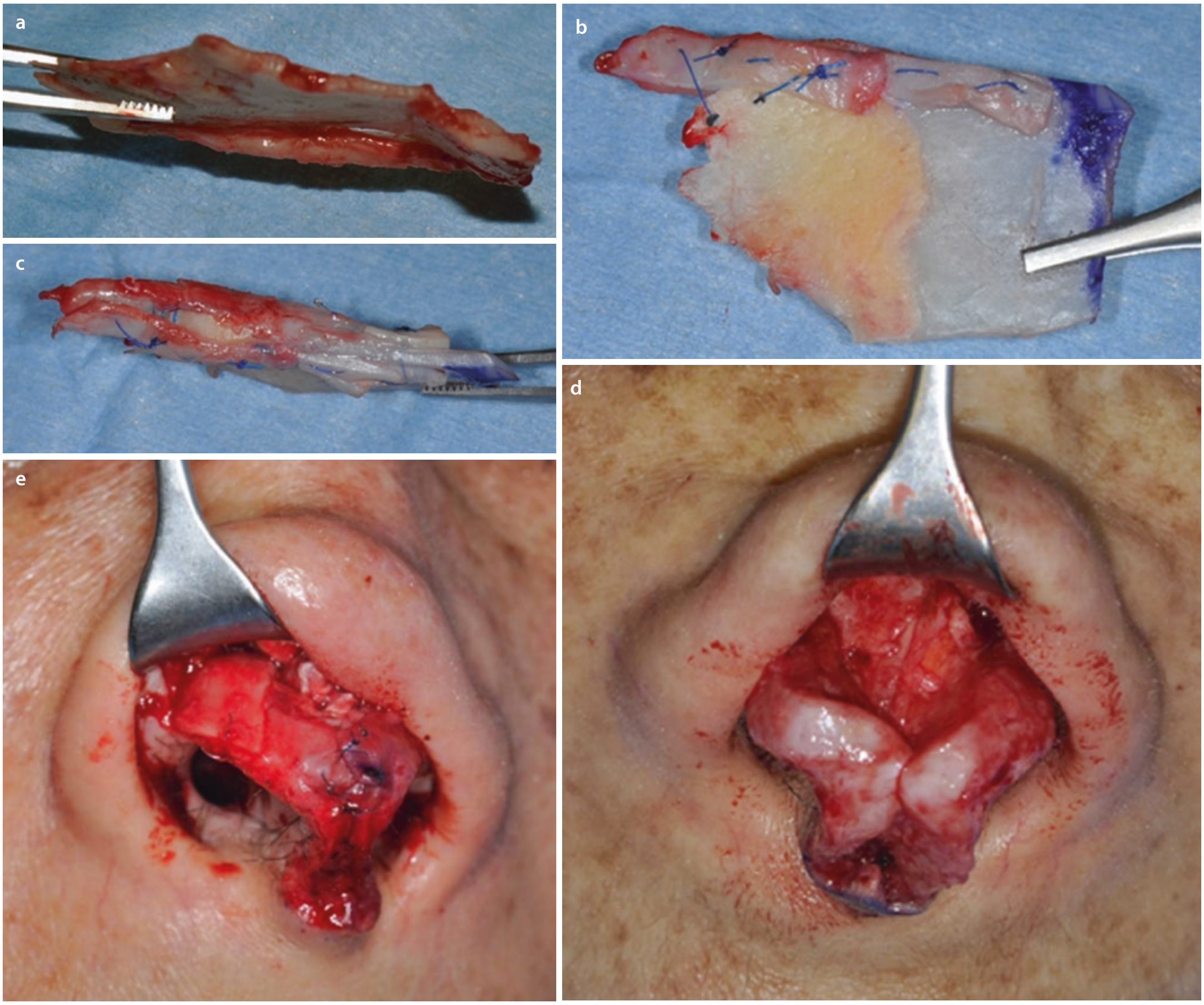

Fig. 4.1 (**a**) Resected septal specimen with maximal anterior deviation corresponding to area of the left internal valve. (**b**) Profile view of the neoseptal construct with cephalically extended spreader grafts prior to reimplantation. Extended spreader grafts (needed to fill the open roof) sutured via multiple drill holes placed within the bony septum. (**c**) Dorsal view of the neoseptal construct. Drill holes placed in the nasal bones facilitate suture fixation of the construct at the keystone area. (**d**) Twisted alar cartilage framework and overresected lateral crura. (**e**) The axis was corrected by vertical dome division and suture reapproximation. A lateral crural strut graft was already fixated in its position. (**f**) Positioning of lateral crural strut grafts for increased support at the piriform aperture. Outline of desired graft position overlying the alar groove. (**g**) Fixated graft sutured to the left lateral crus. (**h**) Diced cartilage wrapped in allogenic fasciae used for dorsal augmentation (seen beneath the Aufricht retractor). (**i**) Frontal view demonstrating alar groove depressions and dorsal deficiency before and (**j**) result 6 months after revision rhinoplasty. (**k**) Preoperative profile view, (**l**) postoperative profile view. Base view (**m**) preoperatively; (**n**) closer base view demonstrating severe internal valve collapse; (**o**) postoperatively

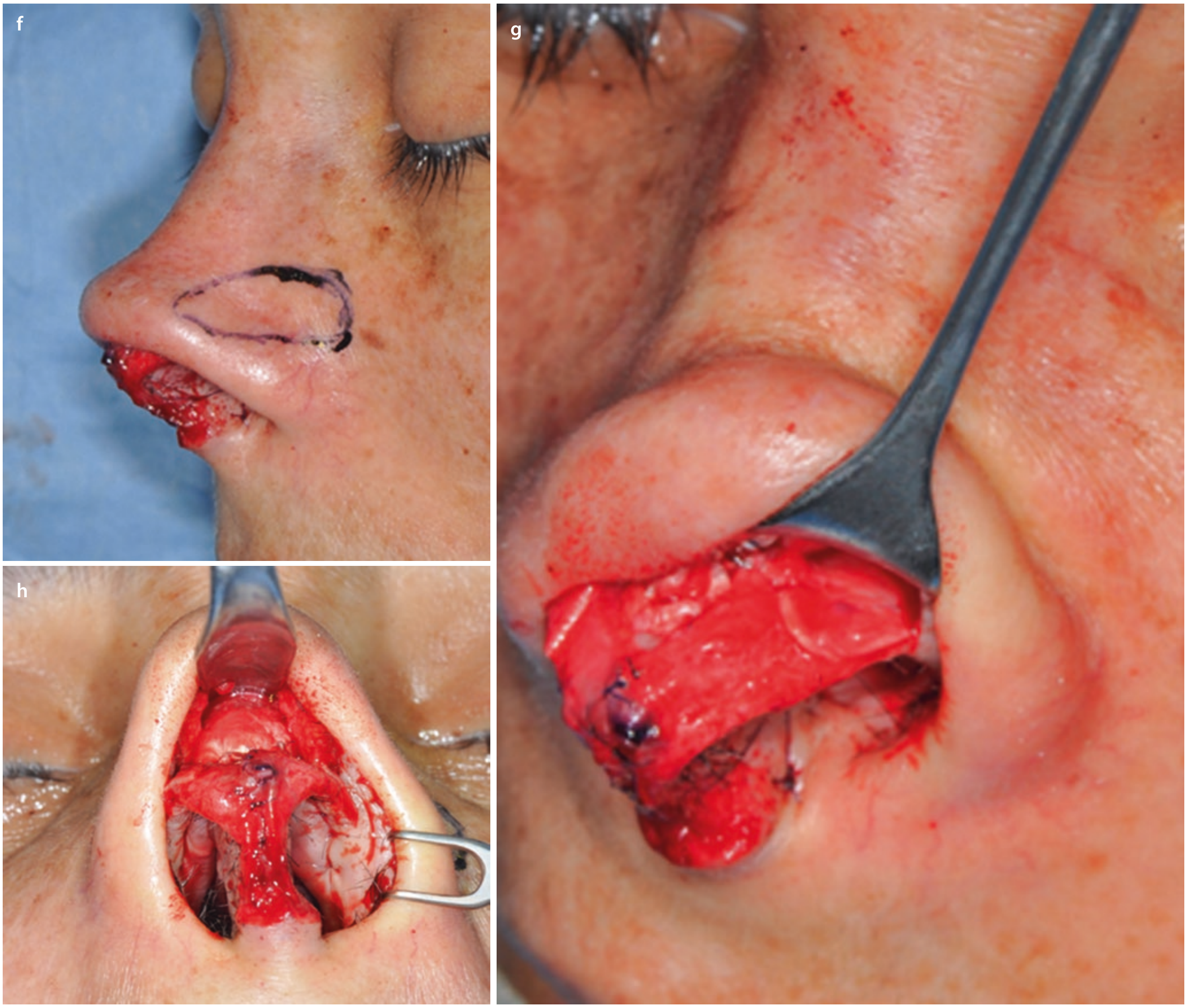

Fig. 4.1 (continued)

Fig. 4.1 (continued)

Fig. 4.1 (continued)

4.3.2 Case 2: Spreader Grafts and Alar Batten Grafts

An 18-year-old female was seen after previous reduction rhinoplasty with complaints of postsurgical nasal airway obstruction and overprojection of the nasal tip and nasal root. Physical examination revealed pinched internal nasal valves and severe recurvature of the LLCs. LLC overresection was suspected. Revision surgery to widen and augment the middle vault was recommended rather than deprojecting the tip and nasal root. In this manner, a wider middle vault would help address the functional deficits, while a taller middle vault would avoid the visual impression of a significantly wider nose. Restructuring of the LLCs to eliminate concavity was also planned (Fig. 4.2).

Surgical Steps

1. Harvest of septal cartilage.
2. Spreader graft placement.
3. Middle vault suspension by reattaching ULCs to the uppermost dorsal septum in near horizontal orientation.
4. Intradomal and interdomal suture placement.
5. Vertical infolding of the cephalic LLC, longitudinal scoring, and spanning suture placement.
6. Bilateral batten graft placement.
7. Dorsal augmentation with allogenic fascia grafts.

Ultimately the patient accepted the profile augmentation in exchange for much better breathing.

Fig. 4.2 (**a**) *Left*, profile prior to revision surgery; center, patient's (initial) desired profile; and *right*, the recommended profile. (**b**) Right prerevision endonasal view and (**c**) left prerevision endonasal view. (**d**) Intraoperative view of spreader graft and suture reattachment of ULCs and (**e**) schematic view of spreader grafts and suture reattachment of ULCs. (**f**) Rectangular infolding of the cephalic rim in L shape for improved rigidity against collapse and (**g**) simultaneous supratip narrowing effect by flaring sutures. (**h**) Septal cartilage batten grafts; (**i**) grafts sutured on top of the LLCs. (**j**) Prerevision frontal view and (**k**) postrevision frontal view with improved airway function. (**l**) Prerevision profile view and (**m**) postrevision profile view with improved airway function. (**n**) Prerevision base view and (**o**) postrevision base view with improved airway function


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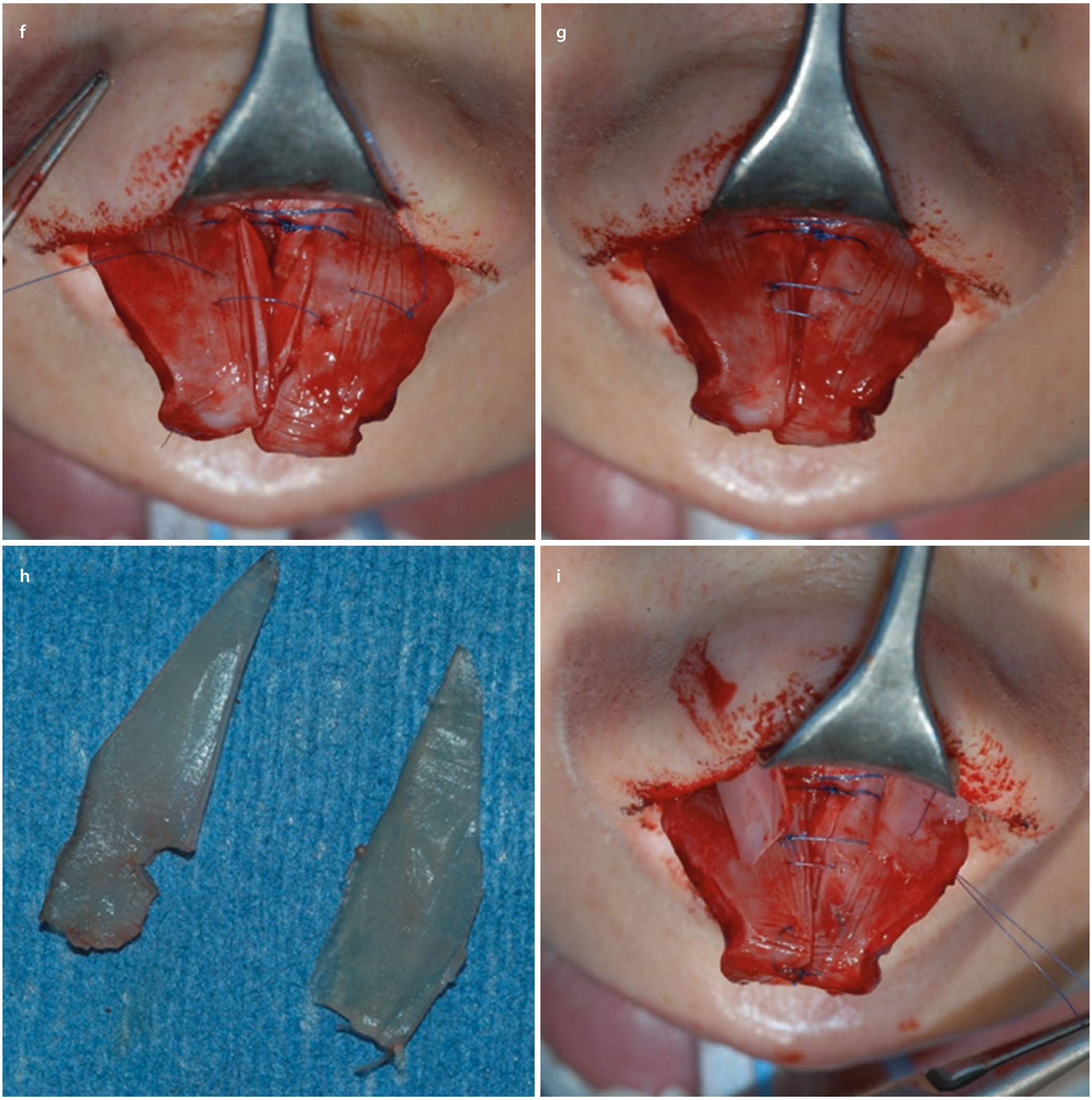

Fig. 4.2 (continued)

Fig. 4.2 (continued)

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Fig. 4.2 (continued)

4.3.3 Case 3: Bony Out-Fracture and Spreader Grafts

A 44-year-old male hemophiliac (Fig. 4.3) with a history of multiple prior nasal surgeries, including septorhinoplasty, presented complaining of worsening nasal airway obstruction and frequent sinus headaches. Recurrent frontal sinusitis with multiple courses of antibiotic therapy led to the development of pseudomembranous colitis, making the patient extremely apprehensive about further treatment. His anxiety was heightened by the refusal of other surgeons to reoperate. Physical examination revealed an exceedingly narrow bony nasal vault with greater narrowing on the right. Endoscopic examination confirmed an ultranarrow bony vault. A surgically widened bony nasal vault was recommended to improve nasal airway obstruction and frontal sinus aeration. The patient was advised about the high probability of treatment failure. Increased tip projection and dorsal augmentation were also recommended to minimize the visual appearance of excessive nasal width and to create a balanced nasal contour.

Surgical Steps

1. Harvest of left conchal and tragal cartilages.
2. Parasagittal median, transverse, and low-low lateral osteotomies to open both the bony base and roof.
3. Extended butterfly-type spreader graft placement to maintain widening of the bony vault.
4. Septal extension graft placement to enable tongue-in-groove tip support.
5. Excision of scarred soft tissues from the supratip area.
6. Placement of diced cartilage wrapped in allogenic fascia to the nasal dorsum for additional augmentation.

The postoperative course was uneventful. Epistaxis was avoided with a combination of clotting factor replacement and application of inflatable nasal packs with hemostatic coating. At long-term follow-up, the patient reported a marked improvement in nasal airflow, a substantial reduction in sinus infections, and far less anxiety regarding his nose.

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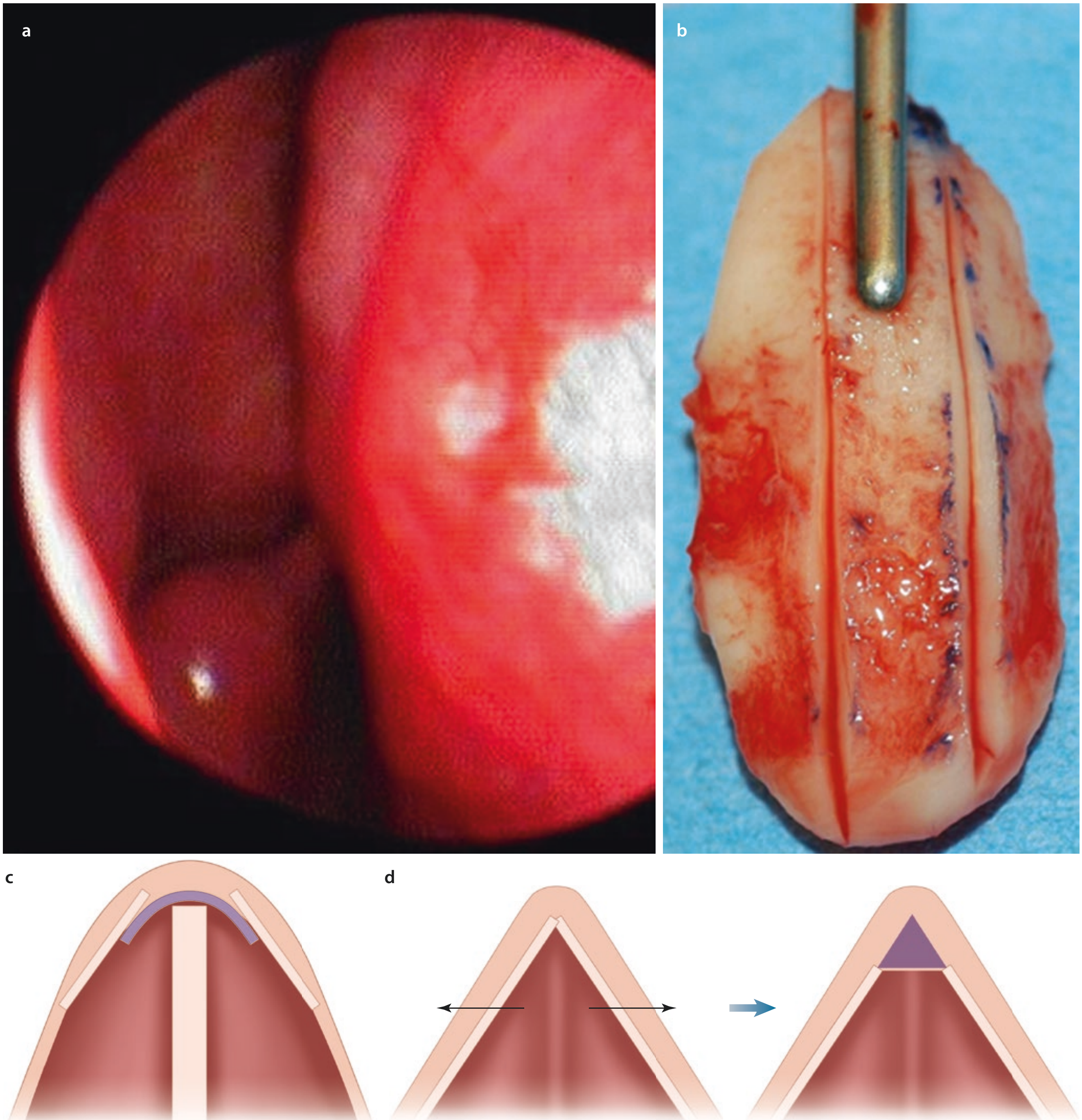

Fig. 4.3 (**a**) Narrow upper airway on endoscopic view, (**b**) butterfly-type spreader graft, and (**c**) schematic showing graft placement beneath the dorsal side walls. (**d**) Schematic representation of bony out-fracture for airway enhancement followed by dorsal augmentation to maintain a slender frontal contour. (**e**) Prevision frontal view demonstrating an asymmetrical and pinched bony and middle nasal vault and (**f**) postrevision frontal view. (**g**) Prerevision profile view and (**h**) postrevision profile view. (**i**) Prerevision base view and (**j**) postrevision base view

Fig. 4.3 (continued)

Fig. 4.3 (continued)

4.3.4 Case 4: Bony Out-Fracture

A 20-year-old male with a history of blunt nasal trauma at age 13 presented for primary rhinoplasty consultation. External examination (Fig. 4.4a) suggested a probable prior septal hematoma with loss of septal projection, but the endonasal examination showed only an intact quadrangular septum with a high leftward deviation and a minor deviation at the inferior aspect of the caudal septum. The left nasal bone was depressed, but rhinomanometry was normal. Ultimately the patient disagreed with the diagnostic assessment and was treated elsewhere.

Four months after initial presentation, the patient returned complaining of an unsatisfactory rhinoplasty outcome and development of severe breathing impairment. Examination revealed an overresected and pinched bony vault with persistent depression of the left nasal bone (Fig. 4.4b). A polly-beak profile deformity was also observed, and the endonasal examination revealed narrow internal nasal valves and narrow nasal cavities. Spreader graft simulation using a small glass spatula to widen the upper nasal valve resulted in significant breathing improvement, thereby convincing the patient to undergo widening of the lower nasal side walls. Repeat rhinomanometry showed (150 Pa): R 80 mL/s, L 416 mL/s.

Revision surgery was delayed until 1 year following primary rhinoplasty. Treatment recommendations included widening the cartilaginous and bony vaults with bony out-fracture if necessary and dorsal profile realignment by lowering the anterior septal polly-beak and augmenting the remaining dorsum.

Surgical Steps

1. Harvest of left conchal and tragal cartilages.
2. Resection of subcutaneous supratip scar tissue and out-fracture of both nasal bones.
3. Septal extension graft placement using a reciprocally curved graft to straighten the caudal septum.
4. Reduction of the left inferior turbinate head.
5. Tongue-in-groove fixation of the medial crura to the septal extension graft using transfixion sutures.
6. Dorsal augmentation with diced cartilage wrapped in allogenic fascia lata.

Postoperatively the patient reported normal nasal breathing. Examination revealed improved dorsal and frontal nasal contours.

4

Fig. 4.4 (**a**) Frontal view at the time of first consultation prior to rhinoplasty performed elsewhere: (**b**) prerevision frontal view and (**c**) postrevision frontal view. (**d**) Left profile view at the time of first consultation prior to rhinoplasty performed elsewhere: (**e**) prerevision left profile view and (**f**) postrevision left profile view. (**g**) Base view at the time of first consultation prior to rhinoplasty performed elsewhere: (**h**) prerevision base view and (**i**) postrevision base view

4.3.5 Case 5: Underscoring the Importance of Septal Support to Nasal Valve Function

A 32-year-old female presented seeking revision surgery for nasal airway obstruction and a misshapen nose (Fig. 4.5). The patient reported childhood trauma followed by unsuccessful surgery at age 12 and again at age 23. Examination revealed an asymmetrical tip with a conspicuous supratip depression. A dorsal onlay graft with visible edges was also evident. Endonasal examination revealed absence of the caudal septum and a severe posterior septal deviation behind a large septal perforation. Deformed alar cartilages were also present.

Treatment recommendations included L-strut reconstruction to restore both dorsal and caudal septal projections, closure of the septal perforation, tip reconstruction, and augmentation and simultaneous smoothing of the dorsum. The importance of the valvular support by the septum is demonstrated by the case of this patient.

Surgical Steps

1. Harvest of left conchal and tragal cartilages bilaterally.
2. Removal of old septal cartilage (dorsal) onlay graft.
3. Septal perforation repair (via external rhinoplasty approach) using mucosal advancement flaps from the roof, side walls, surrounding septum, and nasal floor. Separation of the mucoperichondrial flaps facilitated by a sharpened metal suction-dissector. Interposition with a flattened conchal cartilage graft and everting sutures helped to prevent recurrence.
4. Submucous resection of the (bony) inferior turbinates to eliminate perforation-induced turbinate hypertrophy.
5. Septal extension graft placement using the recycled dorsal (septal) onlay graft. Drill hole graft fixation to the left side of the nasal spine and maxillary crest using a contralateral ethmoid splinting graft to prevent displacement.
6. Dorsal L-strut reconstruction using a double-layered conchal cartilage graft to bridge the keystone area to the upper septal extension graft.
7. Bony out-fracture after parasagittal medial osteotomies (with a small bony wedge resection on the left), transverse osteotomies, and low-low lateral osteotomies.
8. Cephalic margin fold-under flaps to correct LLC concavity and improve rigidity.
9. Revision of the vertical dome division with an LLC overlap technique (sliding technique in our nomenclature).
10. Tongue-in-groove fixation of the medial crura to the septal extension graft for improved tip support.
11. Dorsal augmentation with diced cartilage in allogenic fascia.
12. Shield graft placement using tragal cartilage for increased tip projection and counterrotation.
13. Onlay allogenic fascia graft to augment thin tip skin.

Postoperatively, the patient reported the best nasal function of her entire life. Aesthetically, the nose was also greatly improved except for a modest rightward tip deviation. Tip displacement most likely resulted from asymmetrical L-strut fixation at the nasal spine.

Fig. 4.5 Patient after trauma and two rhinoplasties. (**a**) Prerevision frontal view and (**b**) postrevision frontal view. (**c**) Prerevision profile view and (**d**) postrevision profile view. (**e**) Prerevision base view and (**f**) postrevision base view

4.3.6 Case 6: Bony Out-Fracture and Dorsal Narrowing

A 38-year-old female presented complaining of persistent nasal airway obstruction after previous rhinoplasty 3 years prior (Fig. 4.6). We had performed the initial surgery for hump reduction and airway improvement. For better breathing, we had corrected the septum, reduced the turbinates, and applied spreader flaps to open the very narrow airway in an overall very narrow nose. The patient stated a partially successful functional surgery but asked for further improvement and simultaneously complained of a wider nasal dorsum compared with her former appearance.

Examination revealed a persistent narrow base of the bony pyramid, while the bony and cartilaginous dorsum now appeared too wide. The tip was a little too pointed after the previous lateral steal tip plasty and the columella-labial angle still too obtuse although reduced.

Revision surgery was recommended to open the bony pyramid at the base by out-fracture and simultaneously narrow the nasal dorsum, improve the profile by changing the tip-dorsum relation, and reduce the lower columella show for a balance and attractive contour.

Surgical Steps

1. Reosteotomies transverse and lateral.
2. Opening the base of the bony pyramid (out-fracture).
3. Transosseus suture cerclage at the rhinion to close the bony roof.
4. Separation of the spreader flaps from the septum and adjustments with a bilateral scoring incision and U-shaped tightening sutures.
5. Application of small strips of donor fascia for camouflage to balance the profile (nasion, supratip, infratip).
6. Reduction of the membranous septum at the columella base to restrain the medial crura footplates improving the former tongue in groove maneuver.

For stabilizing the out-fracture maneuver, nasal sponge tamponades where left in place over 4 days.

Postoperatively, the patient enjoys good nasal airway function and very satisfactory cosmesis.

Fig. 4.6 One year after primary rhinoplasty the bony and cartilaginous dorsum appeared too wide while the sidewalls and piriform aperture appeared too narrow at the base, a major reason for residual breathing problems in the physical reexamination of the patient. The series of the patient's photos show the development towards the final result after revision rhinoplasty with outfracturing of the nasal bones at the bottom and closure of the open roof as well as narrowing of the former spreader flaps by secondary scoring and suture adaptation (**a**) initial frontal view, (**b**) frontal view after previous rhinoplasty, (**c**) postrevision frontal view, (**d**) initial profile view, (**e**) profile view after previous rhinoplasty, (**f**) postrevision profile view, (**g**) initial base view, (**h**) base view after previous rhinoplasty, (**i**) postrevision base view

Fig. 4.6 (continued)

4.3.7 Case 7: Spreader Grafts and Alar Batten Grafts

A 32-year-old patient (Fig. 4.7) had had four previous rhinoplasties, the last including porous polyethylene implants for alar stabilization. He suffered from continuous breathing impairment and was bothered by the nasal deformity. He had a very low bony dorsum, a parrot beak, a hidden columella, asymmetry of the nostrils, and septal deviation with a narrow inner valve on the right side. The alloplastic implants were found to be located too far cephalically, and the right alar wing had no structural support. The septum was empty of grafting material.

Rhinomanometry (results 150 Pa), right 92 mL/s, left 204 mL/s, displayed severe right-sided and mild left-sided nasal breathing impairment (without decongestion).

Revision septorhinoplasty was planned, including creation of a stabile L-frame, spreader grafts for opening the inner valves, replacement of the alloplastic alar implants by autologous grafts, and dorsal augmentation for a balanced profile and a narrow roof.

Surgical Steps

1. Rib cartilage harvest.
2. Deep temporal fascia harvest.
3. Removal of one single complex porous polyethylene implant bridging alae and tip from one side to the other, an additional porous polyethylene implant from the right ala, a solid silicone implant from the tip, and a mass of scar tissue.
4. Anterior septal reconstruction with a reinforced double-layered rib cartilage graft was taken from the dislocated previous rib cartilage septal reconstruction. It was placed in a more anterior position to gain a normal columella show. Placement of the graft like an inverted Y onto the maxillary crest inferior to the missing anterior nasal spine and suture fixation via a drill hole through the maxillary crest.
5. A bony cartilaginous graft of the previous reconstruction of the cartilaginous dorsum was left in place, as it was stable and in a straight position. However, it was extended by two spreader grafts to fix the septum-columellar strut in a distal position and prevent cephalic tip rotation and thus a short nose.
6. Tip reconstruction by suturing the original alar cartilages on top of the strut.
7. Alar support by two thin symmetrically shaped and bended rib cartilage grafts positioned more caudally in the alar base.
8. Dorsal augmentation with diced cartilage in autologous fasciae to compensate for the increased tip projection.

Result

Dramatic improvement of nasal breathing and normalization of the nasal shape occurred.

An accidental click phenomenon was noted at the columella base despite suture fixation of the strut at its bottom.

4

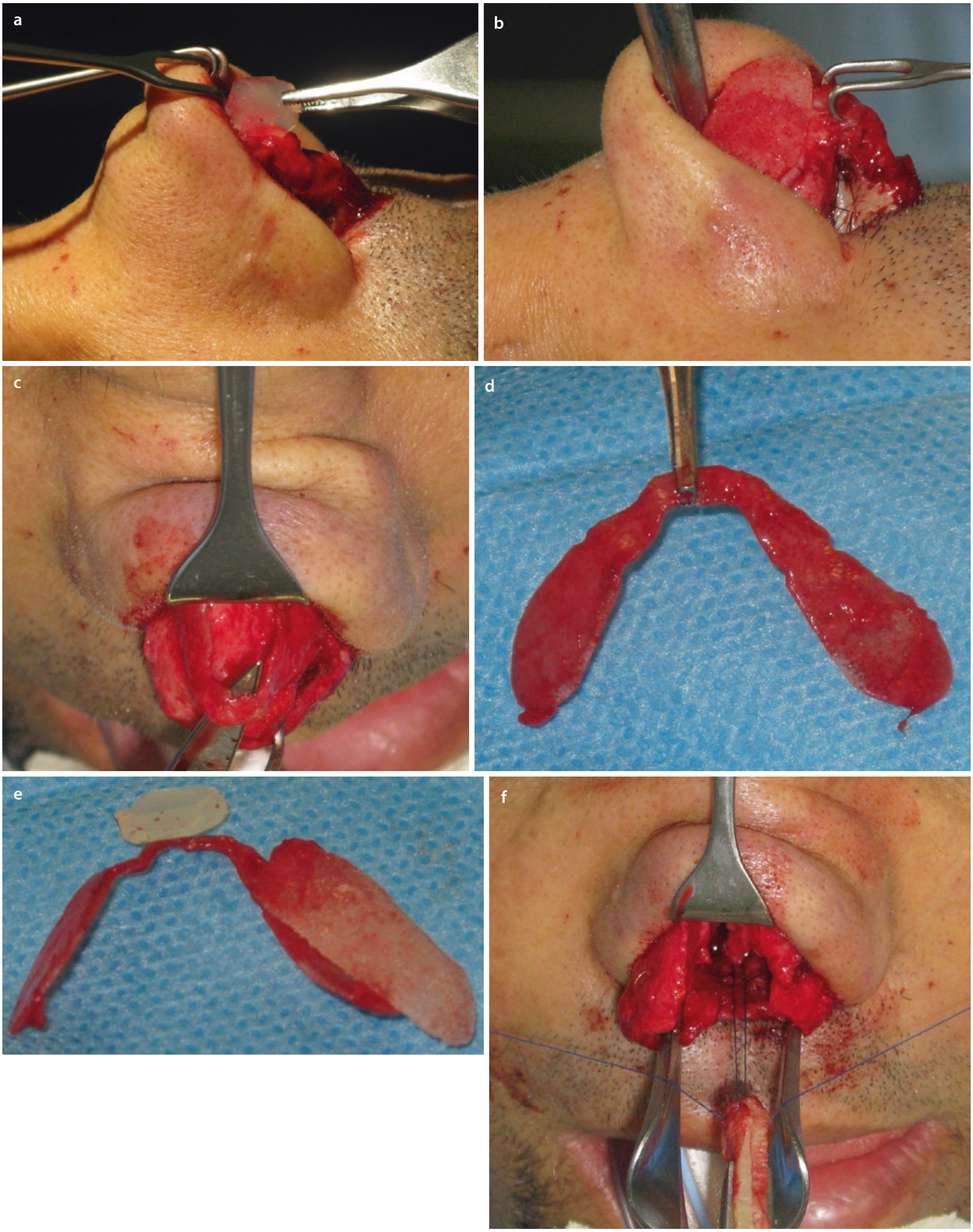

Fig. 4.7 Revision rhinoplasty patient Case 7. (**a**) Silicone cap graft removal; (**b**) high-density porous polyethylene (HDPP) alar framework exposed. (**c**) HDPP implant still in position before removal; the tip of a sharp-tipped scissors is seen underneath the tip of the graft. (**d**) HDPP implant removed; intended to act like a splay graft and bilateral batten grafts simultaneously but finally did not work. (**e**) The additional grafts were removed: silicone tip onlay, right alar HDPP batten graft. (**f**) Placement of a columellar strut created from a previous rib cartilage septal replacement graft, suture placed to fixate the graft at the anterior nasal spin. (**g**) New rib cartilage batten grafts carved out in a curved shape ready for implantation, to be supported by the columellar strut. (**h**) Prerevision frontal view and (**i**) postrevision frontal view. (**j**) Prerevision left profile view and (**k**) postrevision left profile view, the dorsum augmented with a DC-F graft. (**l**) Prerevision base view and (**m**) postrevision base view

Fig. 4.7 (continued)

Fig. 4.7 (continued)

4.3.8 Case 8: Septal Reconstruction with Rib Cartilage, Cephalic Fold-Under Flap

A 28-year-old female patient (Fig. 4.8) reported nasal trauma 12 years prior to consultation. Three years later, she had a septoplasty and removal of polyps. Consecutively she developed a severe saddle-nose deformity. Four years later, she underwent a rhinoplasty for dorsal augmentation, and 5 years later she came for consultation for the first time, still with a supratip saddle, and asked for revision rhinoplasty for further augmentation of the dorsum and increase of tip projection.

She felt no breathing impairment, but the objective rhinomanometry data suggested a one third reduction on the right side (R 208 mL/s vs. L 348 mL/s).

We planned elongation of the short nose and columella by a septal extension graft placed like a columellar strut, anticipating that its height would help to increase tip projection. Thus, the supratip saddle was expected to be increased and had to be augmented even more. Therefore, spreader grafts were planned to be fixated on a high dorsal level, 2–3 mm higher than the septal dorsum and the ULCs, fixated to the augmented septum—a functional saddle-nose correction completed by a DC-F onlay for additional aesthetic saddle-nose correction. The spreader grafts were expected to stabilize the septal extension graft as they are extended beyond the anterior septal angle and work like bilateral splints (extended spreader grafts).

Surgical Steps

1. Harvest of rib cartilage, right number 9.
2. Temporal fascia harvest.
3. Removal of a hypermobile old dorsal onlay to create a better condition for a new dorsal onlay integration.
4. Anterior septal reconstruction by solid rib graft, tailored and inverted Y-shaped at the bottom; fixation with 4-0 Prolene suture through the right branch, then the drill hole in the maxillary crest, and lastly through the left branch of the graft (a 3-point fixation preventing dislocation).
5. Septal dorsum reconstruction by solid rib graft, split on both sides for tongue-in-groove fixation to the septal remnant at the key area and to the anterior strut to construct a stable L-frame. There was no septal material found for fixation of typical spreader grafts nor were there ULCs except for scarred remnants.
6. Lateral osteotomy unilateral right was sufficient for correction of the deviation of the bony pyramid in this particular case.
7. Rectangular infolding of the cephalic third of the concave LLCs for straightening and stabilization (L-profile).
8. Additional dorsal augmentation by DC-F.
9. Tip refinements for dome symmetry.

Result

Nasal breathing was unimpaired at 9 months after the surgery, and the patient was highly satisfied with the result of the nasal augmentation.

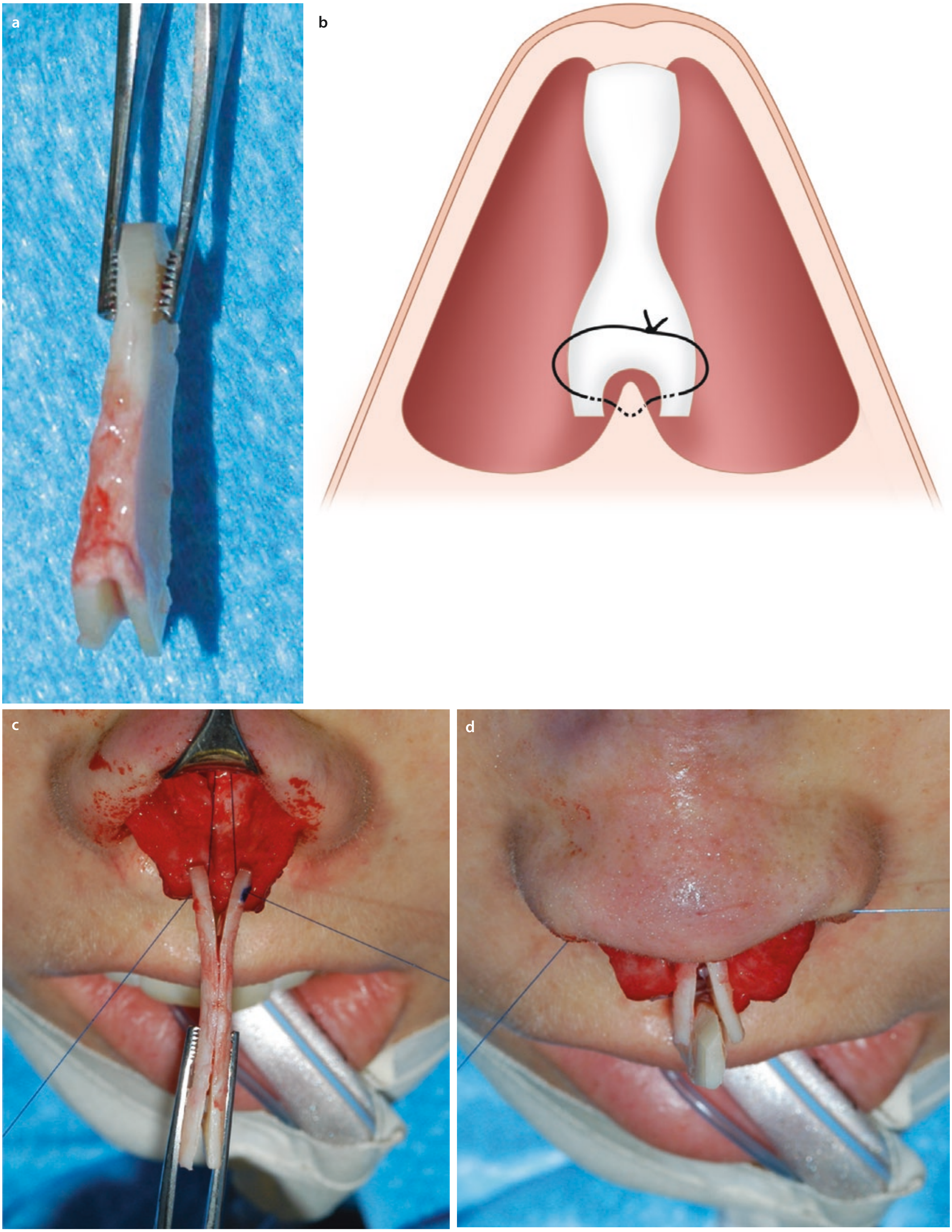

Fig. 4.8 (**a**) Septum-columellar strut; (**b**) schematic drawing of strut-anchoring on top of the ANS or on the maxillary crest just below the ANS, of sutures passing one limb of the strut, a drill hole in the bone, and the other limb of the strut. (**c**) Inserting the dorsal graft. (**d**) Anchoring the dorsal sandwich graft at the columella graft applying the tongue-in-groove principle. (**e**) Prerevision frontal view and (**f**) postrevision frontal view. (**g**) Prerevision left profile view and (**h**) postrevision left profile view. (**i**) Prerevision base view and (**j**) postrevision base view

Fig. 4.8 (continued)

Fig. 4.8 (continued)

Suggested Reading

Maring VP, Landecker A, Gunter JP. Harvesting rib cartilage grafts for secondary rhinoplasty. In: Gunter JP, Rohrich RJ, Adams WP, editors. Dallas rhinoplasty. 2nd ed. St. Louis: Quality Medical Publishing; 2007. p. 705.

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External Nose

Contents

Primary Reduction of the Dorsum

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_5

5.1 Surgical Principles

Most patients seeking rhinoplasty desire enhancements of their nasal profiles. In fact, more than 80 % of all rhinoplasty patients are seeking a reduction rhinoplasty because they feel their nasal profiles are too prominent. However, it is first necessary to determine why the patient feels this way, since there are many different causes of the overly prominent nose. Proper characterization is critical, since failure to correctly analyze the cosmetic deformity may lead to inappropriate treatment and patient dissatisfaction. Is the problem a simple overprojected dorsal hump? Or is the entire nasal profile, including the nasal tip, overprojected (i.e., rhinomegaly)? Alternatively, does the excessive prominence result from a tension-nose deformity in which an overprojected dorsal septum gives rise to pinching of the middle vault and excessive elongation of the nostrils (Fig. 5.1)?

The typical nasal hump is a combination of an overprojected cartilaginous dorsum and an overprojected bony dorsum. On the other hand, overprojection can be restricted to either the bony or the cartilaginous segment. The latter is known as an idiopathic parrot-beak deformity.

For surgical reduction of the nasal dorsum, different treatment options are available. However, regardless of the method chosen, nasal mucosa should first be elevated from the undersurface of the cartilaginous hump to expose the junction of the upper lateral cartilages and the dorsal septum. This enables a so-called extramucosal dissection, which preserves the protective mucosal barrier and stabilizes the overlying graft material. Additionally it minimizes contracture following hump resection. We perform dorsal reduction in most cases using the open approach. We first begin by dividing the membranous septum in order to expose the leading edge of the caudal septum. We then elevate the outer perichondrium off the inner perichondrium. Histologic analysis of the septal mucosa has identified two layers of perichondrium (Pirsig and Fischer 1982). The inner layer is tightly adherent to the cartilage matrix, whereas the outer layer is more easily elevated for flap dissection. We denude the septal cartilage of the outer perichondrium, which provides a comparatively bloodless plane of dissection and tends to produce fewer lacerations in the septal flaps. The extramucosal dissection can then be performed easily after entering the correct plane, for example, by using a suction dissector (Fig. 5.2). The instrument we are using for this purpose was developed by Haraldsson (Medicon eG, Tuttlingen, Germany); it has a semisharp tip and a revolving handle. This instrument enables us to safely and quickly dissect the mucosa, even without direct visualization.

For many years, we have been using a compound (or en bloc) resection technique for hump removal (Fig. 5.3). The cartilaginous hump was transected at the desired height using a no. 11 blade, beginning caudally at the distal margin of the hump and ending cephalically at the bony cartilaginous junction. The left upper lateral cartilage was then transected, followed by the dorsal septum and the right upper lateral cartilage. After all three components of the cartilaginous hump have been cut, we inserted a sharpened chisel into the newly made gap and engaged the lower end of the bony hump. Once the proper trajectory has been confirmed, we transected the bony hump and completed the en bloc resection. We preferred not to use an osteotome for bony hump resection since osteotome movement is more likely to result in inadvertent overresection of the nasal bone. Overresection is less likely with a sharp chisel with a long flat blade that cuts like a knife (Fig. 5.4). However, it is important to sharpen the blade before each use because it dulls easily. A major advantage of the compound resection technique is the comparatively large block of composite tissue that is generated by hump removal. When necessary, the resected hump can be remodeled and reshaped using a power drill to create an onlay graft, which is ideal for refinement of the dorsum. The graft can be used to cover minor contour irregularities or to conceal an open roof deformity (Fig. 5.5). The major disadvantage of this technique is resection of the ULC where it is fused to undersurface of the bony hump. By resecting a tall bony hump, a bony cartilaginous open roof may be created potentially causing irregularities in the surface contour of the rhinion.

As an alternative to the en bloc method, the component technique can be used for dorsal hump resection. Because of its ease and precision, it has become our preferred technique for hump removal (Fig. 5.6). After completing the extramucosal dissection, we divide the upper lateral cartilages from the dorsal septum and treat each anatomic component of the cartilaginous dorsum separately (i.e., a split technique). First we lower the dorsal septum using a straight scissors. Unless we are planning to reconstitute the middle vault with spreader flaps, each upper lateral cartilage is then trimmed individually with a straight scissors prior to spreader graft placement. When using spreader flaps, the upper lateral cartilages are bluntly detached from the undersurface of the nasal bones prior to bony hump resection. Typically, there is a 10- or 12-mm overlap.

The next step in the component technique is resection of the bony dorsum. Often, the bony hump is much smaller than expected, since the bony contribution to the dorsal hump is usually only 5–8 mm in length. Therefore, in most cases we prefer reducing the bony hump with a rasp rather than with a chisel. At present we prefer a rasp with disposable blades (Fig. 5.7) so that a sharp instrument is always available. Only with very large and thick humps is our algorithm changed, and the hump is removed using a chisel.

Transection of the dorsal hump is then followed by osteotomies to remodel the nasal pyramid. Osteotomies can be classified according to their shape: curved or straight. Curved osteotomy cuts are commonly used for paramedian osteotomies that diverge or “fade” laterally at their upper ends, often to join curved lateral osteotomy cuts that have either a high-to-low-to-high or a low-to-high configuration (Fig. 5.8).

However, we prefer straight osteotomies, which yield larger bony fragments for more effective bone contouring. Therefore, we perform a straight paramedian osteotomy, a straight transverse osteotomy, and a straight low-to-low lateral osteotomy as our standard technique (◘ Fig. 5.8). The paramedian osteotomy is performed using a power-driven Lindemann fraise, beginning inferiorly and extending superiorly to create precise parasagittal cuts parallel to the septum. By using a fraise, we can also remove additional bone to create a small open roof in order to prevent blocking of the fragments during infracture. Hence, the Lindemann fraise facilitates both precise placement of straight paramedian osteotomies and narrowing of the central bony complex to optimize infracture (◘ Fig. 5.9). This process is followed by the transverse and the low-to-low lateral osteotomy, which are always performed percutaneously (◘ Fig. 5.10). Two percutaneous skin incisions are required, one vertically oriented at the junction of the caudal and middle thirds and one transversely oriented at the junction of the cranial and middle thirds. For this procedure, we use a 2- or 3-mm unguarded osteotome. After inserting the instrument through the skin incision, we use the osteotome to elevate the soft tissues along the osteotomy line in order to displace the vessels and reduce bleeding (◘ Fig. 5.11).

Based upon our experience, the percutaneous technique minimizes bone fragmentation by optimizing angulation of the osteotome. Although the osteotomy lines converge near the inner canthus, we prefer not to join the osteotomy cuts. Instead, we use a greenstick fracture with manual pressure to complete the release and mobilization of the nasal bones.

The next step is internal nasal valve reconstruction. In most cases we use a spreader flap technique (◘ see Fig. 5.11). Spreader flaps are created from upper lateral cartilage that remains after cartilaginous (septal) hump resection. The overprojecting edges of the upper lateral cartilage are scored or nonscored, invaginated inward, and then sutured flush to the newly established dorsal septum. We favor this technique over the use of spreader grafts, since it creates a very smooth dorsum as well as a favorable internal nasal valve configuration. Furthermore, spreader flaps typically produce good aesthetic dorsal lines.

Another option for internal valve reconstruction is the use of spreader grafts (◘ Fig. 5.12). However, like spreader flaps, spreader grafts are also used to contour the middle vault, reinforce a weak dorsal septum, or compensate for middle vault asymmetries. Spreader grafts can be created from the previous septal dorsum or from central parts of the quadrangular cartilage. Care must be taken to bridge the keystone area because this is the most sensitive part of the dorsum. Typically, spreader grafts have a width of 1–2 mm and a height of approximately 3 mm. Fixation to the dorsal septum is accomplished by means of horizontal mattress sutures, which are recessed to permit additional smoothing of the cartilaginous dorsum when needed. Following spreader graft fixation, the upper lateral cartilages are trimmed flush with the dorsal septum and sewn to the newly created dorsal construct.

The last step of this procedure is smoothing the dorsum. For the bony dorsum, this can be accomplished with a power drill to eliminate any contour irregularities. Smoothing the bony cartilaginous junction or the cartilaginous dorsum is accomplished with a no. 11 blade. The benefits of spreader flaps or spreader grafts are many. These include maintaining or improving internal valve patency and/or straightening the cartilaginous dorsum. Pinching of the upper lateral cartilages adjacent to the bony/cartilaginous junction—the so-called inverted-V deformity—is also reversed and/or prevented using spreader flaps or spreader grafts. The by-products of these corrections are smooth and symmetrical and have continuous dorsal aesthetic lines.

Depending upon the desired cosmetic objective, the dorsum can be intentionally overreduced if immediate dorsal augmentation is preplanned. In our hands, augmentation of the dorsum is accomplished by reimplantation of a surgically modified (composite) dorsal hump or by blanketing the nasal bridge with one or two layers of autogenous or allogenic fascia (Tutoplast^{R}; Tutogen Medical GmbH; Neunkirchen am Brand, Germany) (◘ Fig. 5.13). In order to create a smooth and even dorsal contour, full-length onlay grafts are preferable. In the case of an underprojected nasion, which is a common contour deficiency, we prefer to avoid isolated radix grafts—which often produce step-off deformities—and use full-length fascial grafts instead.

For some time, our first choice of refining the dorsal contour has been free diced cartilage. All residual cartilage remnants are finely diced into a paste-like consistency and injected using a plain tuberculin syringe. The injected material is then gently molded with digital pressure until the desired contour is achieved. After contouring is complete, the dorsum is stabilized with an outer layer of adhesive tape prior to final closure of marginal incisions (◘ Fig. 5.14).

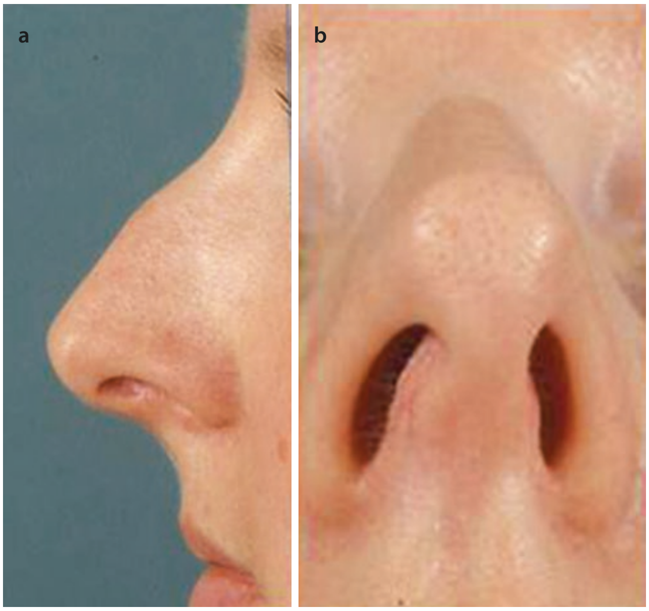


Fig. 5.1 (a, b) Tension nose with elongated nostrils

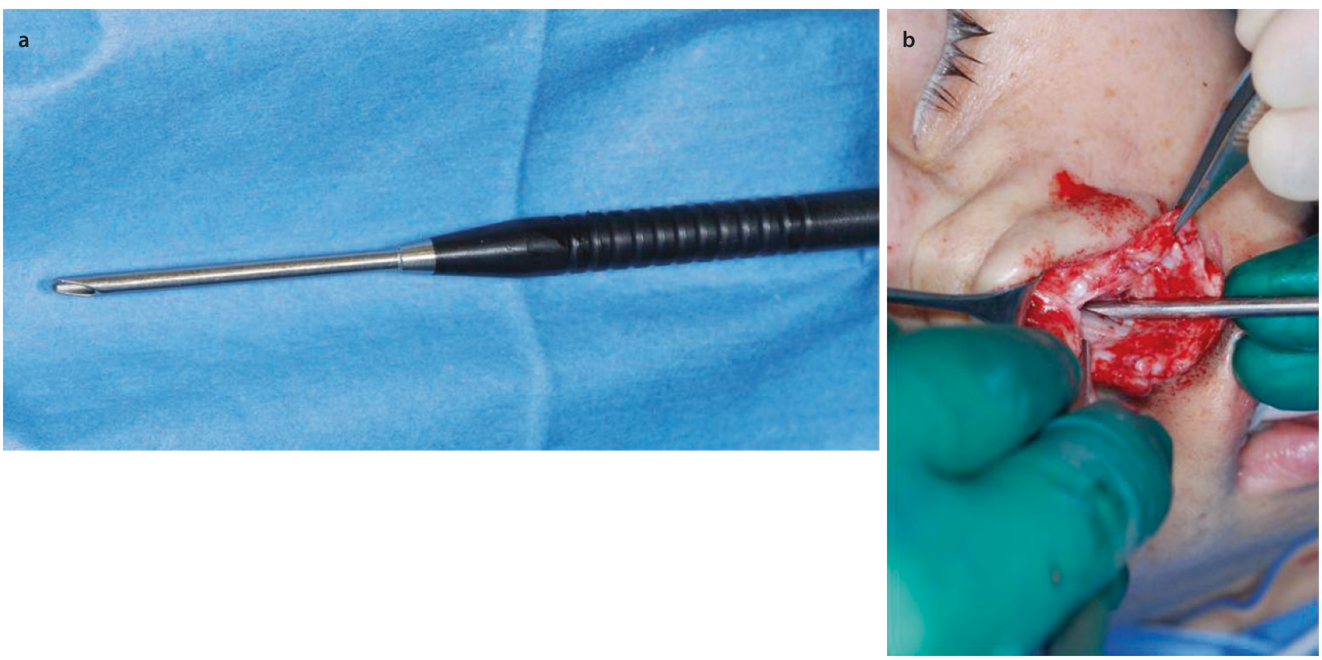


Fig. 5.2 (a, b) Suction dissector with revolving handle

Fig. 5.3 (**a, b**) En bloc hump resection

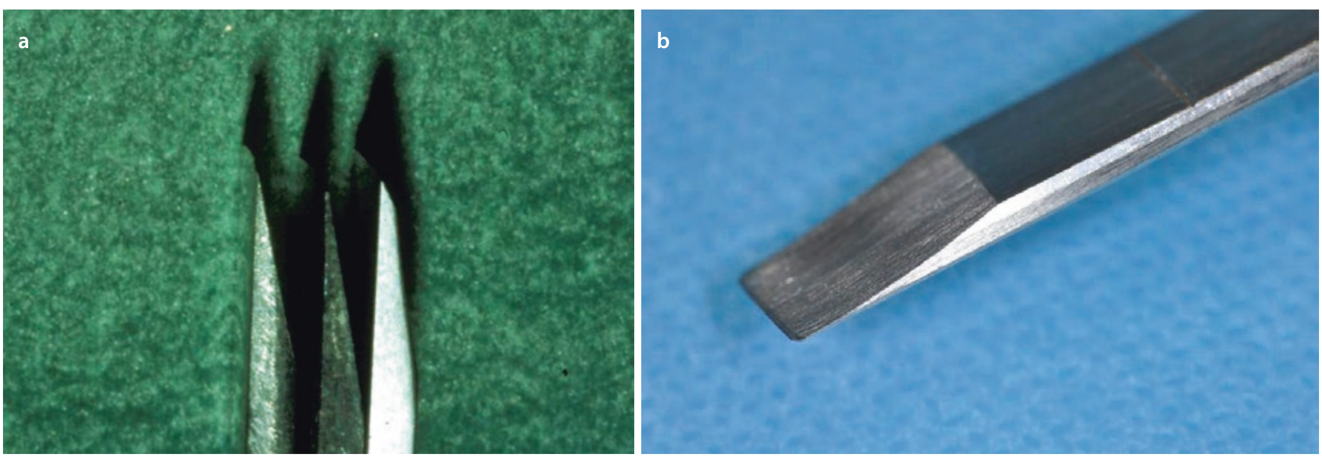


Fig. 5.4 (**a**, **b**) Chisel with long flat blade

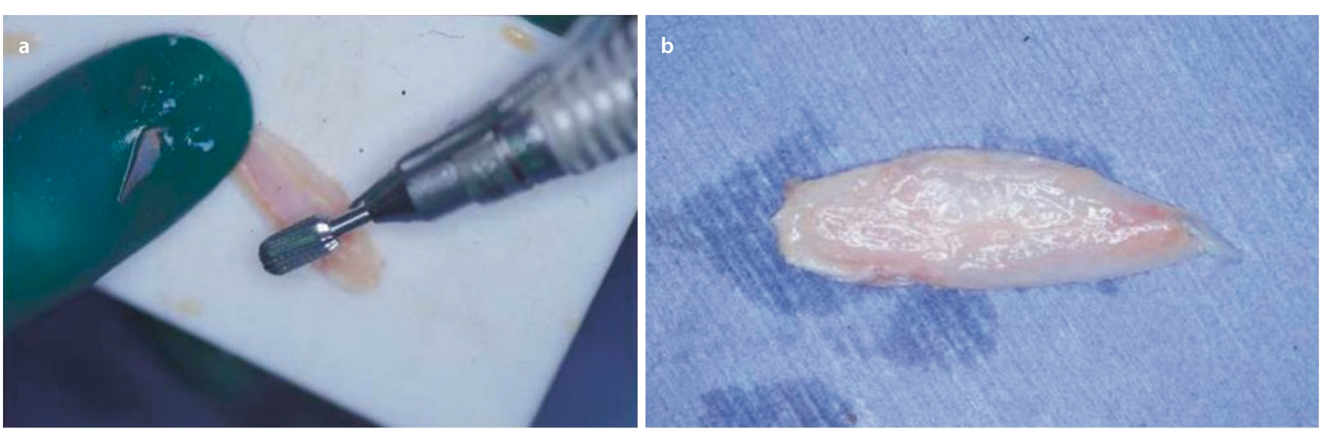


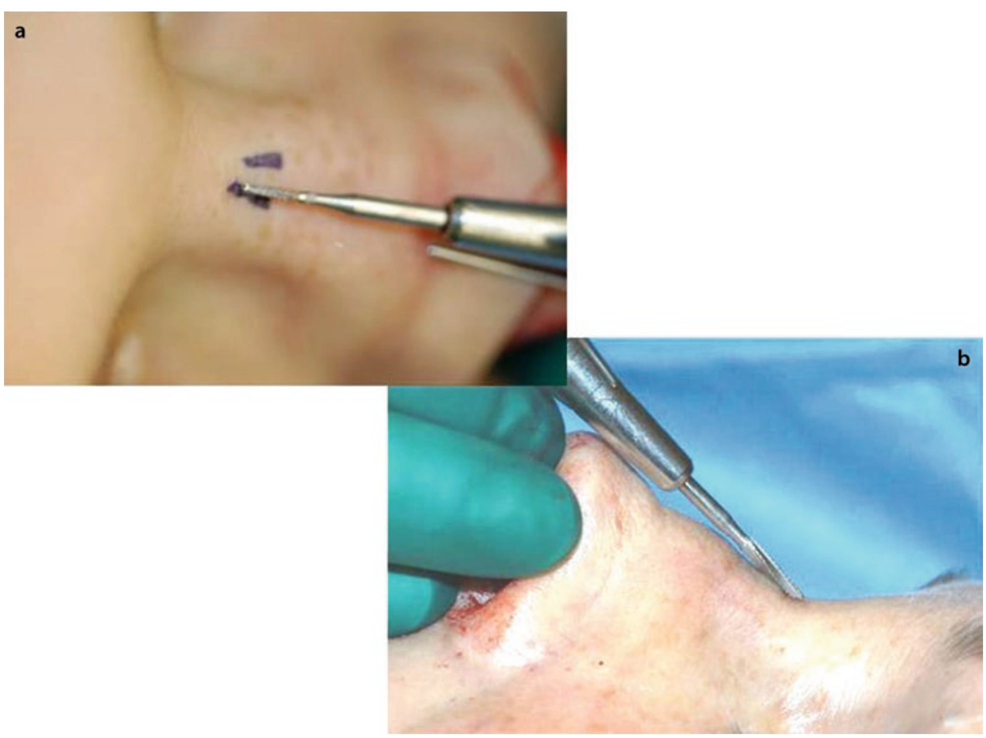
Fig. 5.5 (**a**, **b**) Surgically modified hump for reinsertion as a dorsal onlay graft

Fig. 5.6 (**a**–**d**) Component hump resection

Fig. 5.7 Manual rasp with disposable blades

Fig. 5.8 Planning of the osteotomies

Fig. 5.9 (a, b) Using Lindemann fraise for paramedian osteotomy



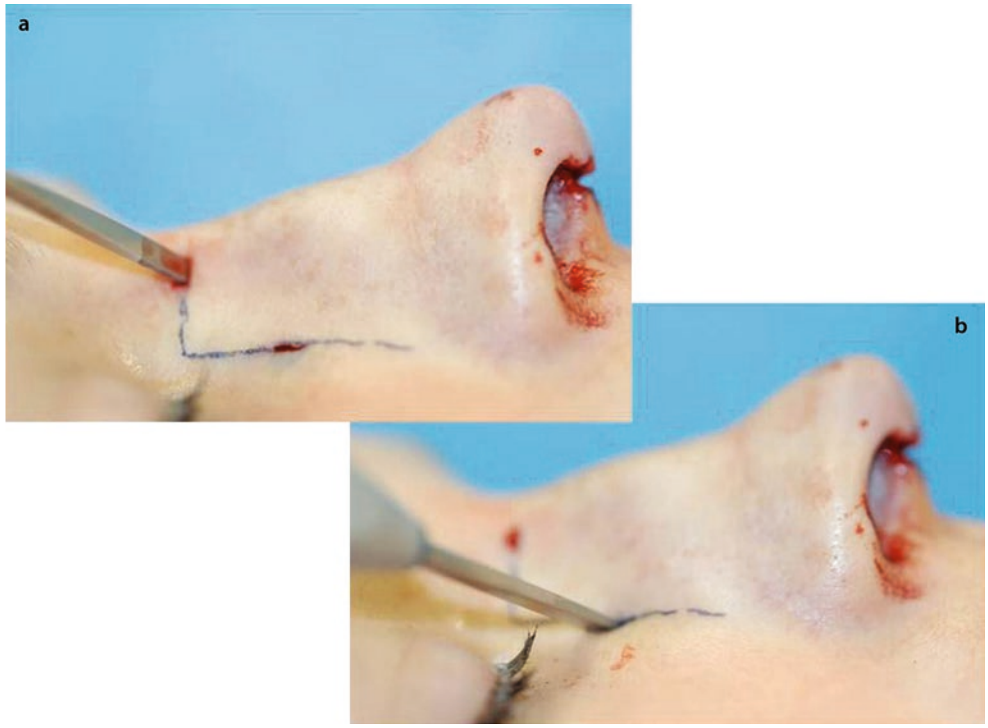


Fig. 5.10 (a, b) Small osteotome inserted through a percutaneous incision

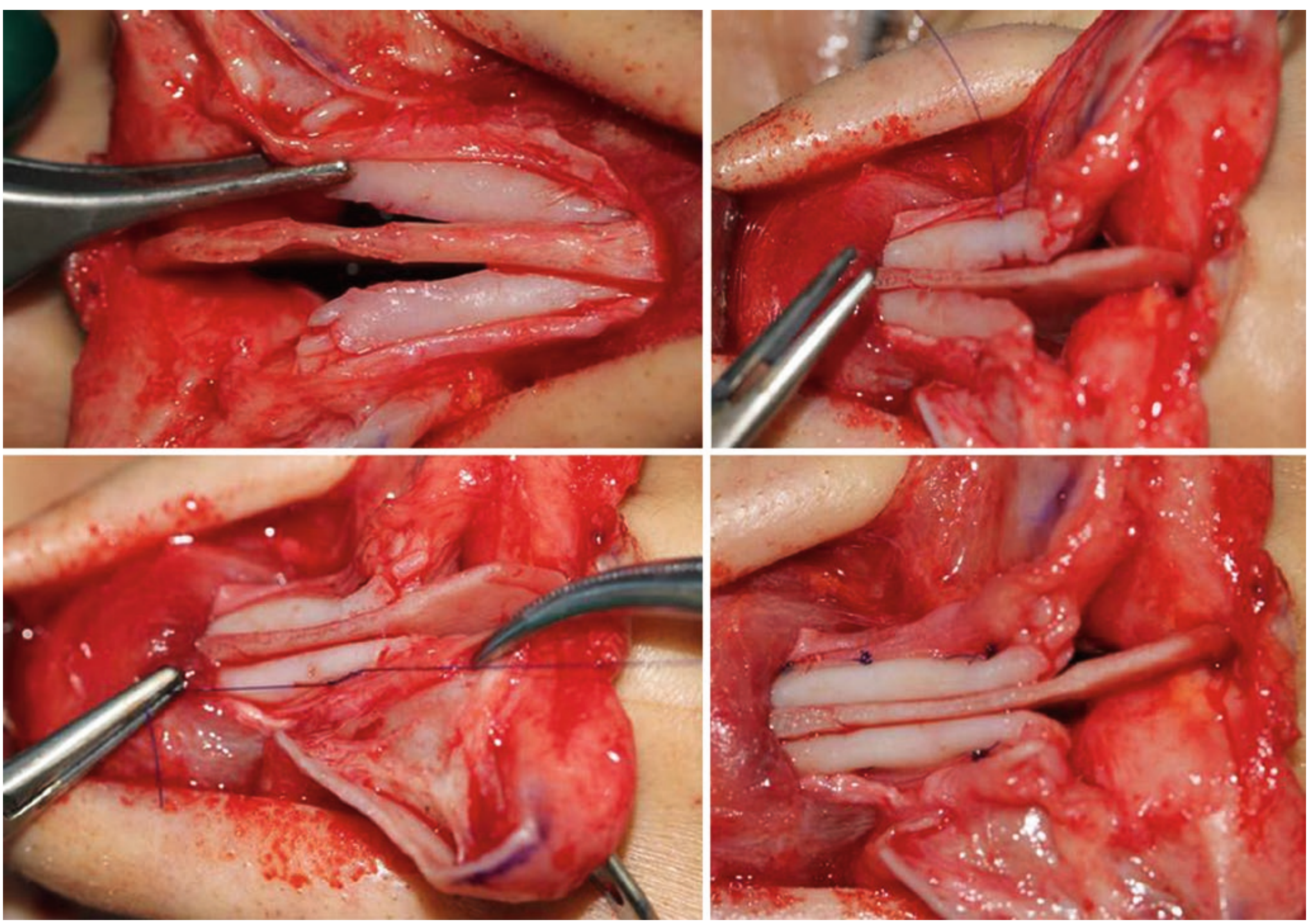


Fig. 5.11 Spreader flap technique

Fig. 5.12 Spreader graft technique

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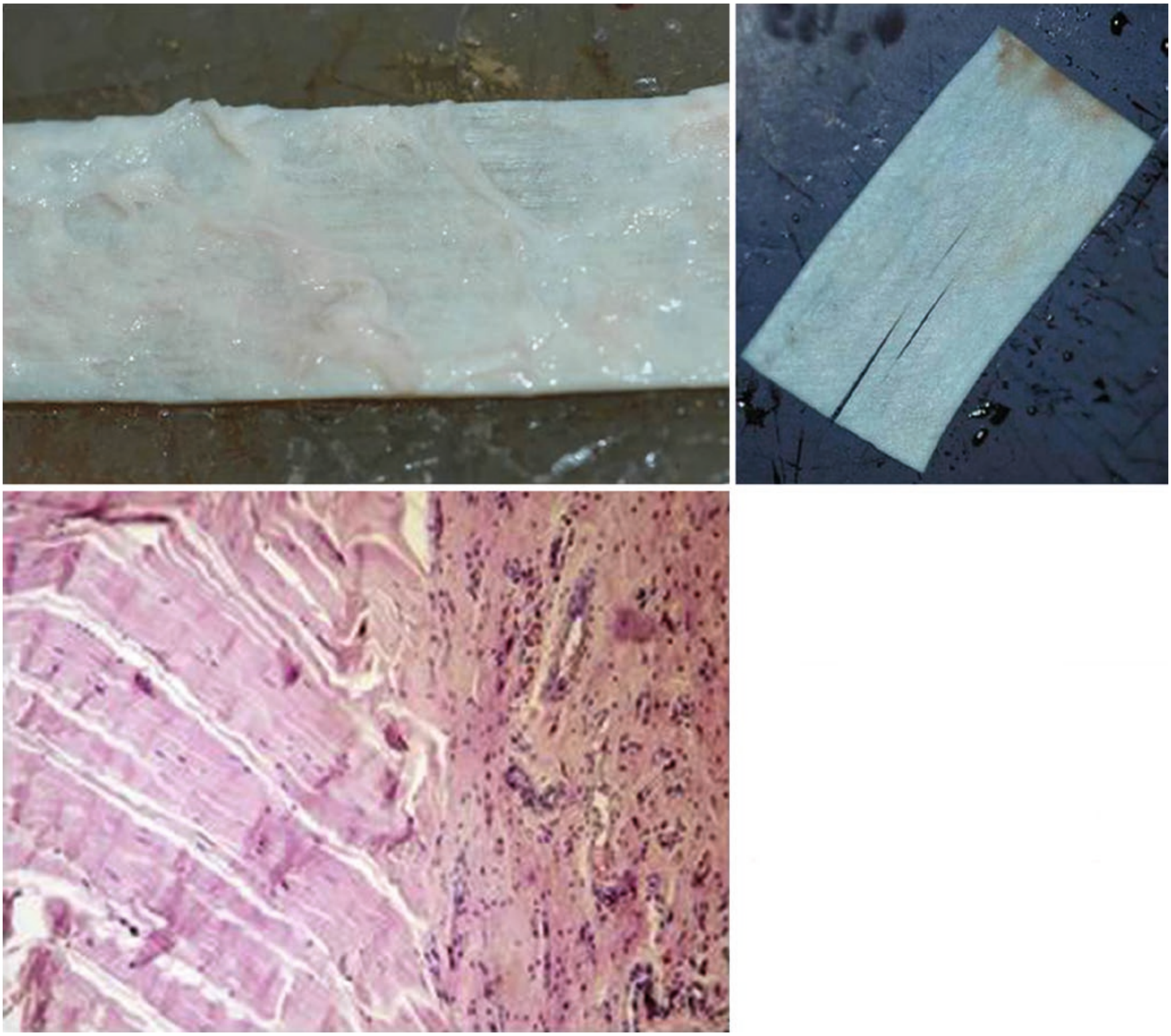


Fig. 5.13 Allogenic fascia lata (Tutoplast)

Fig. 5.14 Finely diced cartilage in tuberculin syringe for camouflaging irregularities

5.2 Case Studies

5.2.1 Case 1: Minor Hump Reduction with Power Drill

A 27-year-old female presented with a narrow and overprojected dorsum complaining of left-sided nasal obstruction. Endonasal examination showed a central septal deviation in the left nasal passage. The tip was also bulbous and slightly asymmetrical.

Using the open approach, interdomal soft tissues and portions of the depressor septi muscle were excised. Following extramucosal dissection of the middle vault, the upper later cartilages (ULCs) were divided from the septum, and upper submucosal tunnels were dissected over the septum. The dorsal septum was then lowered using a component resection, but a 10.0-mm dorsal L-strut was preserved after removing the central septal deformity. Using the Lindemann burr, the ethmoid bone was then cut to prevent separation of the bony cartilaginous septum and/or fracture of the cribriform plate during blunt fracture of the perpendicular ethmoid bone (with the 5.0-mm osteotome) while removing the septal partition. The overprojected bony dorsum was then lowered with an electric cylindrical drill, and the bony pyramid was also straightened and narrowed using (internal) parasagittal medial osteotomies, followed by percutaneous low-to-low lateral and transverse osteotomies. The overprojected ULCs were then invaginated medially and used to create spreader flaps. The tip was also contoured with lateral crural strut grafts (lateral crural underlay technique) to flatten the lateral crura, and both spanning sutures and transdomal sutures were used after inserting a columellar strut graft. Alar rim grafts were also placed for contour and support of the nostril rims (Fig. 5.15).

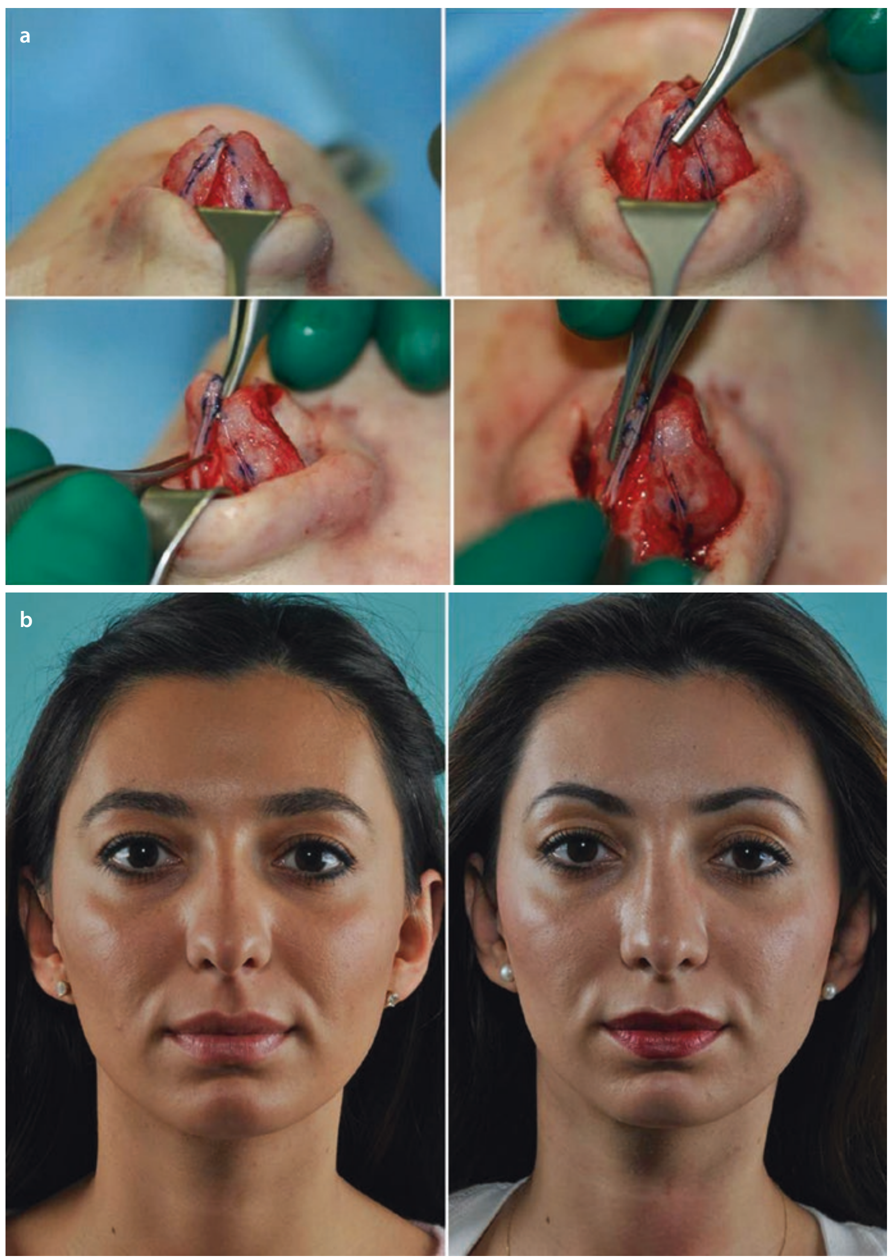


Fig. 5.15 (**a**) Cephalic fold-under flaps (lateral crural underlay). (**b**–**d**) Minor hump reduction with power drill (Front view, profile view, base view pre-op/post-op.)

5

Fig. 5.15 (continued)

5.2.2 Case 2: Hump Reduction with Compound Technique

An 18-year-old female presented with a narrow and overprojected dorsum, a wide nasal tip, and obstruction of the nasal airway. The endonasal examination revealed pinched nasal valves and a high septal deviation to the patient's left side. The septum was otherwise unremarkable without airway obstruction.

Using the external rhinoplasty approach, we separated the membranous septum and resected a majority of the depressor septi muscle. The caudal border of the septum was then trimmed to deepen the nasolabial angle. After exposing the nasal dorsum, mucoperichondrial pockets were elevated on the undersurface of the ULC/septal cartilage junction on both sides, and the ULCs were then sharply separated from the dorsal septum with straight scissors. Attachments of the ULCs to the nasal bones were also elevated off the nasal hump in order to preserve the underlying cartilage during bony hump resection. The cartilaginous hump was first resected with straight scissors, followed by transection of the bone using a sharp chisel to remove the rhinion hump as a single specimen. The bony pyramid was then narrowed using parasagittal medial osteotomies and percutaneous transverse and percutaneous (low-to-low) lateral osteotomies. The overprojected ULCs were then used to create spreader flaps to widen the internal nasal valves, fill the open roof, and widen the previously pinched dorsal aesthetic lines.

Tip refinement began with cephalic fold-under flaps of the lateral crura followed by intradomal tip sutures to reduce tip width. The domes were temporarily stabilized in the desired position by pinning the cartilages transversely with a small-caliber needle until transdomal (=interdomal) suture placement was complete. After strengthening the lateral crura with cephalic fold-under flaps, spanning sutures were used to reduce crural flaring without risking iatrogenic collapse. Finally, the residual septal cartilage was finely diced and injected beneath the skin flap (via the marginal incisions after closing the columellar incision) to smooth and refine the outer nasal contour (Fig. 5.16).

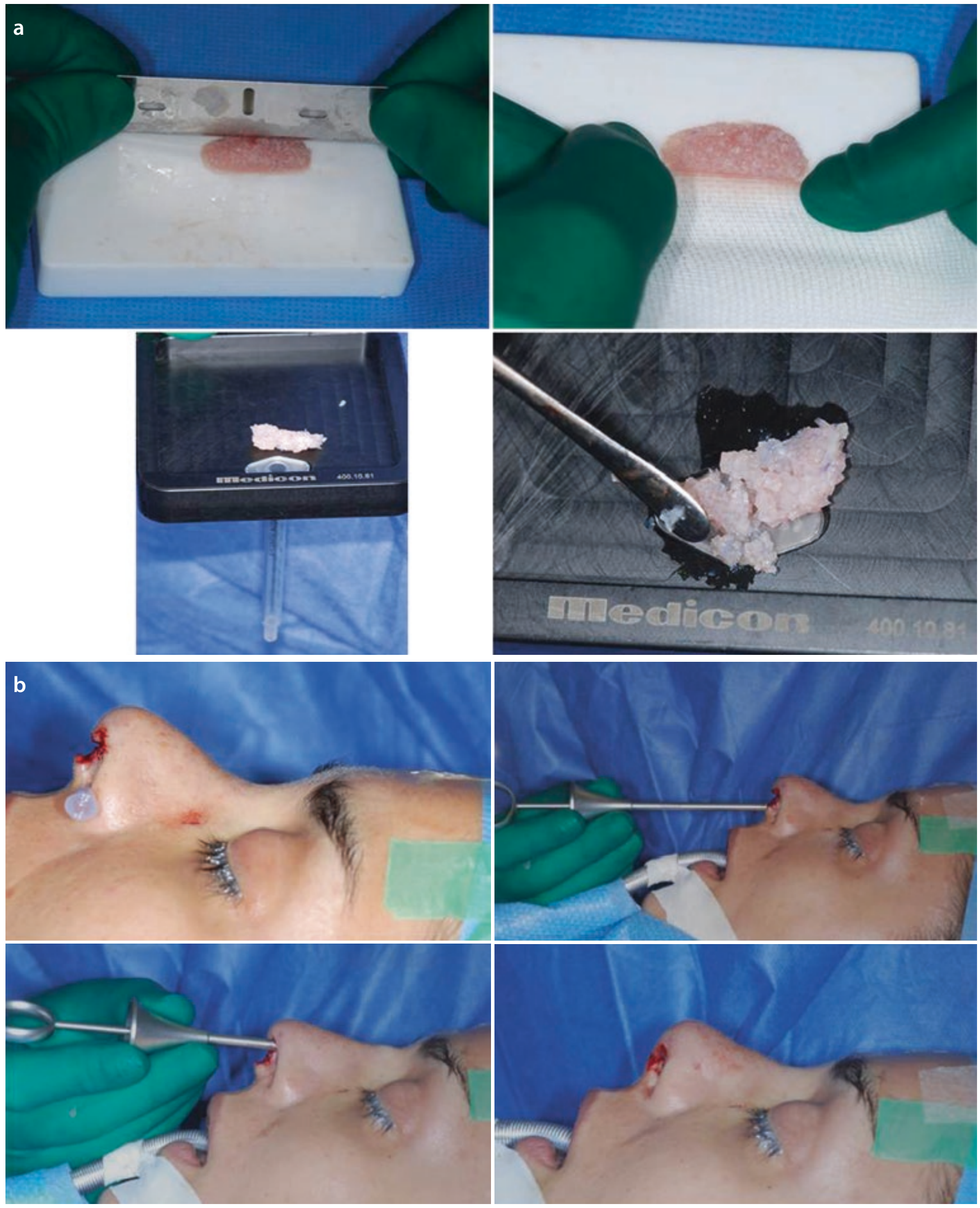


Fig. 5.16 (**a**) Preparation of free diced cartilage (FDC). (**b**) Application of FDC. (**c**) Pre- and post augmentation with FDC, device for FDC application. (**d**–**f**) Hump reduction with compound technique and covering the dorsum with FDC (Front view, profile view, base view pre-op/post-op.)

Fig. 5.16 (continued)

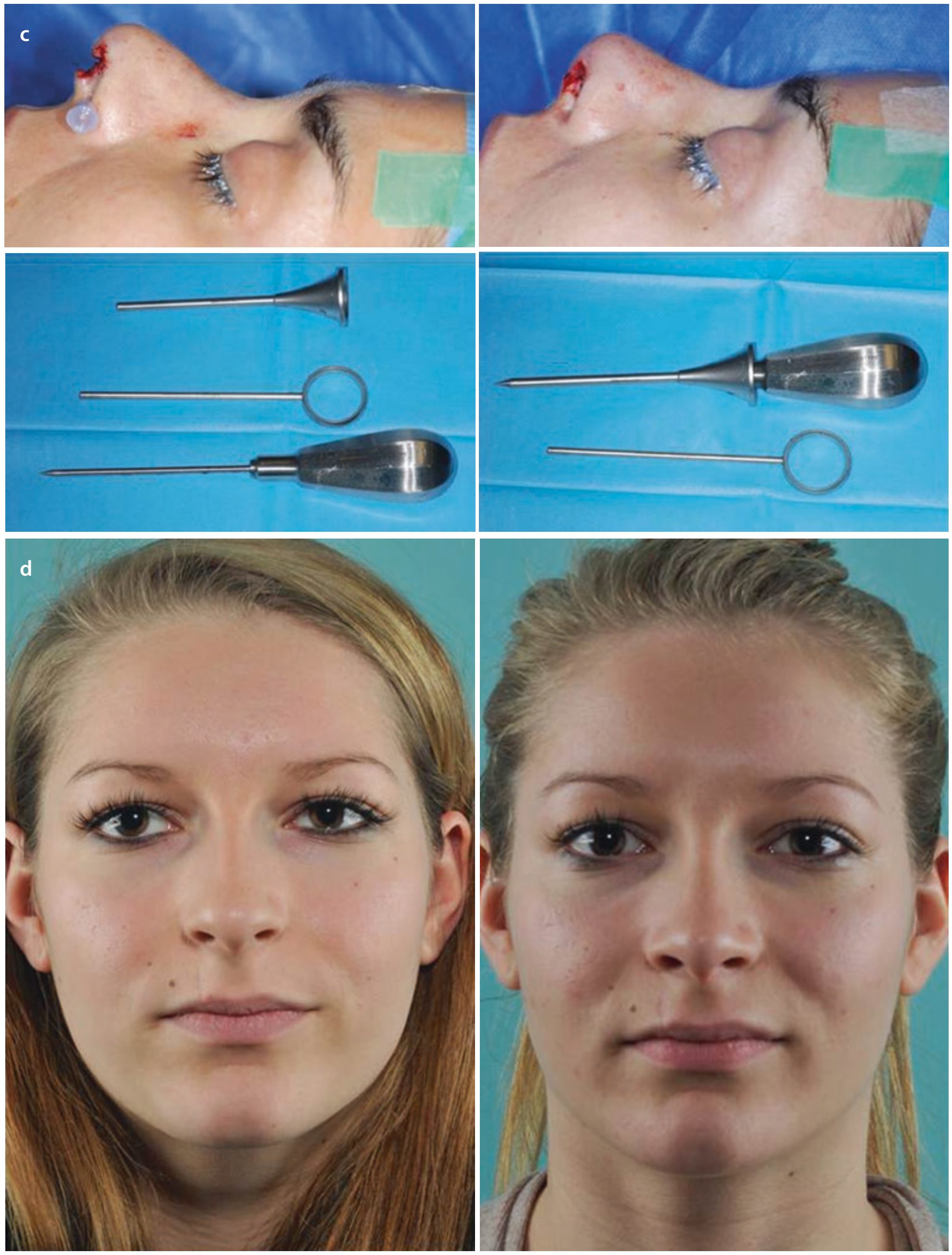
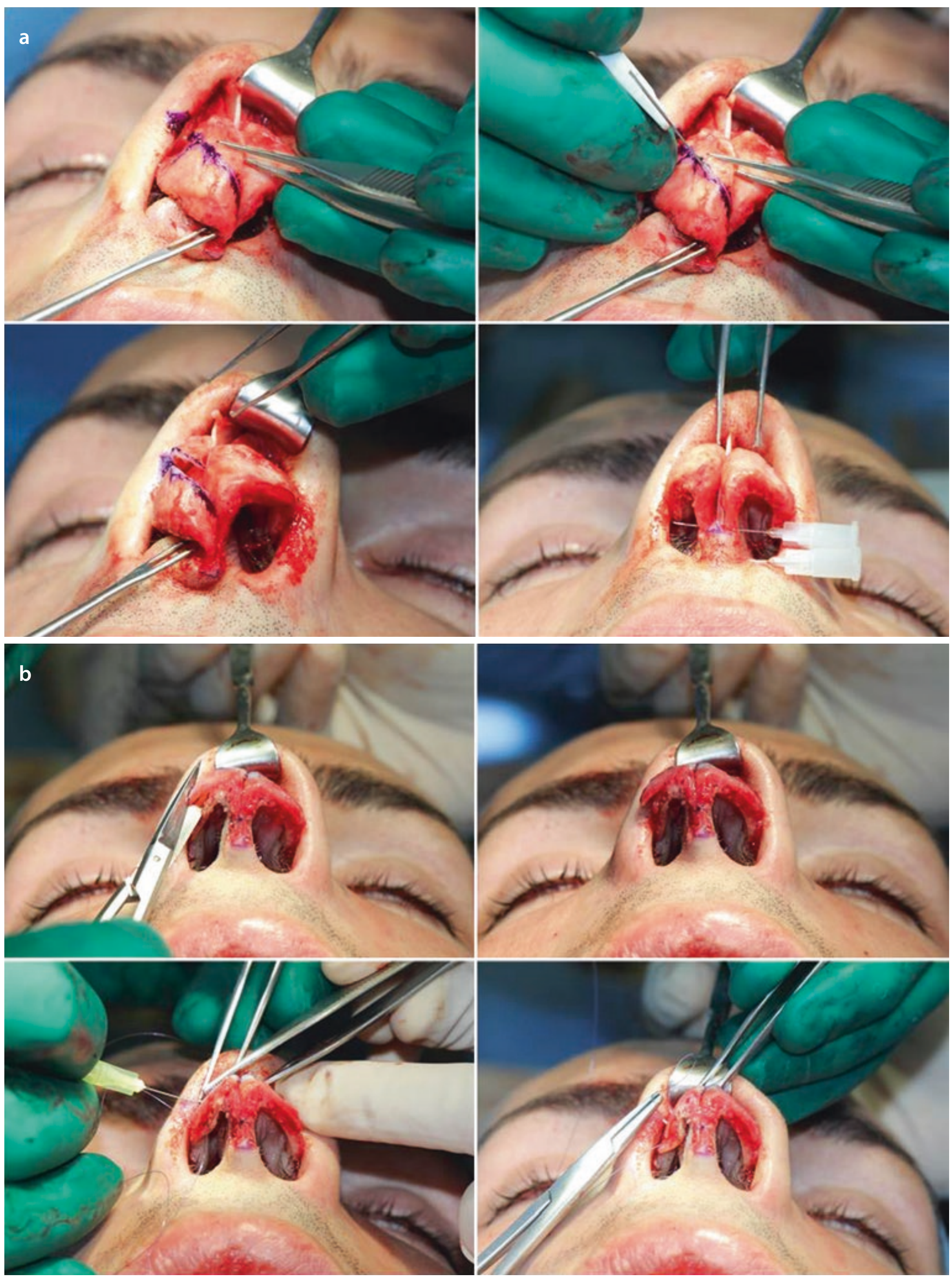


Fig. 5.16 (continued)

5.2.3 Case 3: Major Reduction for Rhinomegaly with Chisel Combined with Lateral Sliding Technique for Deprojection of the Tip

A 26-year-old male presented with a severely oversized nose. Profile examination revealed a substantially overprojected dorsum, an overly obtuse nasolabial angle, and a prominent anterior nasal spine (ANS). Frontal examination revealed deviation of the nasal axis to the right side with asymmetrical aesthetic dorsal lines in an hourglass configuration. The tip was also bulbous and overly wide.

Using the open rhinoplasty approach, the nasolabial angle was reduced by trimming the caudal septum and resecting a portion of the ANS. The M depressor septi was released and partially resected. The dorsum was then lowered using a component technique (with resection of 8 mm of dorsal septum), and the bony pyramid was reconfigured using paramedian and percutaneous transverse and low-to-low osteotomies. Tip deprojection and rotation were accomplished using a lateral crural overlap technique combined with a tongue-in-groove setback. A shield graft combined with spanning sutures and a posterior sling were used for tip contouring and stabilization (▣ Fig. 5.17).



▣ **Fig. 5.17** (**a**) Cephalic trim, tongue-in-groove setback. (**b**, **c**) Lateral sliding technique for deprojecting the tip. (**d**–**f**) Reduction for rhinoplasty in a rhinomegaly (**d**, front view; **e**, profile; **f**, base view pre-op/ postop.)

■ **Fig. 5.17** (continued)

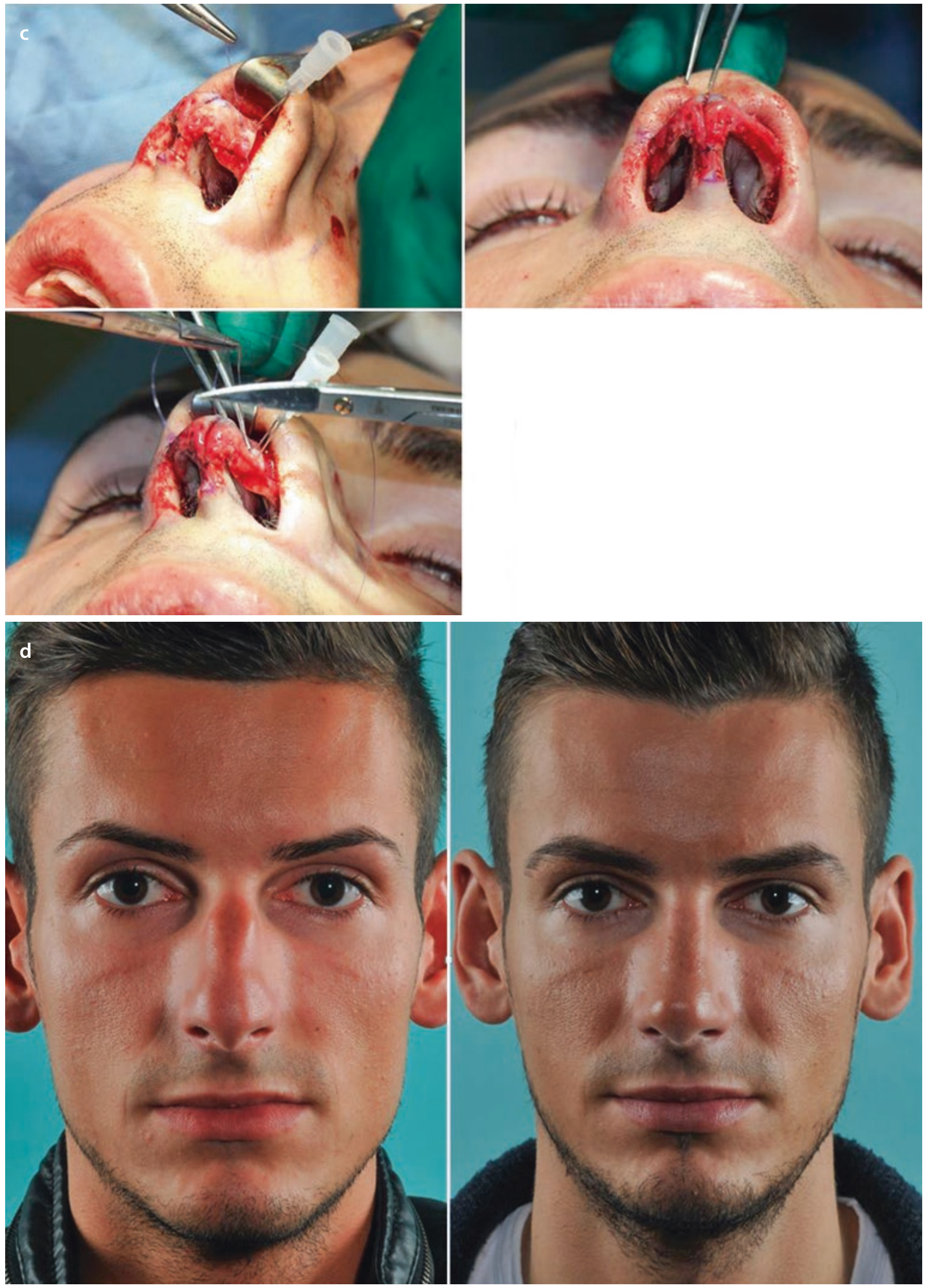


Fig. 5.17 (continued)

5.2.4 Case 4: Lowering the Dorsum Combined with Extracorporeal Septal Reconstruction

A 20-year-old male presented with an oversized nose and severe septal deformity. Examination revealed a long, narrow, and overprojected dorsum with an obtuse (85°) nasolabial angle. Protruding ears were also observed and were corrected simultaneously. Using the open rhinoplasty approach, the septum was removed. To create a straight neoseptum, the septal partition was rotated 90° counterclockwise, and the deformed caudal septum was resected and used for bilateral spreader graft placement. For additional widening of the pinched internal valves, spreader flaps were also used in addition to spreader grafts. After component reduction of the dorsum and reinsertion of the neoseptum, spreader flaps fashioned from the overprojected ULCs were sewn to the spreader grafts, and osseous suture fixation was performed at the nasal bones and ANS. The tip was then deprojected and rotated cranially using the lateral crural overlay technique, thereby also reducing nasal length. Morselized septal cartilage grafts were then used to augment both soft-tissue facets (Fig. 5.18).

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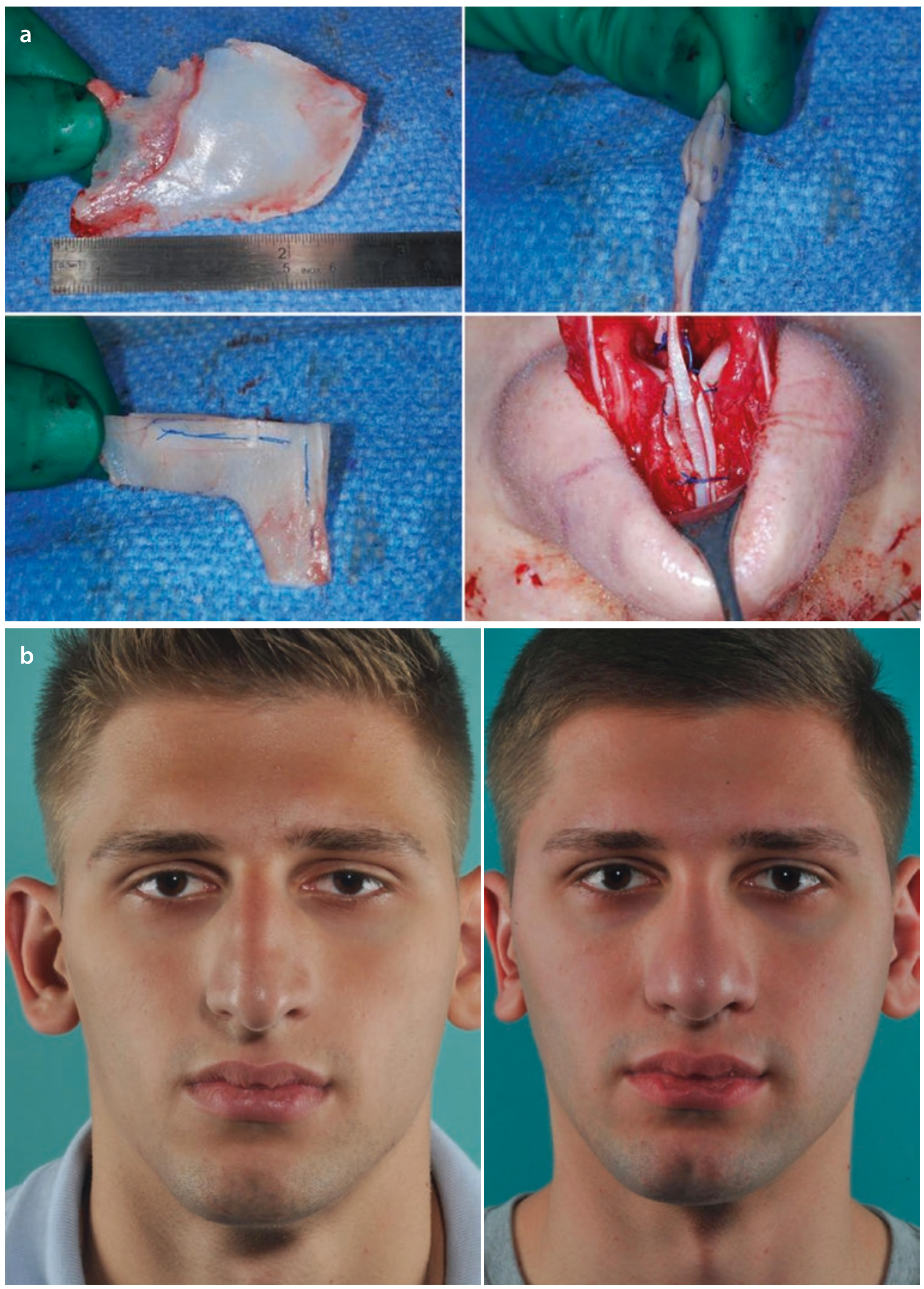

Fig. 5.18 (**a**) Lowering the dorsum combined with extracorporeal septal reconstruction and spreader flaps (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 5.18 (continued)

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5.2.5 Case 5: Lowering the Dorsum Plus Spreader Flaps

Technique was as follows. In the thin-skinned nose, there is a greater risk of skeletal irregularities becoming visible through the overlying skin. This problem is best prevented by avoiding imperfections in the skeletal framework. However, when minor irregularities are unavoidable, camouflage of the skeletal imperfections with an onlay of allogenic fascia lata will typically result in a smooth and even outer nasal contour.

This fascia graft is rehydrated in antibiotic solution before the final thickness can be determined. It has an excellent structure with parallel collagen fibers and can be used as a multilayered onlay graft.

A 22-year-old female presented with an overprojected dorsum, a wide and bulky nasal tip, asymmetry of the nostrils, an overly wide columella, and very thin nasal skin.

Using the open rhinoplasty approach, the dorsum was lowered using the component technique in which each skeletal element was resected individually. After trimming the dorsal septum and upper lateral cartilage, the middle vault was reconstructed with spreader grafts harvested from the quadrangular septum. Because of unusually thin lower lateral cartilages, a lateral crural fold-under flap was used to add strength to the naturally weak lower lateral cartilages. For better tip contour, an integrated shield graft with rounded edges was sutured to the infratip lobule. Alar rim grafts were also placed to improve the alar rim contour, but asymmetry of the alar base could not be fully eliminated. The newly shaped tip and the alae were then covered with a layer of allogenic fascia lata (▣ Fig. 5.19).

■ **Fig. 5.19** (**a**) Covering the tip in a thin-skinned patient with allogenic fascia. (**b**) Applying of rim grafts and shield graft. (**c**–**e**) Front view, profile view, base view pre-op/post-op

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■ **Fig. 5.19** (continued)

■ **Fig. 5.19** (continued)

5.2.6 Case 6: Reduction for Rhinomegaly Combined with Extracorporeal Septal Reconstruction

A 16-year-old boy presented with a large dorsal hump, a severely deviated nose, and nasal airway obstruction. On profile view, the nose was overly long with an acute nasolabial angle. From the base view, nostril asymmetry and an overly wide tip were observed. The anterior border of the septum was also subluxed into the left vestibule. Endonasally, a severely deviated septum resulting from traumatic fracture and dislocation of the septal cartilage was also found. Because of the severity of the septal deformity, an extracorporeal reconstruction was required.

After separating the upper lateral cartilages and removing the entire septum en bloc, the specimen was turned 90°. In this manner, the bony cartilaginous junction, which has adequate length to maintain the existing dorsal length, can be used for dorsal reconstruction, and the new caudal septum is created from the previous dorsal septum. Spreader grafts were harvested from unused (deviated) segments of the original specimen and sutured to the neodorsum. Spreader grafts are a prerequisite for long-lasting correction of the crooked nose. Before removing the septum for extracorporeal reconstruction, the upper lateral cartilages and the bony dorsum are first reduced by the component technique, which we now prefer over the composite method. In this manner, the septal partition remains fully intact to provide maximum tissue for the cartilaginous reconstruction. Because this patient had relatively short nasal bones, the neoseptum could only be reattached to the upper lateral cartilages above and to the anterior spine below after creating two transverse drill holes in the nasal spine. The overprojected tip was reduced using the lateral sliding technique, while the nostril asymmetry, excessive nasal length, and tip ptosis were all corrected using the tongue-in-groove technique: the medial crura were retrodisplaced and deprojected and then sutured to the new caudal septum with multiple transseptal sutures. The dorsum was covered with a single layer of allogenic fascia lata. The tip itself was contoured by transdomal and spanning sutures (◘ Fig. 5.20).

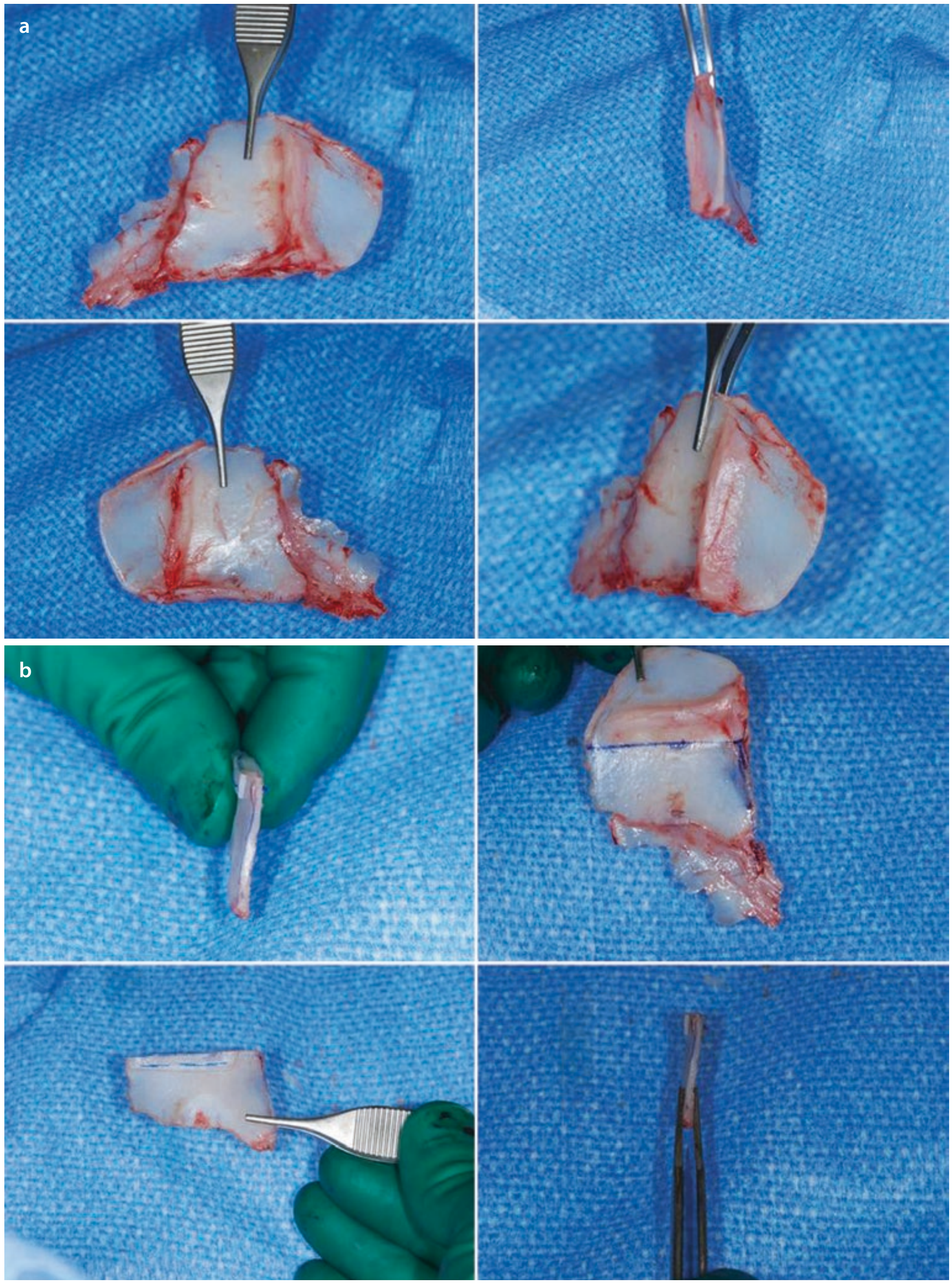
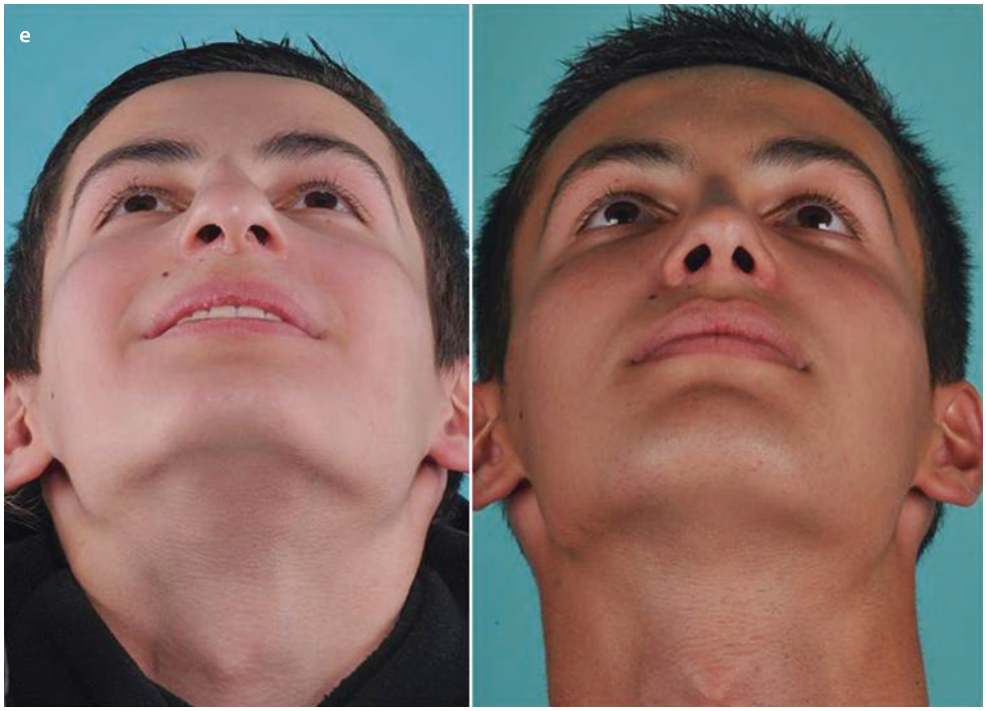


Fig. 5.20 (**a**–**b**) Reduction for rhinomegaly combined with extracorporeal septal reconstruction (**c**-**e**) Front view, profile view, base view pre-op/post-op

Fig. 5.20 (continued)

■ **Fig. 5.20** (continued)



5.2.7 Case 7: Widening of Internal Valves with Spreader Flaps

The technique of spreader flaps was used. Spreader flaps have three main goals: widening of the internal nasal valves, creating a smooth dorsum, and creating attractive dorsal aesthetic lines.

After separating the ULC from the septum and resecting the cartilaginous hump, attachments of the ULC are dissected from the undersurface of the nasal bones for better mobilization. The ULCs are then invaginated (i.e., folded inward with toothed forceps) and then sutured flush with the new dorsal septum. Spreader flaps must encompass the K-area to avoid an open roof deformity.

A 24-year-old female presented for surgical treatment with a severe septal deformity. Examination revealed displacement of the caudal septum into the right nasal vestibule and a narrow and overly high cartilaginous dorsum consistent with a tension-nose deformity. Additionally, the nasal skin was very thin, and the nasal cartilages were unusually weak. On profile examination, the nasolabial angle was also overly obtuse, in part due to the tension effect. Endonasal examination revealed bilateral nasal valve collapse.

Using the external rhinoplasty approach, the base of the caudal septum was trimmed and sutured in the midline (via ANS drill holes) after trimming the nasal spine to deepen the nasolabial angle. The dorsum was then lowered using the component technique in which the ULCs were individually separated from the dorsal septum. However, instead of trimming the ULCs, they were used for spreader flaps to widen the nasal dorsum and eliminate pinching of the internal nasal valves. Care was taken to suture the spreader flaps loosely in order to optimize dorsal width and valve patency. Tip contour was enhanced by first strengthening the lateral crura using cephalic fold-under flaps. After placement of a columellar strut graft, spanning sutures and a tip suspension suture with an anterior sling were used for tip support, refinement, and stabilization. Because of exceedingly thin nasal skin, the dorsum was then camouflaged using finely diced cartilage covered with a single layer of allogenic fascia lata (Fig. 5.21).

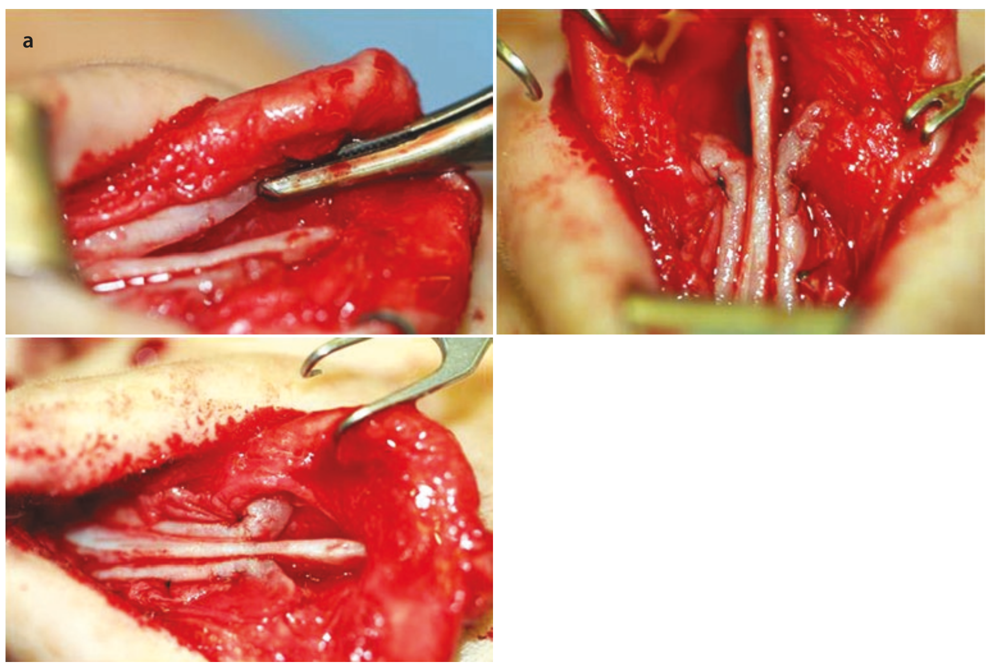


Fig. 5.21 (**a**) Widening of internal valves using spreader flaps (**b**–**d**) Front view, profile view, base view pre-op/post-op

■ **Fig. 5.21** (continued)

Fig. 5.21 (continued)

5.2.8 Case 8: Overprojected Dorsum Combined with Underprojected Tip

A 36-year-old woman presented with an overprojected dorsum, bulbous ptotic tip, and a narrow nasolabial angle. The entire nose was canted to the right side as a result of deviation of both the bony and cartilaginous vaults.

Using the open approach with an inverted-V incision, the septum was released from the nasal spine, shortened at its base, and fixed in the midline using a transverse drill hole through the anterior nasal spine. The hump was resected using the compound technique. Following hump reduction, the nasal dorsum was then narrowed and straightened using a Lindemann fraise to perform the paramedian osteotomy and an unguarded 2-mm osteotome to perform the percutaneous low-to-low lateral and transverse osteotomies. A tongue-in-groove technique was used for increased tip rotation, and the lobule was refined using a shield graft and transdomal sutures (Fig. 5.22).

Fig. 5.22 Overprojected dorsum combined with underprojected tip (**a**–**b**) increasing tip projection. (**c**-**e**) (Front view, profile view, base view pre-op/post-op.)

Fig. 5.22 (continued)

5.2.9 Case 9: Rhinomegaly: Reduction Rhinoplasty Combined with Extracorporeal Septal Reconstruction

A 19-year-old female presented for corrective surgery after childhood nasal trauma. Examination revealed a long, ptotic, and overprojected nose with a rounded tip and an acute nasolabial angle. The nasal axis was also deviated to the left. Endonasal examination revealed a severe septal deformity obstructing the right nasal airway.

Using the open rhinoplasty approach, we removed the entire septum and rotated it 90° so that the existing bony-cartilaginous junction became the new nasal dorsum, and the existing nasal dorsum replaced the deformed caudal septum. To maintain a straight neoseptum, bilateral spreader grafts were applied and the new caudal septum was reinforced with a batten graft fashioned from septal cartilage. To augment central tip support, a double-layered "sandwich" graft fabricated from conchal cartilage was used as columellar strut graft, and placed in front of the neoseptum. After lowering the cartilaginous dorsum incrementally with scissors, the bony dorsum was reduced with a chisel, and the nasal pyramid was straightened with percutaneous low-to-low lateral and transverse osteotomies. The neoseptum was replaced and sutured to the nasal bones after creating osseous drill holes in the upper/caudal aspect of the bony vault. Fixation was completed using horizontal mattress sutures to the upper lateral cartilages (ULC) and transosseous (drill hole) fixation to the anterior nasal spine (ANS).

For tip refinement, interdomal sutures and crural spanning sutures were first placed, followed by placement of a tip suspension suture with posterior sling to suspend the tip complex from the neoseptum. A nonintegrated shield graft was placed for improved tip contour and projection, and finely diced cartilage was used for final surface refinement and smoothing (Fig. 5.23).

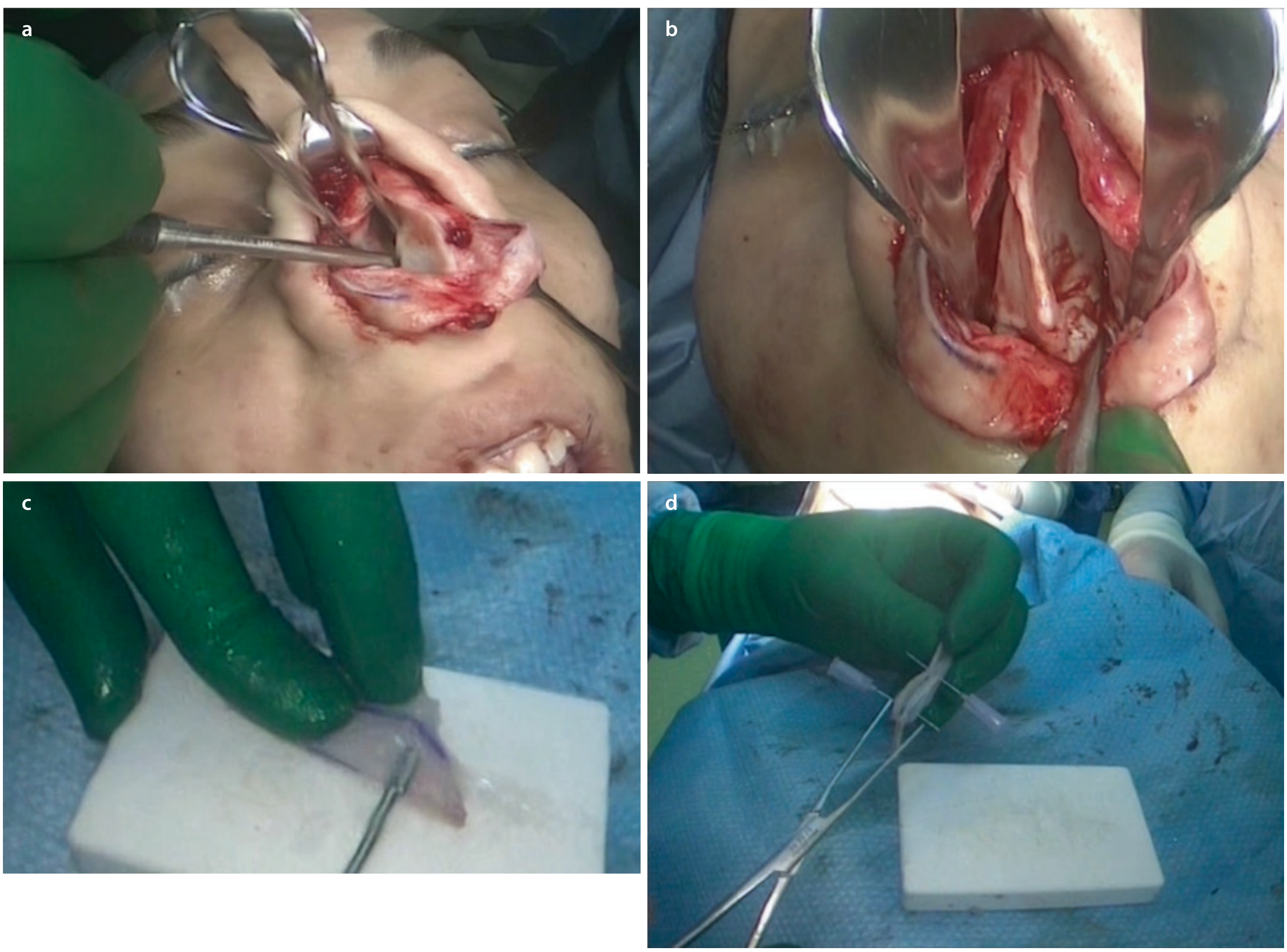


Fig. 5.23 (**a**–**j**) Extracorporeal septal reconstruction, double-layered conchal strut graft, tip contouring with shield graft, free diced cartilage for final refinements. (**k**–**m**) Front view, profile view, base view pre-op/post-op

■ **Fig. 5.23** (continued)

■ **Fig. 5.23** (continued)

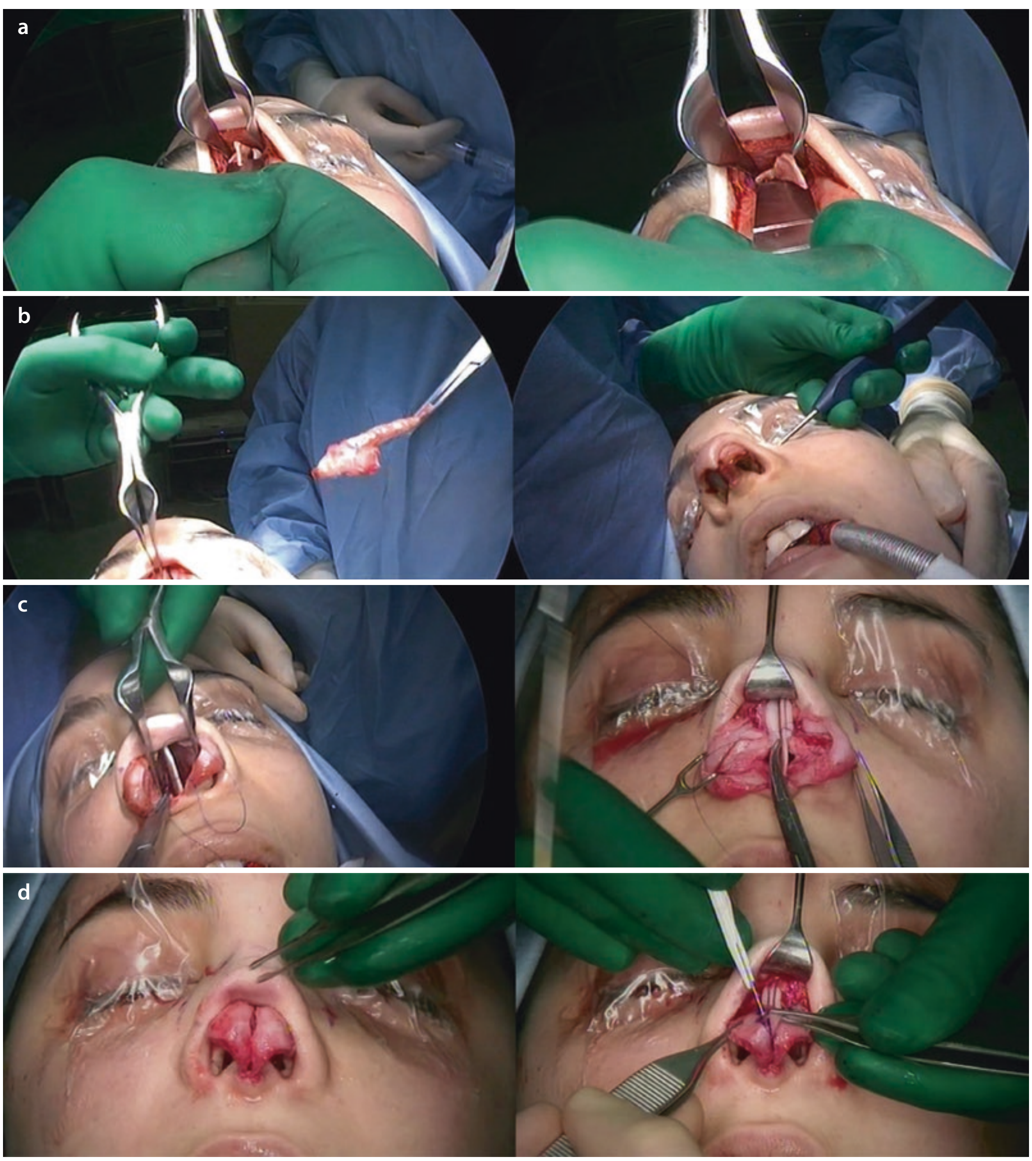
■ **Fig. 5.23** (continued)

5.2.10 Case 10: Rhinomegaly with Hypoplasia of the Chin: Reduction Rhinoplasty Combined with Lateral Crural Overlap (Sliding) Technique, Tongue-in Groove Technique, Spreader Flaps, and Chin Augmentation

A 27-year-old thin-skinned female presented with rhinomegaly and an hourglass-shaped dorsum. The nasal tip was broad, overprojected, and slightly ptotic.

Using an external rhinoplasty approach, extramucosal dissection was used to divide ULCs and denude the dorsal septum. The dorsal septum was then lowered with scissor resection. Next, the ULC attachments to the bony pyramid were released in the area of planned hump resection using blunt dissection, and the bony hump was resected with a sharp chisel. Owing to the wide-open roof produced by hump removal, no medial osteotomy was needed. After narrowing the bony pyramid with low-to-low lateral and transverse osteotomies, the ULCs were invaginated medially and used to form spreader flaps. Mattress sutures were used to secure the flaps in the desired position. The overprojected LLCs were then deprojected using the lateral crural overlap (sliding) technique. After deprojection, the medial crura were displaced anteriorly and cranially, and sutured to the caudal septum using the tongue-in-groove technique to upwardly rotate the ptotic tip. Transdomal sutures were applied near the cranial margin of the domes to maintain satisfactory infratip divergence, and an extended shield graft was used to augment the infratip lobule. Following placement of bilateral alar rim grafts, finely diced septal cartilage was used for final refinements and smoothing the dorsum.

For additional profile enhancement, augmentation genioplasty was also performed via a submental (extraoral) approach using a medium anatomically shaped silicone chin implant (Mentor[R]) (◘ Fig. 5.24).



◘ **Fig. 5.24** (**a**–**h**) Component hump reduction, percutaneous osteotomies, septal fixation to the ANS, spreader flaps, tip correction, FDC application. (**i**–**k**) Front view, lateral view, base view pre-op/post-op

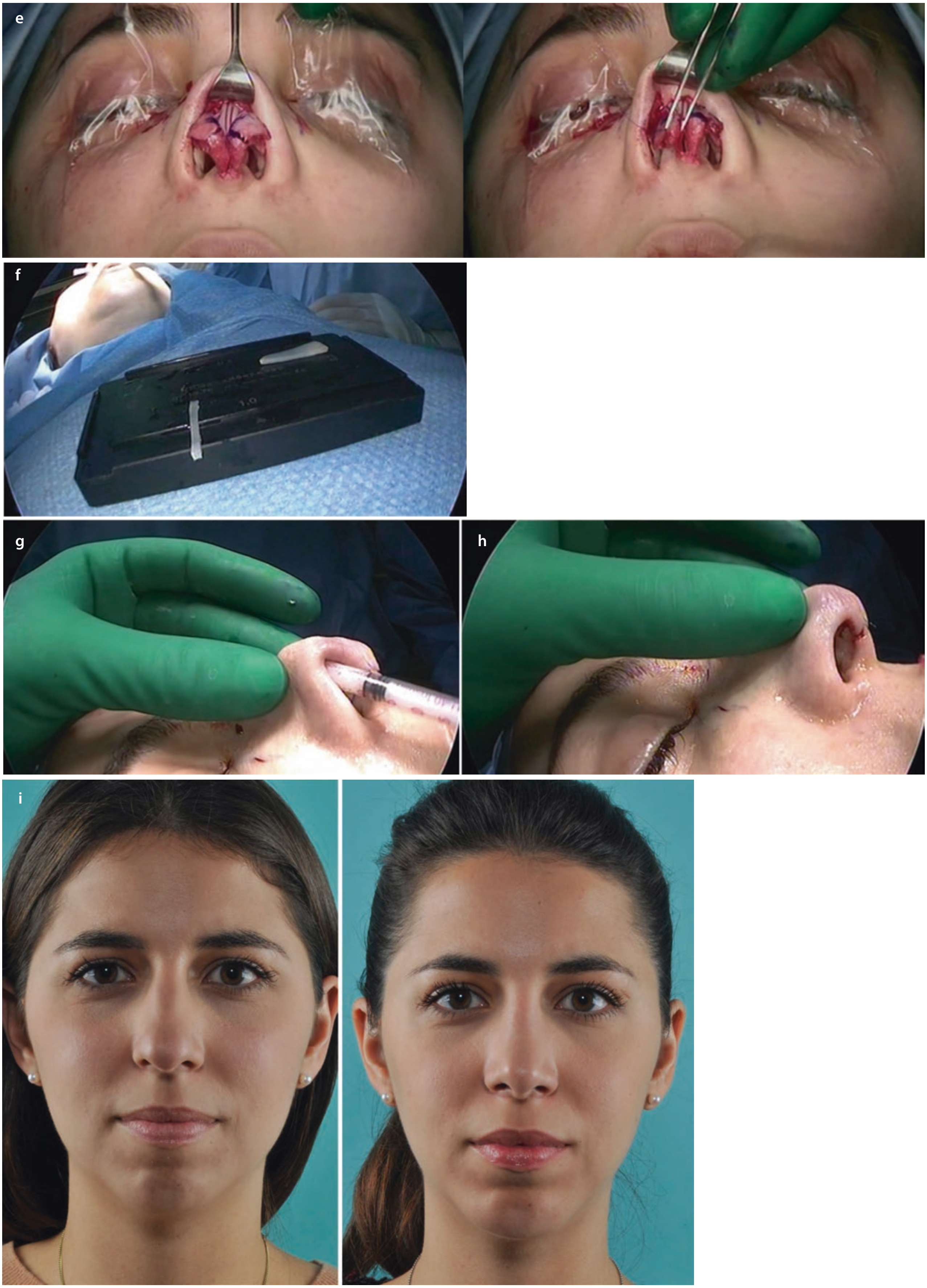
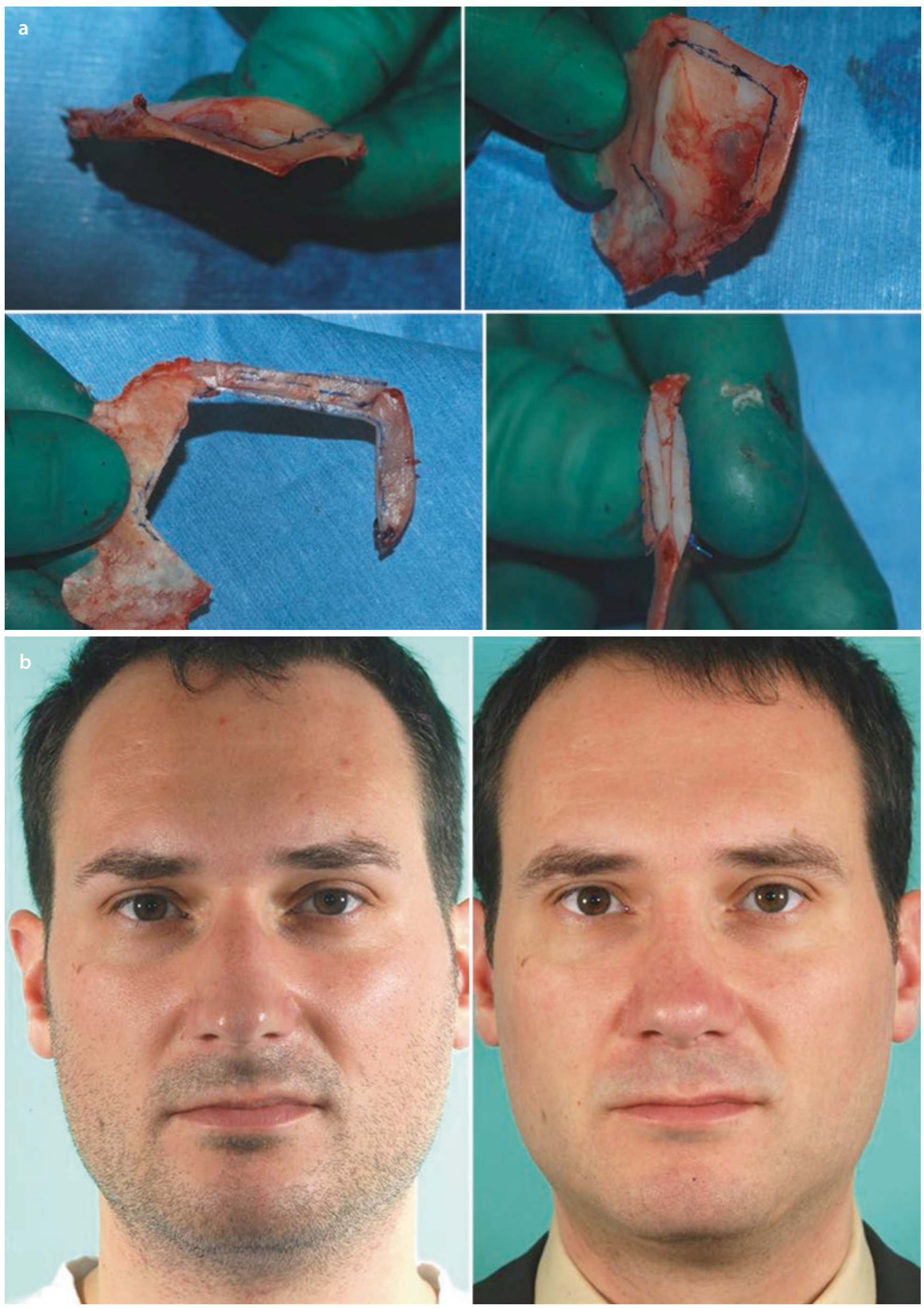


Fig. 5.24 (continued)

Fig. 5.24 (continued)

5.2.11 Case 11: Reduction Rhinoplasty Combined with Extracorporeal Septal Reconstruction Plus Shortening of the Nasal Spine

A 31-year-old male presented with rhinomegaly and a severely deviated septum that led to a narrowing of the internal valve and airway obstruction. The tip was wide, overprojected, and counterrotated. Using the external rhinoplasty approach, the dorsum was lowered using the compound technique with an en bloc hump resection. The severity of the septal deformity also necessitated extracorporeal septal reconstruction. However, because the septal deviation also included the dorsal septum, the small residual framework required spreader grafts from the deviated central septum for adequate stabilization. In addition, by reducing the size of the reimplanted L-strut, additional reduction in dorsal height was achieved. Tip projection was reduced using a lateral sliding technique, which also increased cephalic rotation. After reinserting the neoseptum, dorsal height was partially restored by reimplanting the composite dorsal hump after it was contoured with a power drill. The modified composite hump served as a full-length onlay graft, also augmenting the underprojected nasion (◘ Fig. 5.25).



◘ **Fig. 5.25** (**a**) Reduction rhinoplasty combined with extracorporeal septal reconstruction plus shortening of the nasal spine (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 5.25 (continued)

5.2.12 Case 12: Overprojected Dorsum and Overprojected Tip and Long Nose

A 32-year-old woman presented with rhinomegaly. Additionally, the septum was deviated to the right, and the left lower lateral cartilage (LLC) was malformed and prone to dynamic collapse on inspiration. A broad columellar base and asymmetry of the facial skeleton were also observed.

Using the open approach with extramucosal dissection, the split technique was used to separate the upper lateral cartilages and lower the cartilaginous dorsum. Owing to an exceptionally large hump, bony reduction was first performed with a flat chisel and then refined with a carbide rasp. Following paramedian, low-to-low lateral, and transverse osteotomies, the protruding remnants of the ULC were scored, folded inward, and sutured flush with the newly resected cartilaginous dorsum. The cephalic portion of the lower lateral cartilages was also folded under the lateral crura (fold-under flap technique) in order to preserve stiffness and facilitate further contouring with spanning sutures. Cephalic rotation and deprojection of the tip were achieved using the tongue-in-groove technique. To prevent a groove between the medial crura, a small columellar strut graft was used to fill the dead space and add additional structural support. The flared footpods were partially resected after trimming of the depressor muscle. Alar rim grafts were also placed to optimize contour of the nostril rims (Fig. 5.26).

Fig. 5.26 (**a**–**c**) Overprojected dorsum and overprojected tip and long nose. Front view, profile view, base view pre-op/post-op

5

■ **Fig. 5.26** (continued)

5.2.13 Case 13: Dorsal Reduction Combined with Chin Augmentation

The technique of chin augmentation was utilized. For optimal profile harmony, a chin augmentation is sometimes necessary. We prefer to perform chin augmentation through the submental approach, with the incision about 1.0 cm behind the submental crease. Using the extraoral approach, implant positioning and soft-tissue coverage are enhanced over the intraoral method. We also prefer using anatomically shaped silicone implants. The pocket is developed using blind subperiosteal dissection and controlling the instrument by palpating the tip of the elevator. Pocket size should be approximately the same size as the implant, and bilateral sutures are placed through mandibular drill holes for stabilization.

A 21-year-old female presented complaining of an unattractive facial profile. Profile examination revealed a prominent dorsal hump exacerbated by an underprojected chin. The occlusion was normal. On frontal view, the dorsal aesthetic lines were narrow and uneven. A seagull deformity was present on basal view.

Following hump reduction using the open rhinoplasty approach, spreader grafts were used to widen the narrow internal nasal valves and straighten the crooked dorsum. For elimination of the seagull deformity, the LLCs were first dissected off the underlying vestibular skin while keeping the perichondrium attached. The cephalic margin was then folded under the lateral crus for improved support and contour, and spanning sutures were added for additional contour enhancement. To create a more harmonious profile, chin augmentation was performed using a large, anatomically shaped silicone prosthesis inserted through the extraoral submental approach (Fig. 5.27).

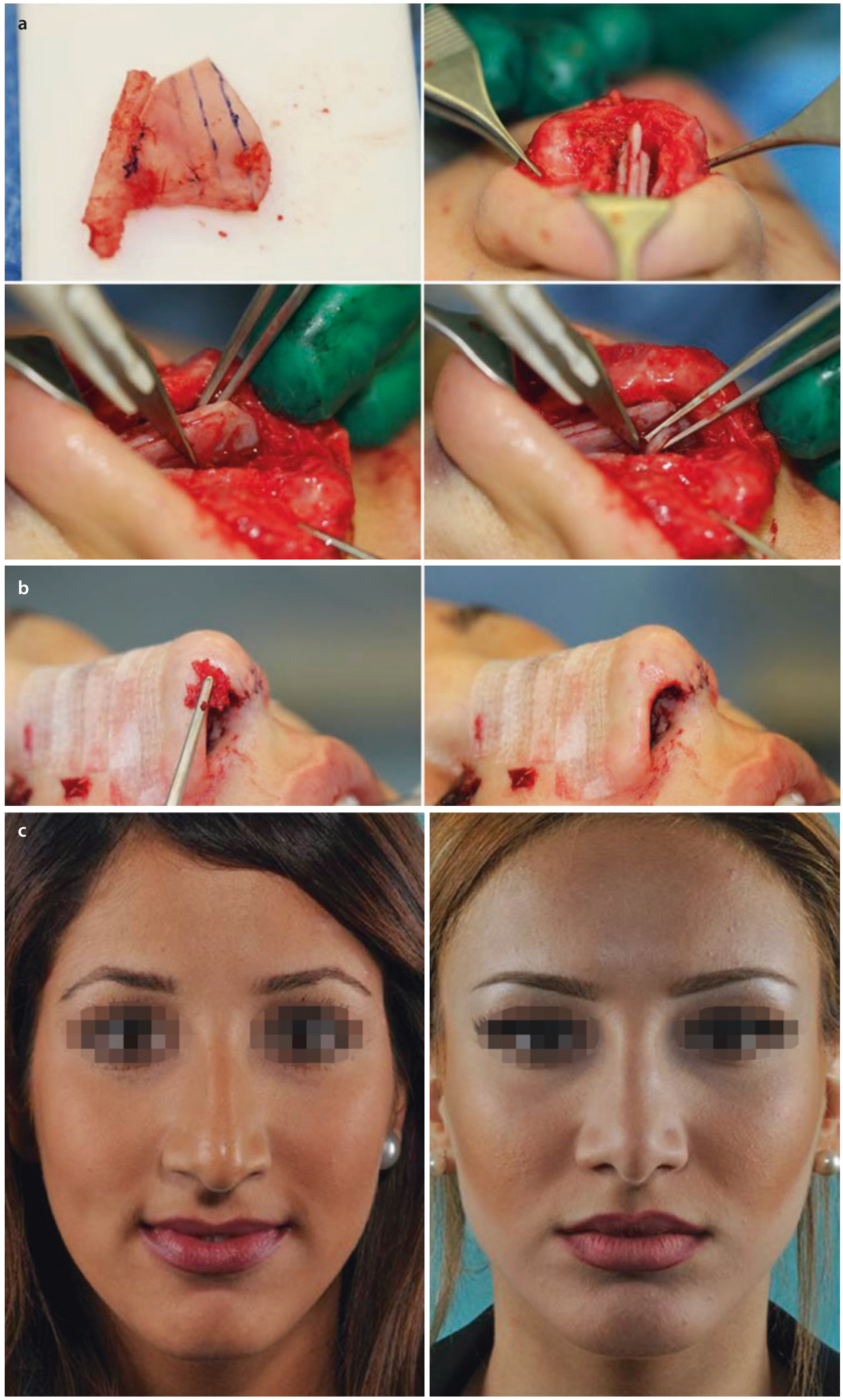


Fig. 5.27 Dorsal reduction combined with chin augmentation. (**a**–**b**) Spreader grafts and augmentation of the soft triangle with morselized cartilage. (**c**–**e**) Front view, lateral view, base view pre-op/post-op

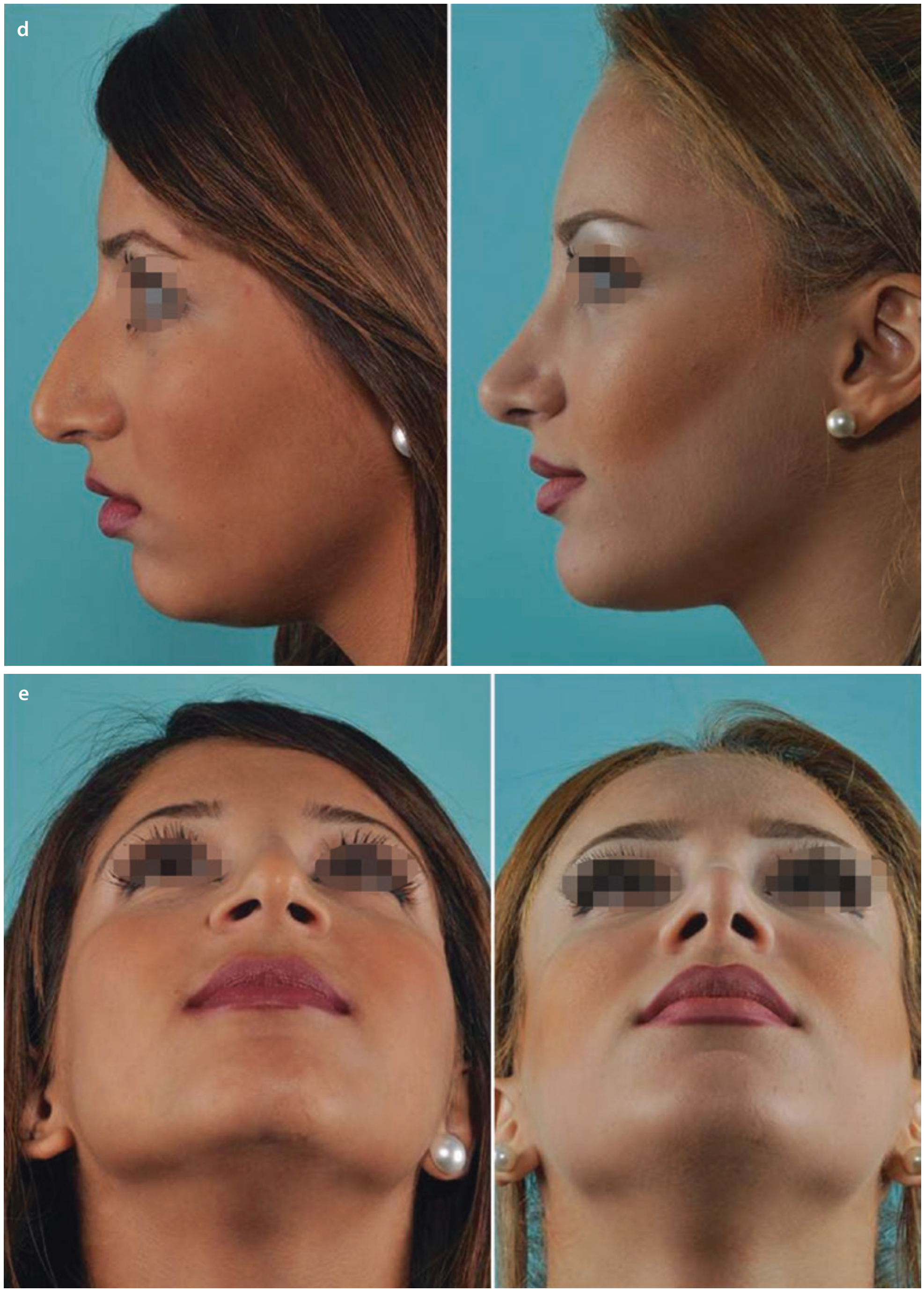


Fig. 5.27 (continued)

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Secondary Correction of the Dorsum Including Polly-Beak Deformity

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_6

6.1 Surgical Principles

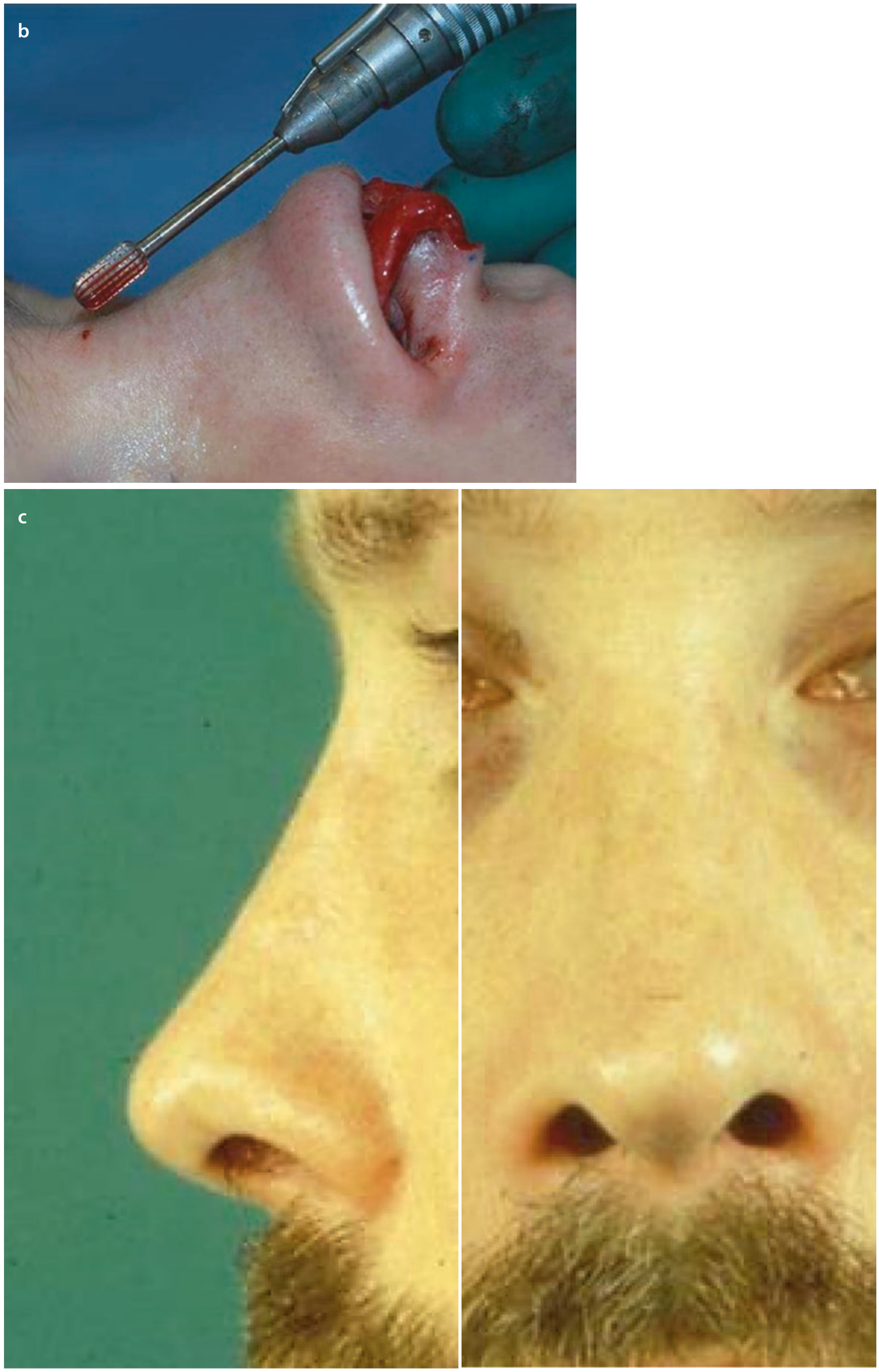
The most common cosmetic profile deformity in secondary rhinoplasty is irregularity of the nasal dorsum. Dorsal irregularities can be minor or major and can arise from overresection, underresection, or insufficient skeletal camouflage. In the overresected dorsum, restoration requires replacement grafting similar to treatment of a saddle-nose deformity. Conversely, the underresected dorsum merely needs removal of the overprojected segment, and in minor cases this may be accomplished with a sharp rasp or power drill (Fig. 6.1).

Another common postsurgical dorsal irregularity is the polly-beak deformity. In this deformity, the cartilaginous dorsum represents the highest point in the nasal profile, and there are a wide variety of underlying causes for this kind of deformity. According to Foda, postoperative tip droop is the most common cause of the polly-beak deformity, but the deformity may also arise from overresection of the bony dorsum, underresection of the cartilaginous dorsum, or scar-mediated thickening of the supratip skin where the soft tissues are comparatively thick. Postoperative tip droop occurs more often with the closed rhinoplasty approach, because many surgeons fail to adequately compensate for the fact that ligamentous soft-tissue support mechanisms are disrupted during exposure of the tip cartilages. Various techniques can be used to reconstitute disrupted tip support, including columellar strut graft placement, the tongue-in-groove technique, or the application of tip suspension sutures.

Another cause of compromised tip support and loss of tip projection is overresection. Similarly, overresection of the lower lateral cartilages (LLCs) may also reduce tip support, and this commonly results from misguided attempts to create a more delicate tip using only extended cartilage resection. In addition to loss of tip support, overresection of the LLCs can also produce unsightly deformities of the ala and nasal tip. Combined overresection of the LLCs and anterior septum can also result in a multifaceted deformity of even greater magnitude.

Fig. 6.1 (**a**–**c**) Motor drill for correcting bony irregularities

Fig. 6.1 (continued)



6.2 Treatment of the Undersupported Nasal Tip

Treatment of the poorly supported nasal tip depends upon identifying and eliminating the underlying root cause. Therefore, a careful surgical analysis is paramount, and removal of overlying scar tissue is necessary before the true etiology of tip droop can be correctly identified. In summary, postsurgical tip droop may result from a variety of causes, including inadequate ligamentous support, weak medial crura, overresection of the caudal septum, and/or overresection of the LLCs. Frequently postsurgical tip droop is also produced by more than one cause.

In the case of inadequate ligamentous support to the medial crura, a columellar strut graft can be highly effective at restoring lost tip support and projection. Donor graft material is preferentially harvested from the septum, since it is well suited to strut grafting and easy to harvest (◘ Fig. 6.2). Although a large portion of the quadrangular septum may have already been removed in secondary cases, frequently the long cartilaginous "tail" of the quadrangular septum may still be available for graft harvest. We have found that this portion of the quadrangular cartilage makes an ideal columellar strut graft. However, if surplus septal cartilage is unavailable, cartilage from the concha cymba can be used for creation of a "sandwich"-type columellar strut graft (◘ Fig. 6.3). The advantage of the conchal graft is derived from suturing two reciprocally curved opposed segments together to create a single, straight, and stable strut graft that will resist warping over time. Usually the concha cymba provides adequate graft length and can be harvested from the anterior approach to include the posterior perichondrium. The cartilage can be divided along its long axis (while keeping the perichondrium intact) and folded upon itself. A modified Aiach clamp is then used to immobilize the bivalved cartilage halves during suture fixation to create the double-layered conchal sandwich (◘ Fig. 6.4). If a longer graft is necessary, it can be created by harvesting larger portions of the conchal bowl or by suturing both conchae together (◘ Fig. 6.5). When necessary, rib cartilage can also be used for columellar strut grafting. However, in the past we rarely used rib grafts, not only because of the risk of warping but also because suture fixation with transseptal mattress sutures often leads to infection, which can be avoided when using auricular grafts. The differences in susceptibility to infection may be explained by the presence of intact perichondrium, which is absent from carved rib grafts. These days, we use more and more rib grafts after developing instruments for easier harvesting (Rollin Daniel at Medicon), using the ninth or tenth rib instead of the sixth rib, which is quicker to dissect and yields more firm cartilage in revision cases in which septal and conchal cartilage have already been used. Further, our actual concept includes a final touch-up with paste-like free diced cartilage (FDC).

Inadequate tip support and nasal tip ptosis can also result from overly weak medial crura. When tip ptosis occurs in the presence of an overly long septum, the tongue-in-groove technique can be used to suspend the weak medial crura and correct the drooping nasal tip (◘ Fig. 6.6). By suturing the medial crura to the anterior edge of the overprotruding caudal septum, the tongue-in-groove technique restores tip projection, rotation, and support while simultaneously reducing excessive columellar protrusion.

In secondary cases, tip ptosis often results from previous overresection of the lower lateral cartilages. Treatment of overresected tip cartilage inevitably involves cartilage augmentation grafting, and various options are available for reconstruction. In general, we prefer using septal cartilage because of its favorable biomechanical characteristics, but rib or conchal cartilage can also be used when surplus septal cartilage is unavailable. Preoperative planning is essential to maximize utilization of limited septal graft material, especially when multiple grafts are needed (▶ see Fig. 6.2), and the maximum amount of cartilage is harvested as a single piece to permit the greatest flexibility in treatment planning. When available, residual septal cartilage remnants should be placed back into the septum to minimize unwanted movement of the donor site mucosa. In cases in which donor septal cartilage has been depleted, our next choice is rib cartilage graft material harvested from the 9th, 10th, or 11th rib through a small horizontal incision. Despite the donor site morbidity associated with rib graft harvest, we prefer rib cartilage over conchal cartilage because it is easily sculpted with a motor-driven fraise to produce thin and delicate lower lateral cartilage replacement grafts.

Regardless of the donor source, long, thin, and flexible cartilage strips are needed to repair damaged or missing segments of the overresected LLCs, and we employ various techniques, depending on the status of the residual framework. In every case we first assemble the reconstructed framework with small needles before securing the grafts with 6-0 nylon sutures.

Previously we used nylon sutures for permanent fixation of all tissue grafts. However, we occasionally observed minor suture abscess formation probably caused by foreign-body reaction of the nonresorbable suture material. For that reason, we have since switched to resorbable 5-0 or 6-0 polydioxanone (PDS) suture material and have subsequently noticed a significant reduction in the incidence of suture abscess formation, although without apparent change in graft stability.

In thin-skinned patients, we cover the reconstructed domes with onlay grafts of fascia or soft tissue to prevent visible contour irregularities (▶ see Fig. 6.13). When the residual LLC framework is missing large portions of both the lateral and intermediate crura, we employ a graft bending technique (◘ Fig. 6.7) in which the entire lateral crus, dome unit, and intermediate crus are simultaneously reconstructed using a single anatomically shaped replacement graft. To achieve adequate bending at the nasal dome, autologous septal or rib cartilage must be carefully thinned at the tip-defining point using a cylinder-shaped, motorized diamond fraise (◘ Fig. 6.8). Although thinning can also be performed with a scalpel, it is difficult to achieve the uniform and precise thinning required to prevent fracture of the graft. In cases where adequate bending cannot be achieved with thinning alone, we use a scoring technique in which the domes are also carefully scored to attain additional flexibility (◘ Fig. 6.9). However, in some cases, such as partially calcified rib cartilage, the graft material is overly brittle, and through-and-through fractures of the tip-defining point cannot be avoided. In this situation, the fractured graft resembles a vertically divided alar cartilage in which the lateral and intermediate crura are divided at the tip-defining point. When such fractures occur, we employ a dome division technique in which the opposite dome is divided for symmetry, and the graft edges are reapproximated with horizontal mattress sutures (◘ Fig. 6.10). Alternatively, if a thick columellar strut graft is available, we use a split graft technique in which a sagittal split is created in the distal end of the strut to permit simultaneous reconstruction of the columella and infratip with only a single strut graft (◘ Fig. 6.11). Finally, when tissue replacement is confined to the lateral crus, we use a batten graft technique to reconstruct deformed or missing segments of the lateral crus (◘ Fig. 6.12). Alternatively, when the crus is severely deformed or absent, we prefer lateral crural strut grafts, which extend farther laterally than batten grafts to better restore support and contour to the alae. Only when the patient refuses the use of rib cartilage do we resort to conchal cartilage. Our experience indicates that conchal cartilage is the least desirable graft material owing to its predetermined shape, which is often difficult to modify with sutures or other techniques described earlier. After reconstruction of the cartilaginous tip framework, we may cover the cartilage with soft-tissue grafts for camouflaging (◘ Fig. 6.13), but this technique has been mostly replaced recently by using free diced cartilage (FDC).

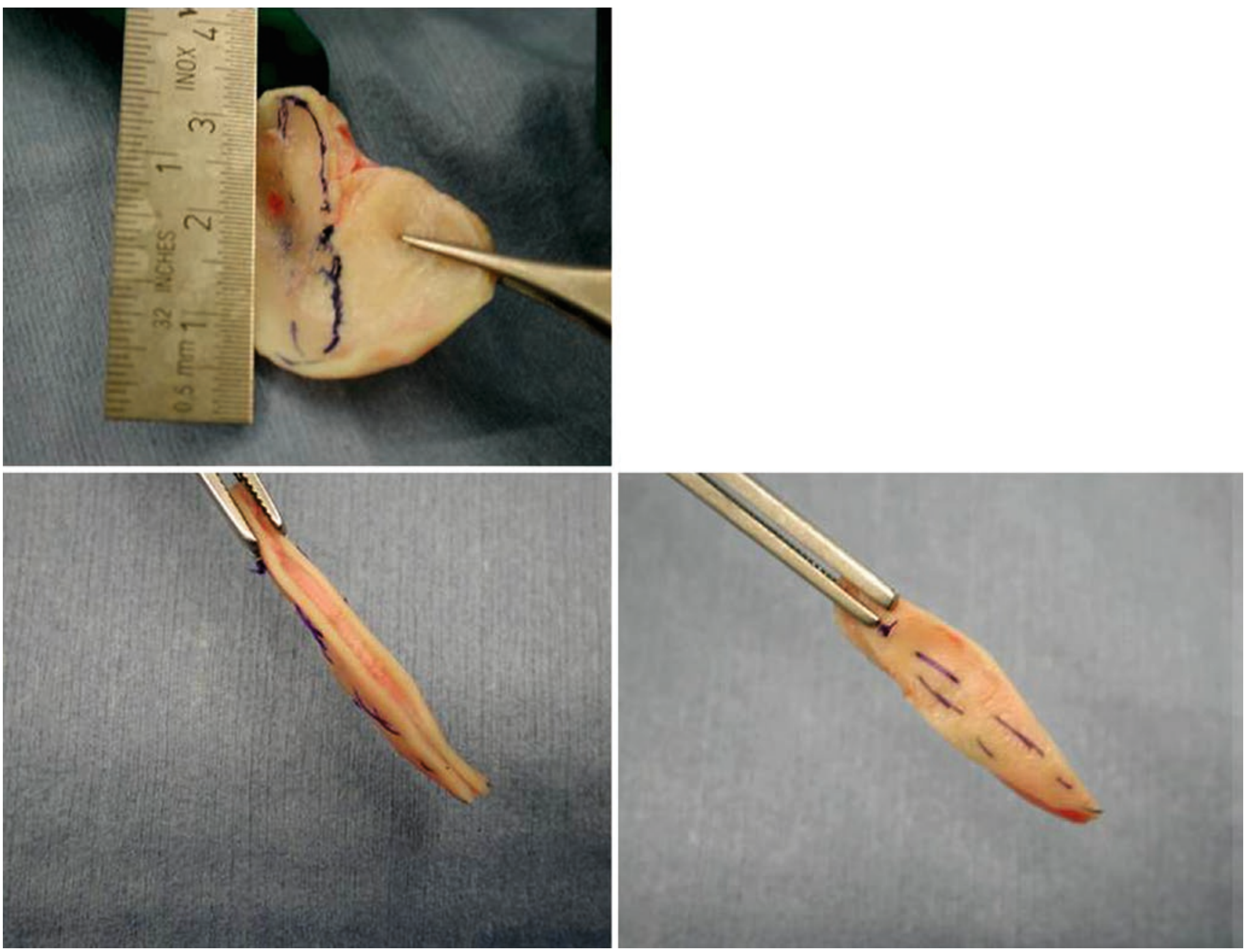
In all cases of nasal tip reconstruction, it is essential to reunite the newly reconstructed framework with the cartilaginous dorsum using long-lasting but resorbable suture material such as PDS fixation sutures. Two main types of suspension suture are used for this purpose: a combination of spanning and suspension suture (◘ Fig. 6.14) and a simple sling-type suspension suture (◘ Figs. 6.15 and 6.16). Although elimination of lateral crural flaring and tip suspension are accomplished simultaneously with the combination suture, this technique is contraindicated in weak cartilage, since an unsightly concave lateral crural deformity usually results. However, when the reconstructed crural cartilages have adequate rigidity, as they most often do following skeletal reconstruction, the combination suture technique is preferred. Placement of the combination suture is a two-step process in which the suture first is passed through both lateral crura in the manner of a standard (bilateral) spanning suture to eliminate crural flaring and then is knotted to prevent further crural movement. The suture is then passed through the dorsal septum, tightened until the desired degree of tip suspension is established, and then knotted a second time to complete the suspension (▶ see Fig. 6.14).

When the lateral crura do not require suture modification, a simple (buried) suspension suture is preferred. However, unlike the combination suture, which uses both lateral crura as suspension points, the simple suture uses only the columella for suspension. To prevent exposure of the nonabsorbable suture material, the stitch must be buried beneath the overlying vestibular skin and the medial crura using a cannulation technique. In the first step, a permanent suture is sewn to the caudal septum at the designated upper suspension point. Next, a second suspension point is selected along the infratip lobule that is oriented to produce the desired profile configuration. A small hollow-bore needle is then inserted at the columellar suspension point and passed between the vestibular skin and medial crus to the designated fixation point on the dorsal septum. One end of the suspension suture is then threaded retrograde through the needle until it emerges from the opposite end. The needle is then removed and reinserted at the equivalent point on the opposite side of the columella to permit antegrade passage of the suture back to the septal fixation point, where it is knotted and tied. In this manner, the knot is buried internally within the membranous septal pocket, where it is neither visible nor palpable. We refer to this configuration as a simple suspension suture with posterior sling (▶ see Fig. 6.15). Alternatively, both ends of the suspension suture can be passed anteriorly and tied over the columella—the so-called tip suspension suture with an anterior sling. Although this placement is easier, knot placement may result in a visible and/or palpable irregularity of the columella in thin-skinned patients (▶ see Fig. 6.16). The advantage of this type of suspension suture is the exact positioning of the tip after flipping back the flap.

When revising the overresected nasal tip, skin thickness often becomes an important factor in treatment planning. In dealing with the thick-skinned nose, it is generally preferable to enlarge the skeletal framework as much as cosmetic tolerance will allow, thereby stretching the overlying soft-tissue envelope and maximizing tip definition. However, aggressive skin stretching is sometimes contraindicated because it occasionally results in an unacceptably large nose. On the other hand, attempting to create a smaller skeletal framework often results in soft-tissue polly-beak formation, since the supratip skin may fail to contract and give rise to dead space, excessive subcutaneous fibrosis, and unwanted skin thickening. In this uncommon scenario, a direct vertically oriented fusiform excision of the supratip skin can be used to eliminate the polly-beak deformity by excising the scarred skin and reducing the overall skin volume, what we call a “supratip excision” (◘ Fig. 6.17). To prevent conspicuous scar formation, closure is accomplished only with subcutaneous sutures, and in our series of 36 patients, only three developed significant scarring.

Unsuccessful treatment of a nasal hump deformity can result in either overresection or underresection of the nasal dorsum. In the overresected dorsum, treatment requires augmentation to restore lost height. Options for dorsal augmentation vary according to the location of the deformity and to the extent of overresection. For minor deformities, tragal cartilage or fascial grafts, either autologous or allogenic, are suitable. Cartilage remnants from cephalic resection of the LLCs cartilages are also well suited to this purpose, but in recent years our workhorse for such a problem has been FDC, which is diced so finely that it can be pressed easily through the tip of a tuberculin syringe and then used like a paste. However, for medium-sized defects, greater volume is required, and layered fascial grafts or cartilage harvested from the septum or auricle can be used for this purpose (▣ Fig. 6.18). When using septal cartilage, a flat graft with beveled edges or a lightly morselized graft is preferred. Crushed septal cartilage is not recommended because chondrocyte survival is unpredictable. When using conchal cartilage, a soft malleable graft is obtained by cross-hatching the cartilage while leaving the opposite perichondrium fully intact; layered conchal grafts are preferred for the correction of saddle deformities confined to the cartilaginous dorsum. Finally, major defects involving the entire nasal dorsum are best reconstructed with DC-F grafts to create a uniform and natural-appearing restoration of the nasal bridge. However, in the complete absence of underlying skeletal support, a solid rib cartilage construct is first used to rebuild the L-strut, and the DC-F graft is used merely as an onlay graft to camouflage the underlying solid construct.

▣ **Fig. 6.2** Planning of the grafts



▣ **Fig. 6.3** Sandwich graft from the concha

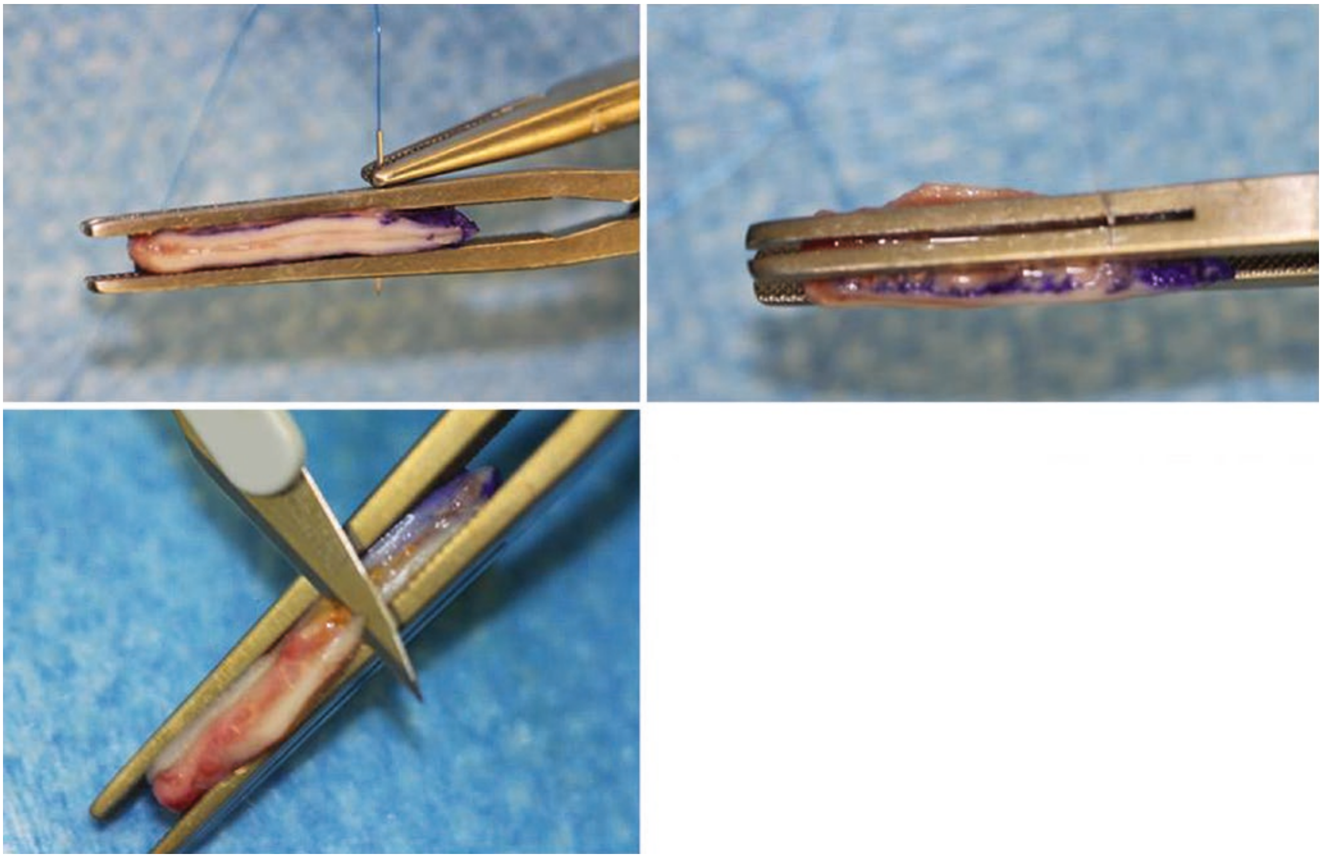


Fig. 6.4 Modified Aiach clamp creating a sandwich graft

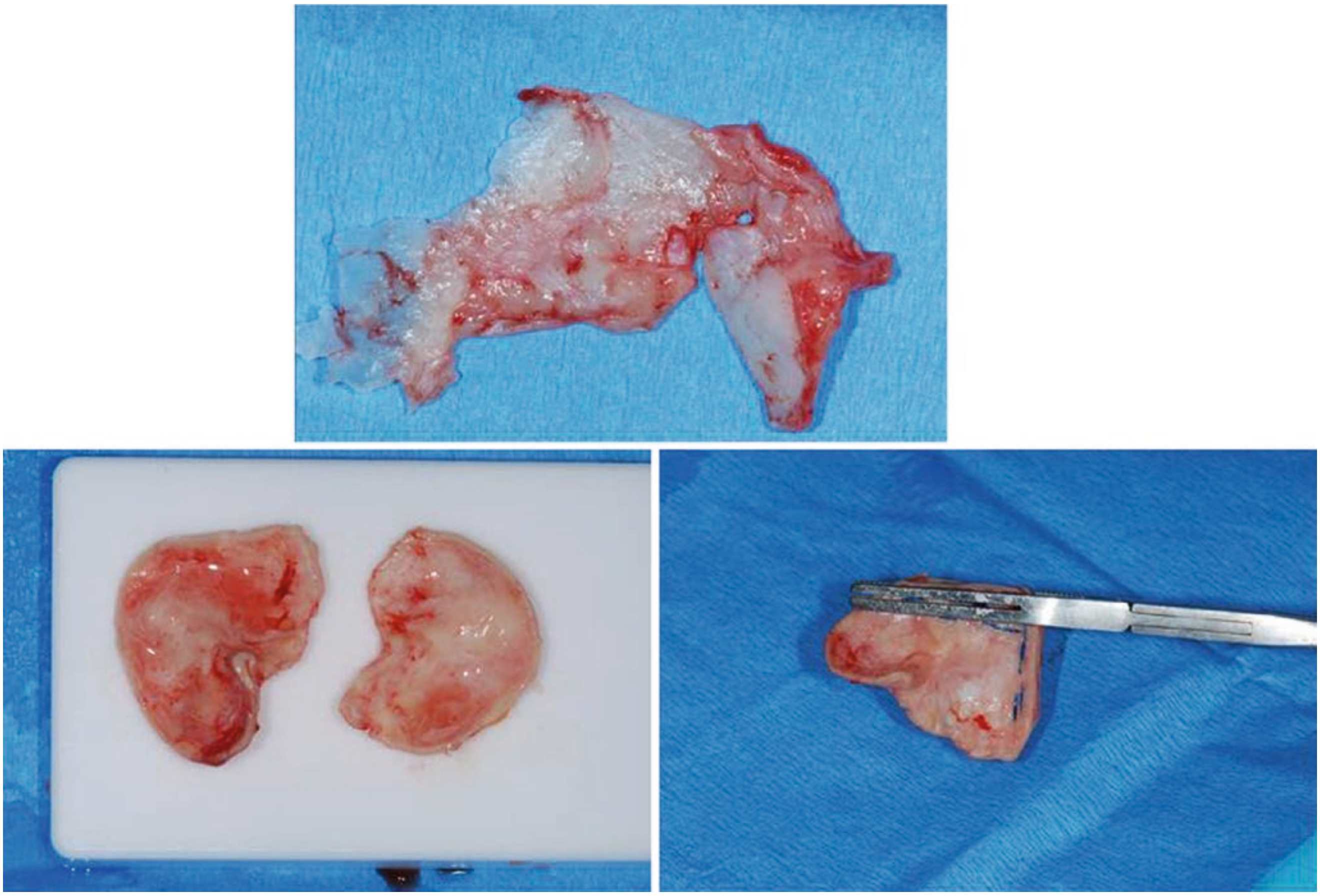


Fig. 6.5 Septum reconstruction from both conchae

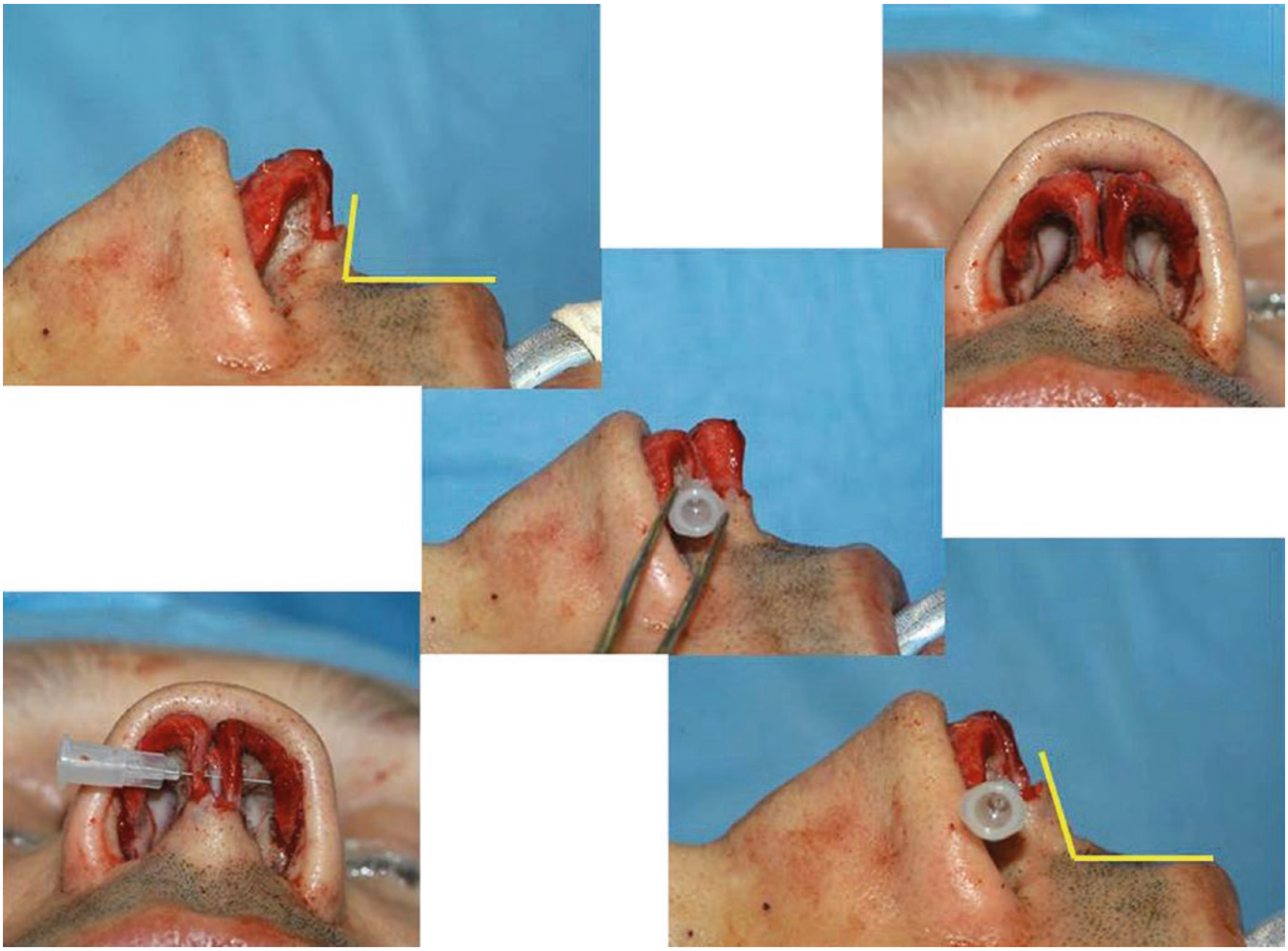


Fig. 6.6 Tongue-in-groove technique

Fig. 6.7 Bending technique

Fig. 6.8 Thinning the cartilage by a motor fraise

Fig. 6.9 Scoring technique

Fig. 6.10 Dome division technique

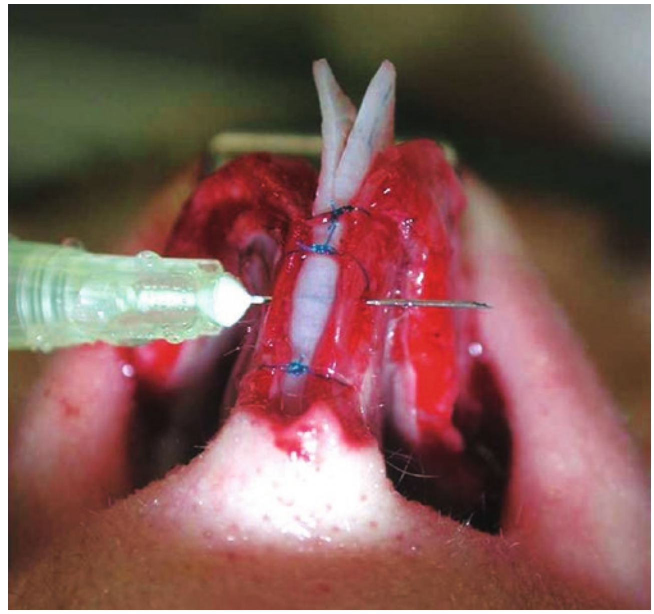


Fig. 6.11 Split technique

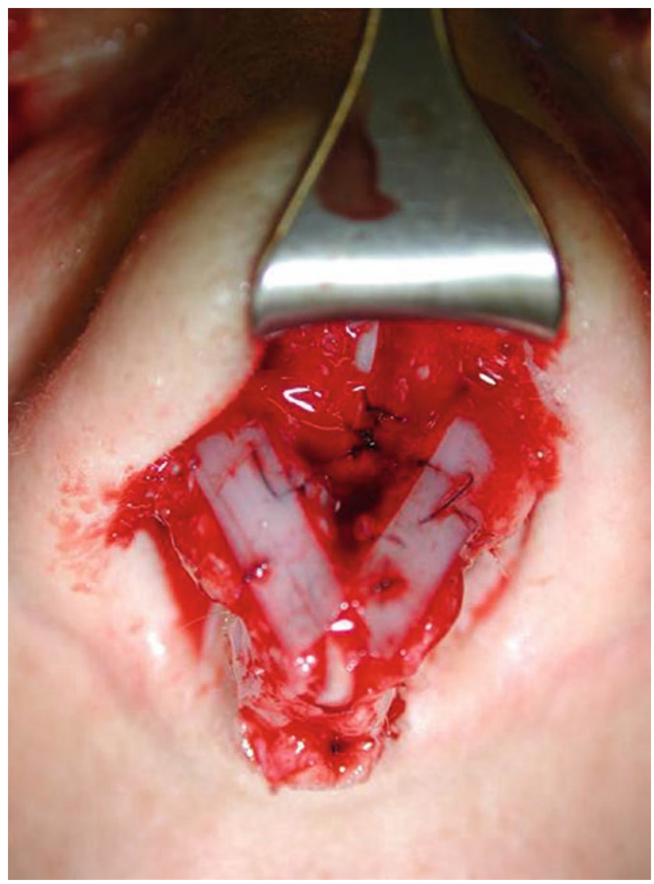


Fig. 6.12 Batten graft technique

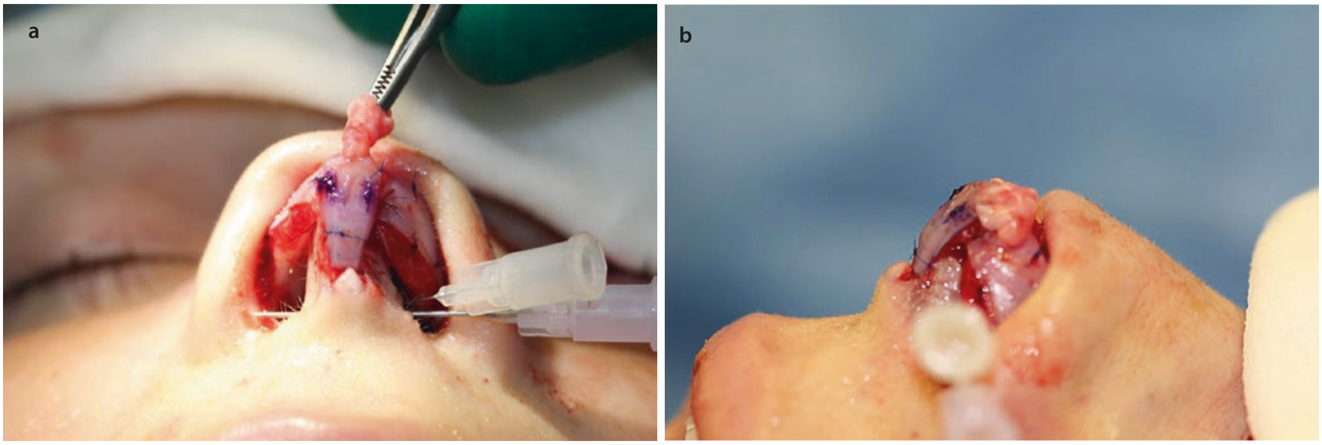


Fig. 6.13 (**a**, **b**) Covering the reconstructed framework with soft-tissue graft

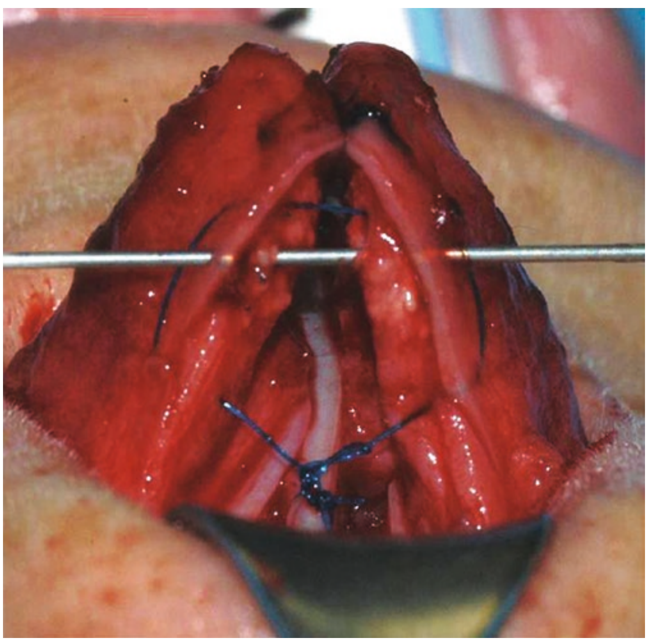
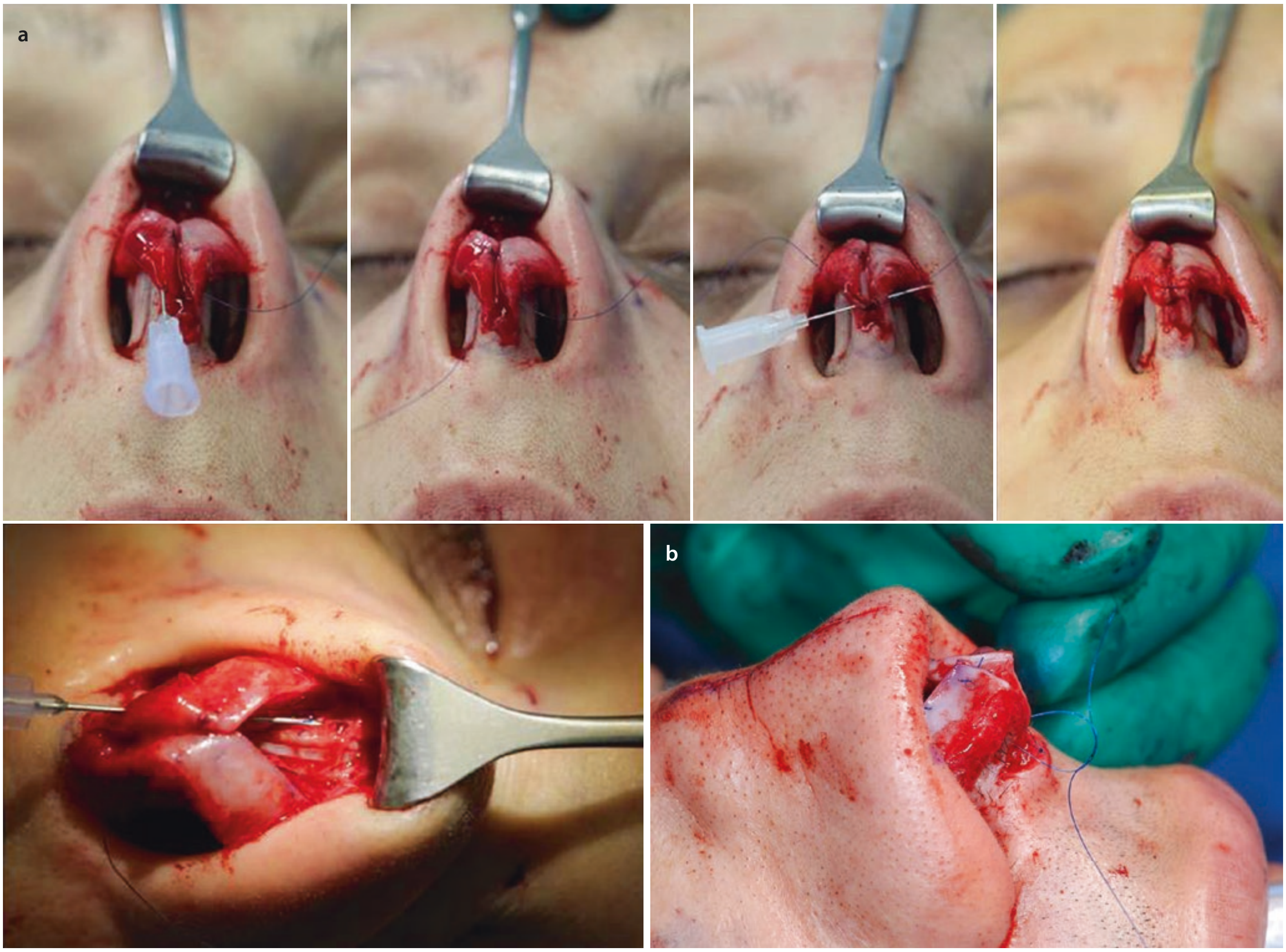


Fig. 6.14 Spanning suture combined with tip suspension suture

Fig. 6.15 Posterior sling suspension suture



■ **Fig. 6.16** (**a**, **b**) Anterior sling suspension suture

■ **Fig. 6.17** Supratip excision

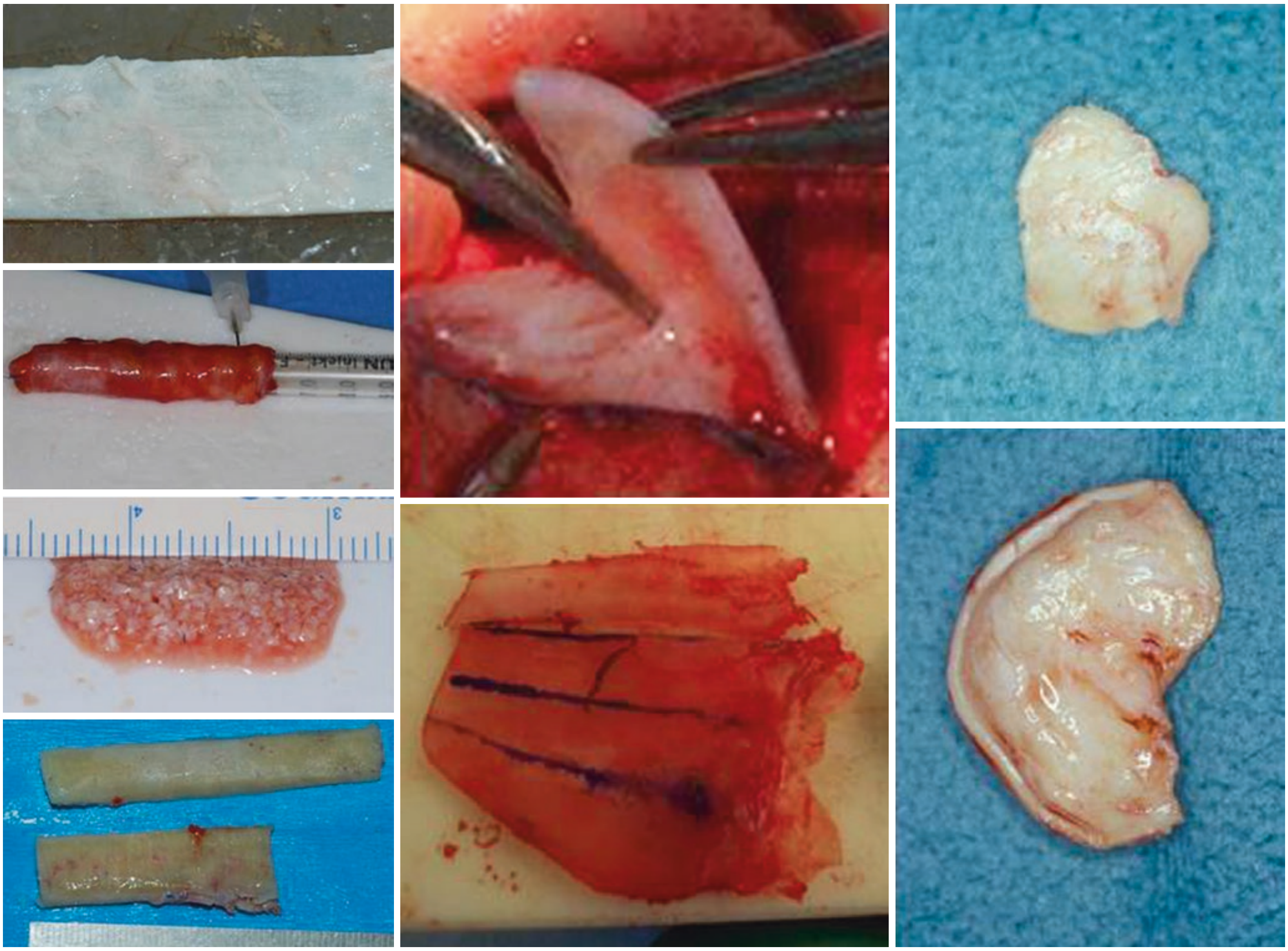


Fig. 6.18 Material for augmentation

6.3 Case Studies

6.3.1 Case 1: Polly-Beak Deformity with Tip Ptosis and Deviated Nose in a Thin-Skinned Patient

A 40-year-old female presents after an unsuccessful rhinoplasty for possible revision surgery. Examination revealed a polly-beak deformity with an asymmetric tip and left alar pinching. The columella was oblique and the nostrils were also asymmetric. The dorsum revealed an S-shaped deviation of the nasal axis, irregular aesthetic dorsal lines, and numerous skeletal irregularities visible through thin overlying nasal skin.

Using the external rhinoplasty approach, the tip cartilages were exposed leaving the subcutaneous scar attached to the tip framework. After removal of the scar tissue, overresected and deformed LLCs were observed. The anterior septum was also overresected leaving only a weakened 6 mm-wide septal framework that was displaced into the left nasal vestibule.

The ninth rib was harvested and cut into long 10 mm wide strips. The strips were then carefully thinned to a uniform thickness of 1.5 mm using a sculpture board (Medicon^{R}). Bilateral strips were then sewn to the dorsal septum as extended spreader grafts. The caudal septum was also reconstructed using two additional strips as splinting grafts. The tip framework was reconstructed using batten grafts and lateral crural strut grafts to contour and strengthen the weak and overresected LLCs. The LLCs were then sutured to the reinforced double-layered rib graft which represented the new anterior septal border. The tip was also contoured with intradomal and interdomal sutures. Following partial closure of the skin flap, free diced cartilage (FDC) was used as a malleable onlay to obtain a smooth and even surface contour (Fig. 6.19).

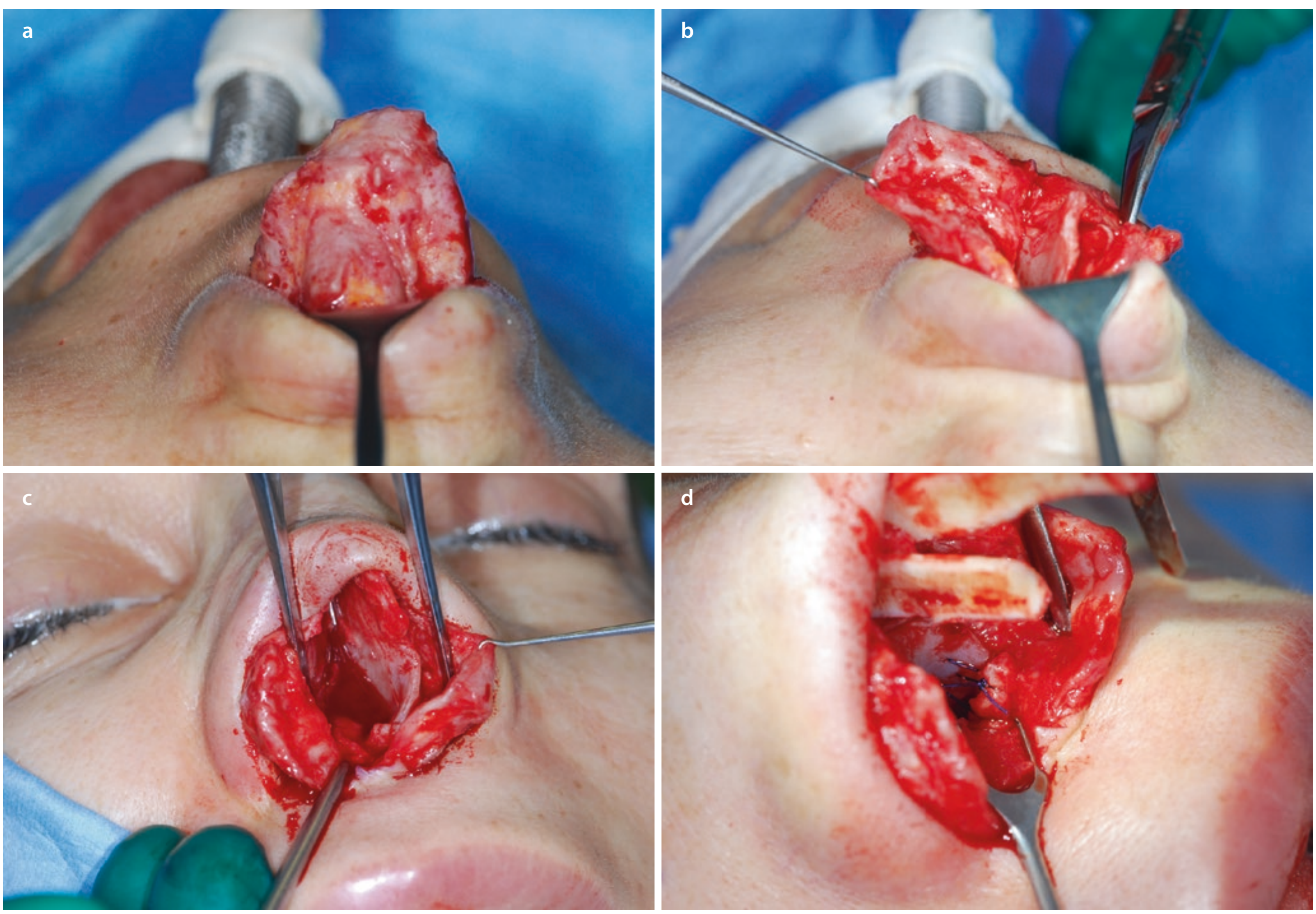


Fig. 6.19 (**a**) Overresected and scarred LLCs. (**b**, **c**) Overresected and deformed anterior septum. (**d**) Dorsal reconstruction with extended spreader grafts from rib. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 6.19 (continued)

6

Fig. 6.19 (continued)

6.3.2 Case 2: Complex Deformity with Polly-Beak Parrot Beak from Incomplete Hump Reduction

A 37-year-old male presented for revision rhinoplasty. Examination revealed tip ptosis with a polly-beak deformity and C-shaped deviation of the nose to the patient's left side. The bony pyramid remained overly wide, and palpation revealed a depressed right nasal bone. In conjunction with a severe anterior septal deviation, extracorporeal septal reconstruction was deemed necessary to straighten the nose.

Using the external rhinoplasty approach, the nasal framework was surgically degloved. After freeing the upper lateral cartilages, C-shaped curvature of the anterior septum was confirmed. Parasagittal medial osteotomies were performed, and the entire septal partition was then removed. Owing to flat segments of the posterior septum, the specimen could be rotated 90° to create a flat septal L-strut for reinsertion. Spreader grafts were added to the neo-L-strut in order to reinforce the dorsal segment, and a batten graft was used to straighten the caudal segment. The newly reconstructed L-strut was then returned to the septal pocket for suture fixation. Cephalically the neoseptum was sutured to both the nasal bone after placing drill holes and to the upper lateral cartilages for dorsal fixation. Caudally, the spine was debulked on the left side to restore midline symmetry, and a transverse drill hole was placed to allow suture fixation of the caudal septum to the nasal spine.

Tip reconstruction was performed by resecting the cephalic border of the left lateral crus and using the specimen to augment the right lateral crus. A columellar strut graft was added for tip support, and both transdomal and lateral crural spanning sutures were used for tip refinement. A cap graft was also used to increase tip projection, and the cap graft was covered with allogenic fascia lata to prevent delayed graft visibility. Alar rim grafts fashioned from autologous (right) tragal cartilage were also placed bilaterally. Tip support was further enhanced using a tip suspension suture with a posterior sling, and dorsal augmentation was achieved using four layers of allogenic fascia lata (Fig. 6.20).

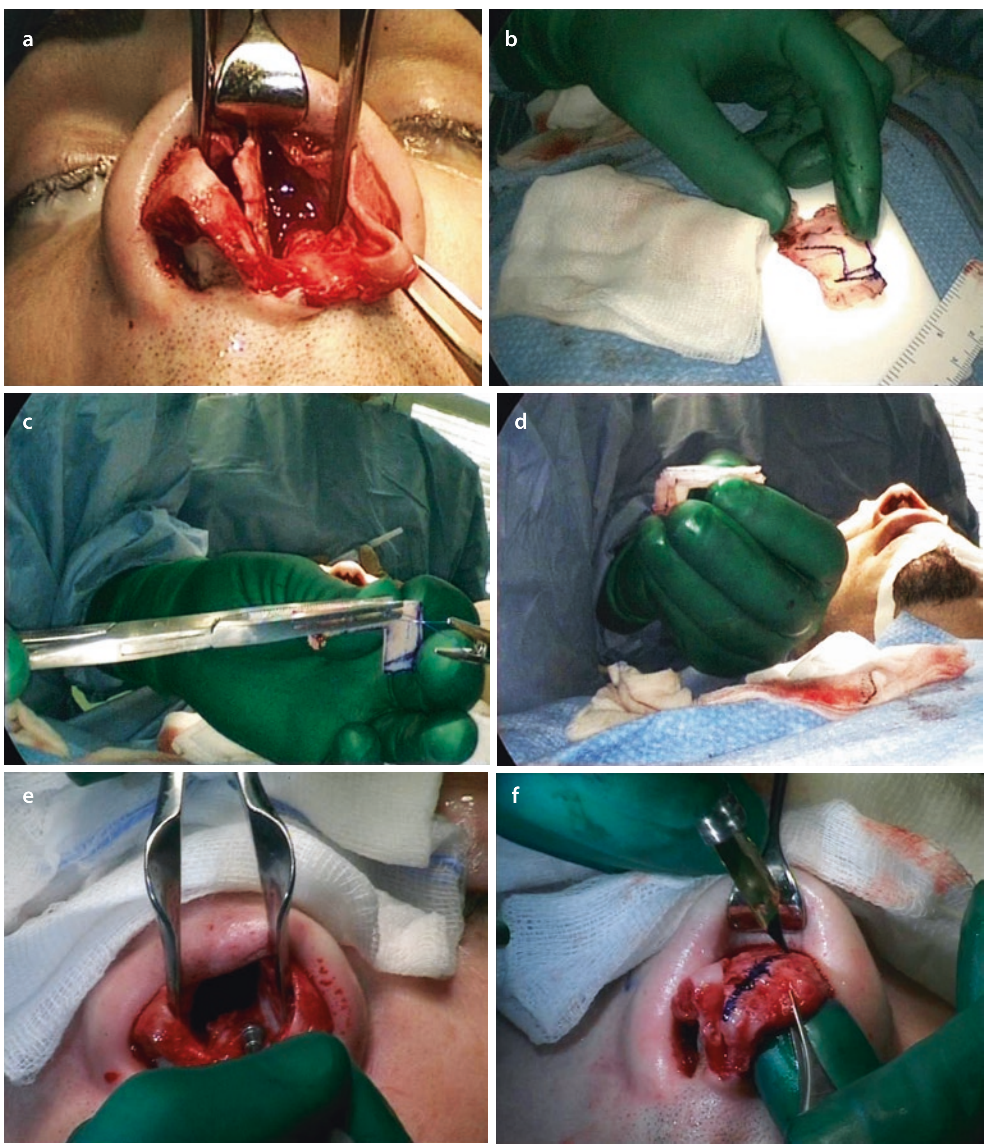


Fig. 6.20 (**a**–**j**) Reconstruction after complex nasal deformity with polly-beak from incomplete hump reduction. (**k**–**m**) Front view, profile view, base view pre-op/post-op

Fig. 6.20 (continued)

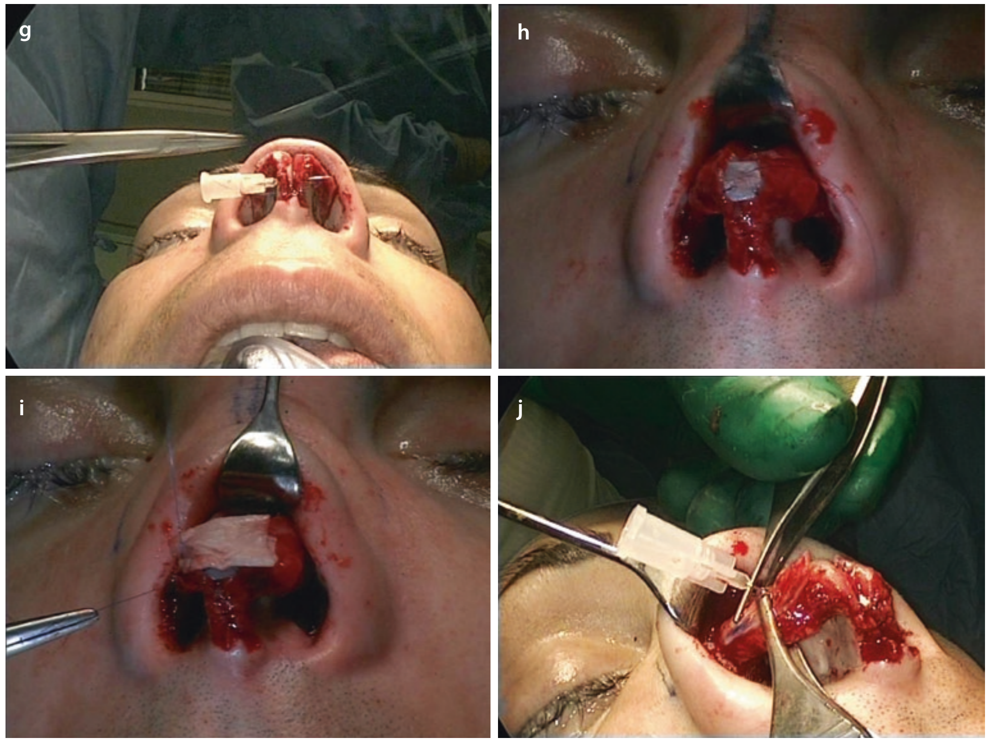


Fig. 6.20 (continued)

Fig. 6.20 (continued)

6.3.3 Case 3: Polly-Beak Deformity Following Septal Overresection and Increased Scarring

A 52-year-old female was seen for revision nasal surgery 20 years after primary rhinoplasty. Examination revealed an asymmetrical nose with an overresected and pinched tip, weak tip cartilages, a concave and overresected dorsum, and leftward deviation of the septum.

After exploring the nose using the external rhinoplasty approach, copious soft-tissue scarring was found covering both tip cartilages. Upon removal of the scar tissue, a badly damaged right lateral crus was revealed, and the left lateral crus, while largely intact, was severely concave. The intermediate crura and medial crural footpods were also absent from both sides. This patient with rhinoplasty 20 years ago had destruction of the caudal framework, septal deviation to the left, overresection of the dorsum with irregularities, a deviated nose, and missing tip contouring with depressed alae. After opening up the nose, we found large severe scars, and after removing the scars, the right LLC was found to be almost totally destroyed. On the left side, large parts had been preserved, but there the shape was concave. The intermediate crus was missing on both sides. Both foot plates were absent.

In addition to the aforementioned alar cartilage deformities, a severe residual deformity of the nasal septum necessitated extracorporeal septal reconstruction. Using the external approach, the entire septal partition was removed. After rotating the septal specimen by 90°, we obtained a straight neo-L-strut that was reinforced with bilateral spreader grafts along the dorsal margin and a batten graft along the caudal septum. The bony pyramid was then mobilized with parasagittal medial osteotomies and low-to-high lateral osteotomies. The septal construct was then reinserted into the septal pocket and sutured to the upper lateral cartilages and nasal spine.

Tip reconstruction was then initiated by replacing the absent intermediate crura using a split cartilage technique. By cleaving a thick segment of septal cartilage, thin intermediate crural replacement grafts were created, bent, and integrated into the residual LLC framework using a columellar strut graft for support. Next, the concave left lateral crus was flattened using a lateral crural strut graft, and the severely damaged right lateral crus was reconstructed with an onlay (batten-type) replacement graft. The rebuilt alar cartilages were then further refined by a combination of transdomal sutures, lateral crural spanning sutures, and tip suspension sutures. After placement of an additional cartilage augmentation graft to the supratip, cartilage grafts to both soft triangles, and bilateral alar rim grafts, the entire tip framework was camouflaged with a soft-tissue onlay graft. The dorsum was then covered with an allogenic fascia lata graft (▫ Fig. 6.21).

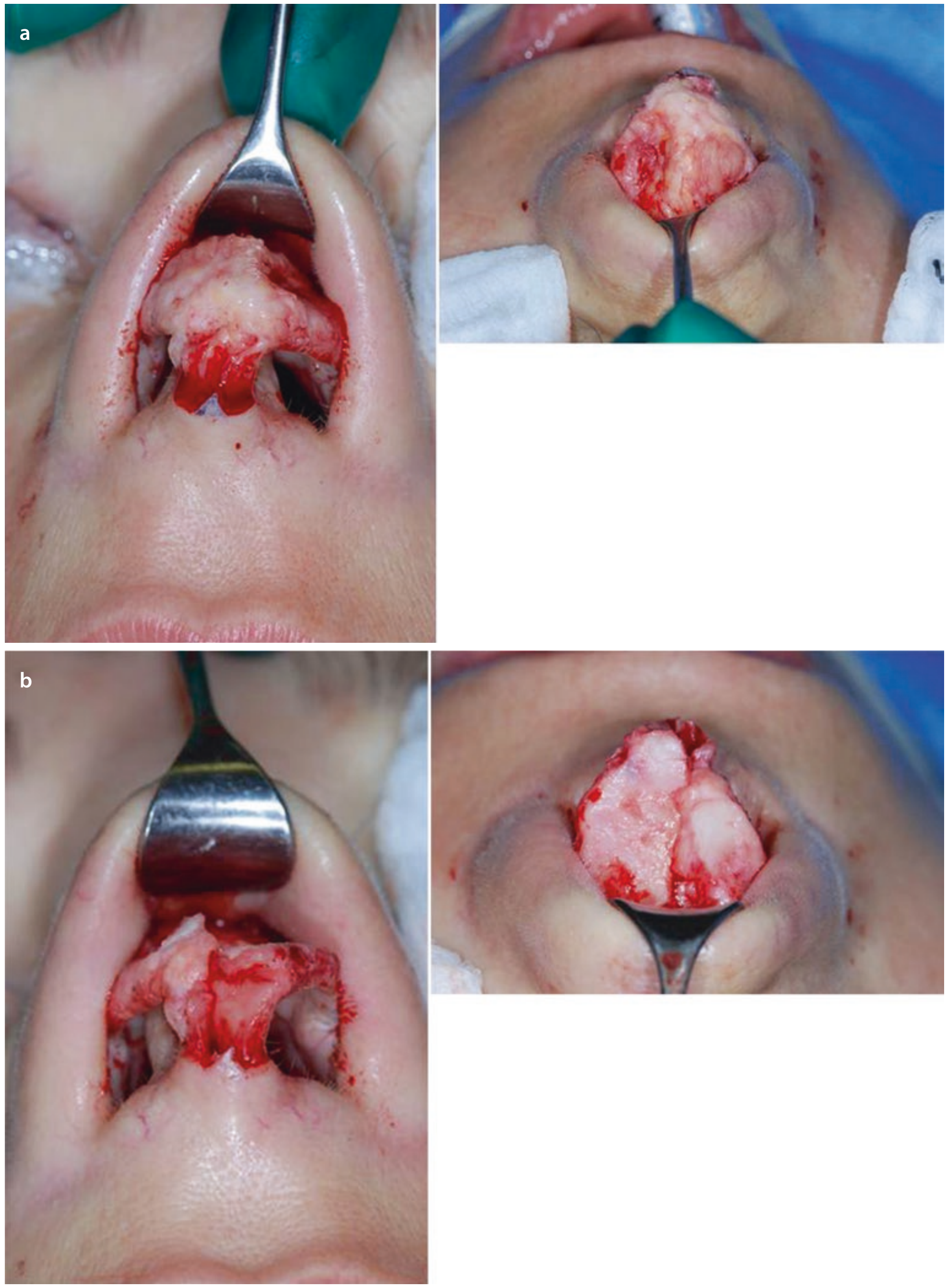
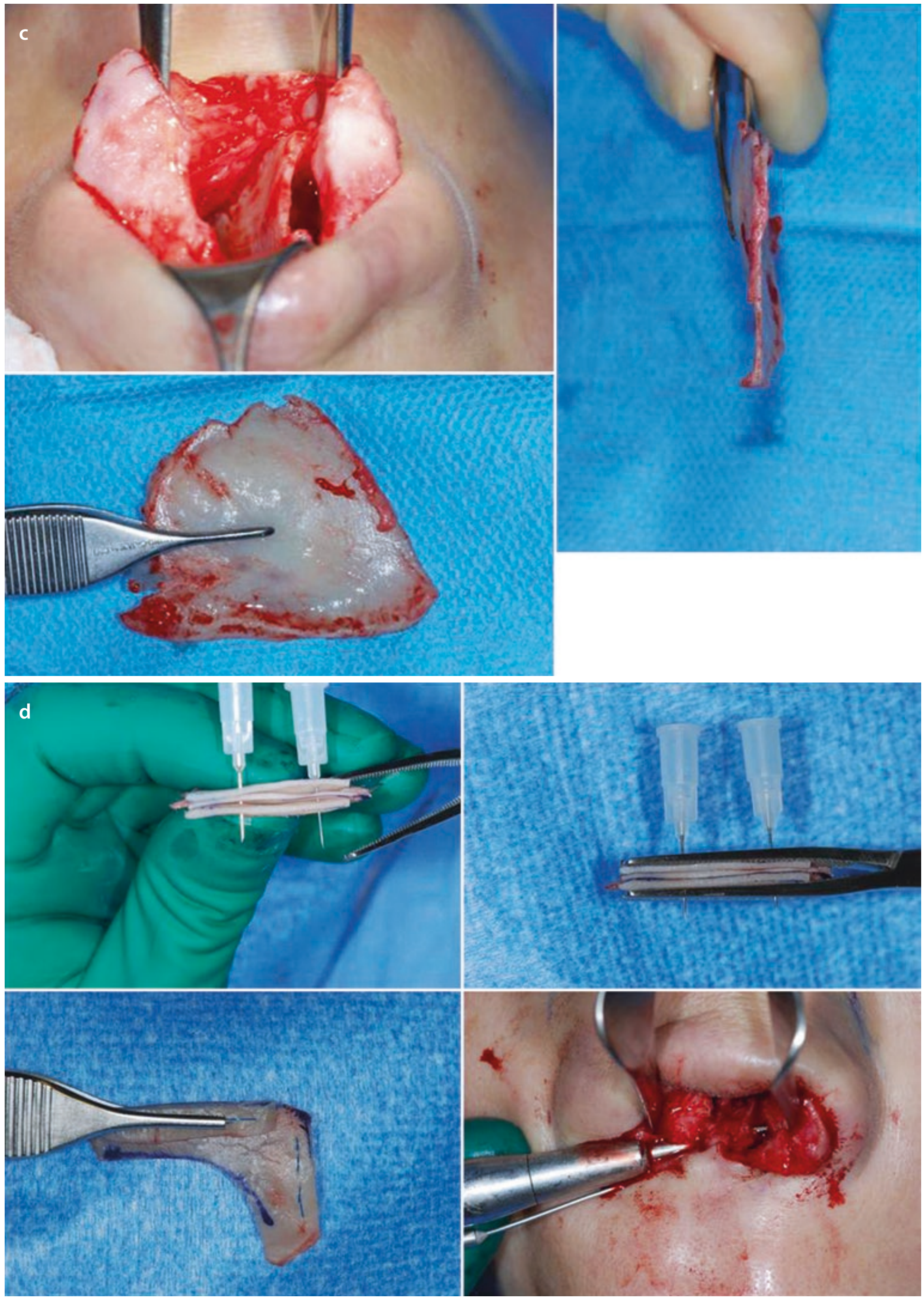


Fig. 6.21 (**a**–**b**) Polly-beak deformity following septal overresection and increased scarring. (**c**–**d**) Extracorporeal septal reconstruction. (**e**–**i**) Tip reconstruction. (**j**–**l**) Front view, profile view, base view pre-op/post-op

Fig. 6.21 (continued)



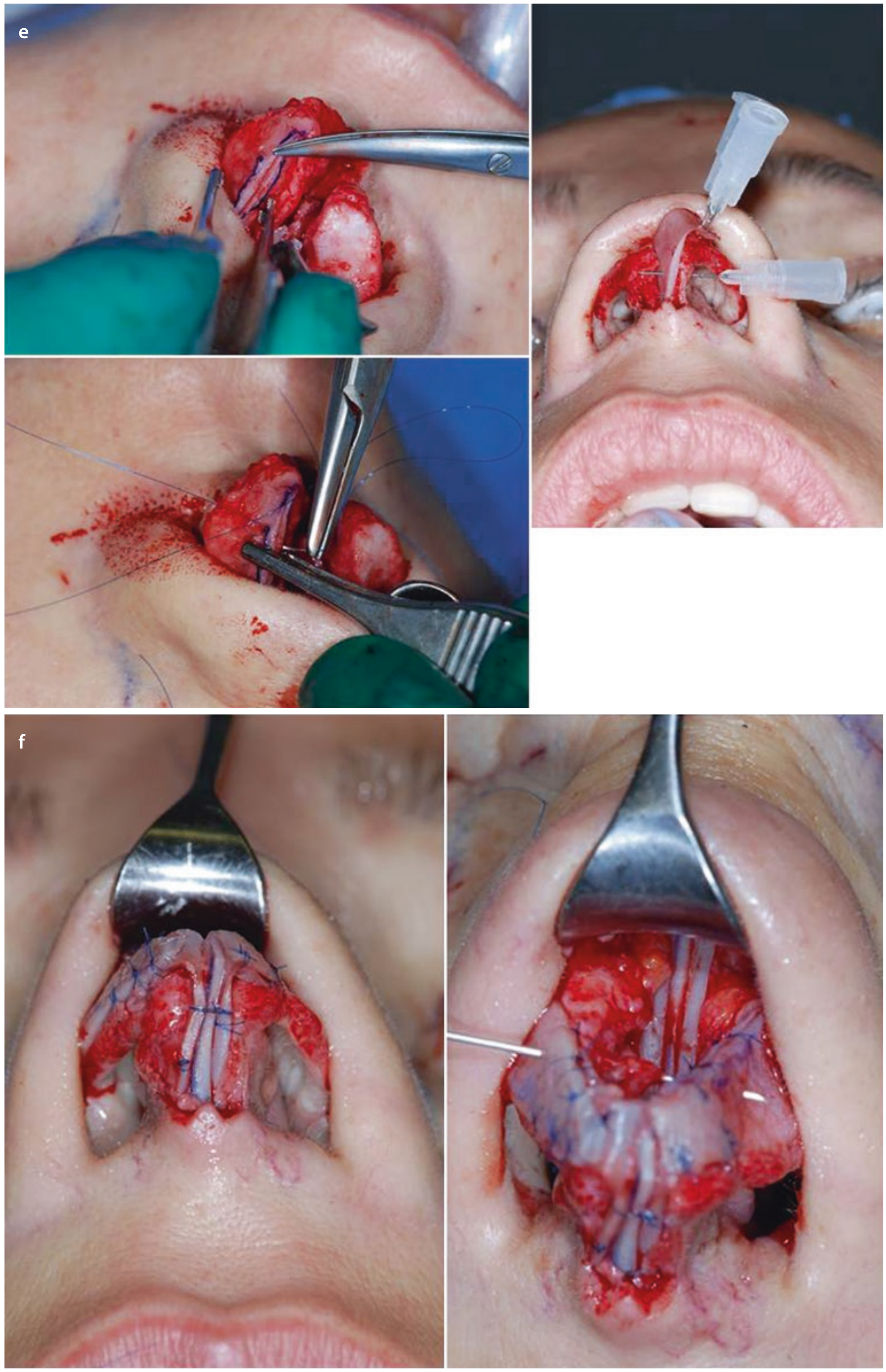
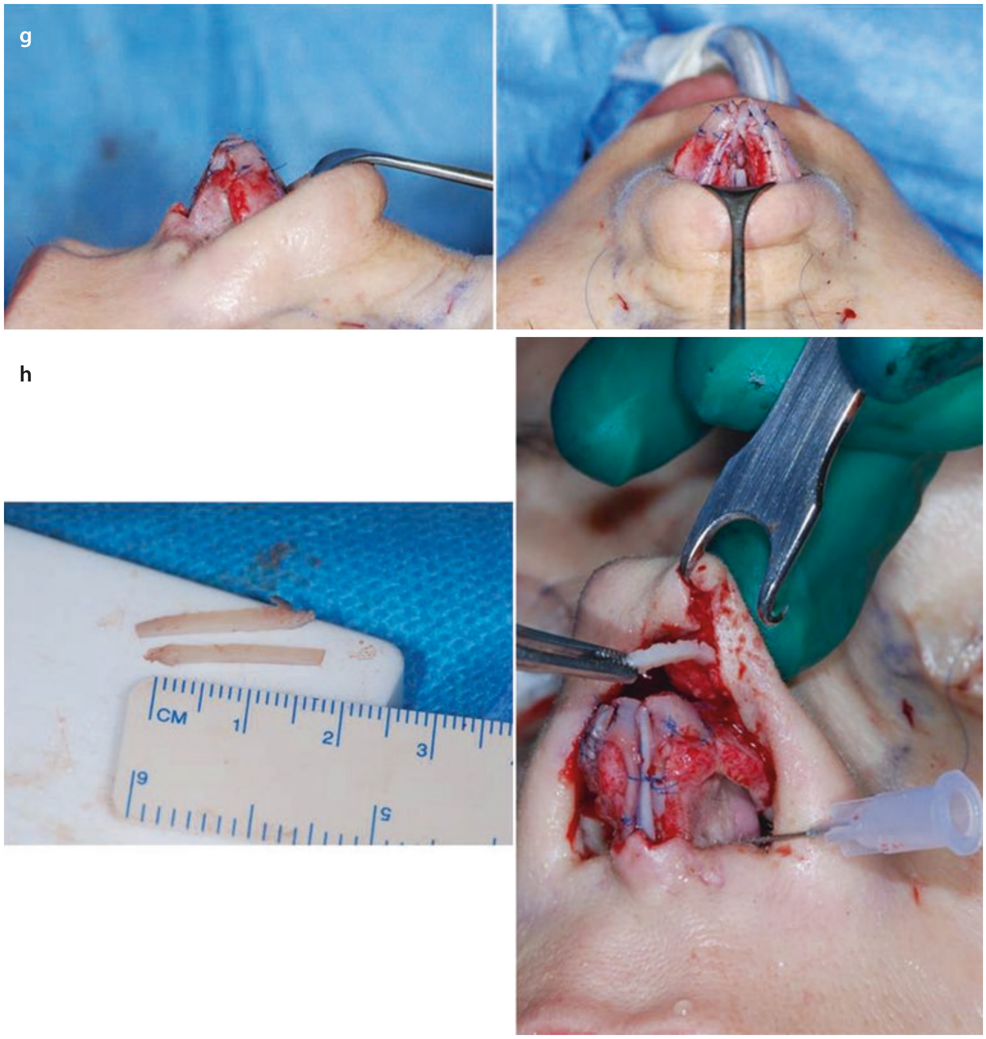


Fig. 6.21 (continued)



■ **Fig. 6.21** (continued)

Fig. 6.21 (continued)

Fig. 6.21 (continued)

6.3.4 Case 4: Inverted-V Deformity Combined with Underresected Dorsum

A 25-year-old female presented for revision rhinoplasty with an oversized nose and a residual hump deformity. The nasal tip was both overprojected and overrotated, producing an obtuse nasolabial angle. From the front, the nose was canted to the right with an inverted-V deformity and a pinched middle vault. In the profile a hump was seen, but the whole nose seemed too big. That means that the tip was also overprojected but at the same time overrotated, with a resulting obtuse nasolabial angle. In the front view, the asymmetry and irregularities of the dorsum became obvious related to an inverted-V deformity as well as a collapsed cartilaginous dorsum.

Using the external rhinoplasty approach, the residual hump was lowered using the composite technique, and donor septal cartilage was harvested from the quadrangular septum. Bilateral spreader grafts were placed to widen the pinched upper lateral cartilages, eliminate the inverted-V deformity, and straighten the nasal bridge. The tip was deprojected and counterrotated using a medial crura overlap technique combined with placement of a shield graft with carefully beveled edges. Spanning sutures were used for further refinement, and counterrotation was stabilized using a tip suspension suture placed more caudally in an upside-down manner to pull the tip downward and in. Finally, the dorsum was augmented with a full-length morselized septal cartilage graft covered with an allogenic fascia lata onlay graft (▣ Fig. 6.22).

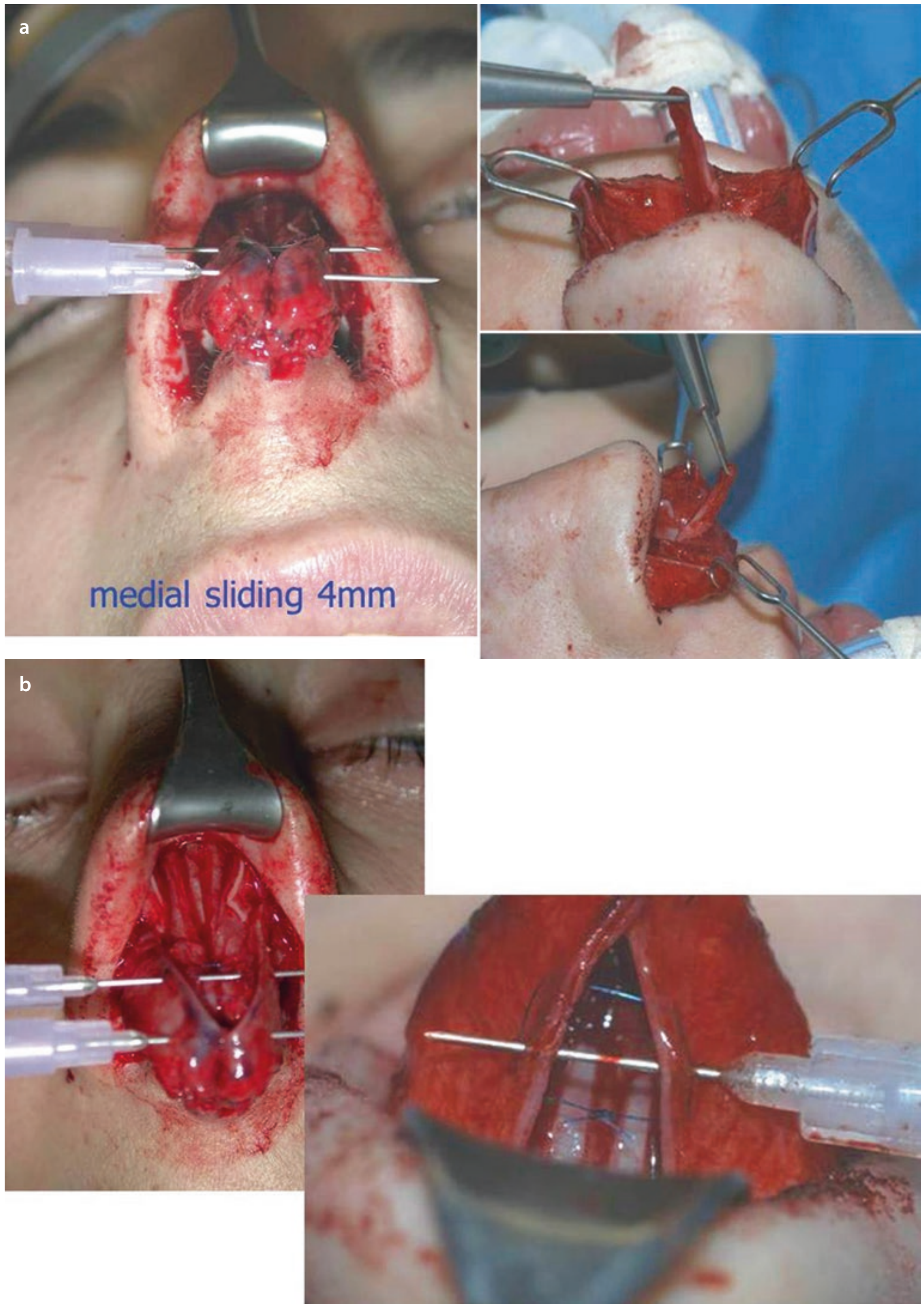


Fig. 6.22 (**a**–**d**) Dorsal revision and tip deprojection in an inverted-V deformity combined with underresected dorsum. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 6.22 (continued)

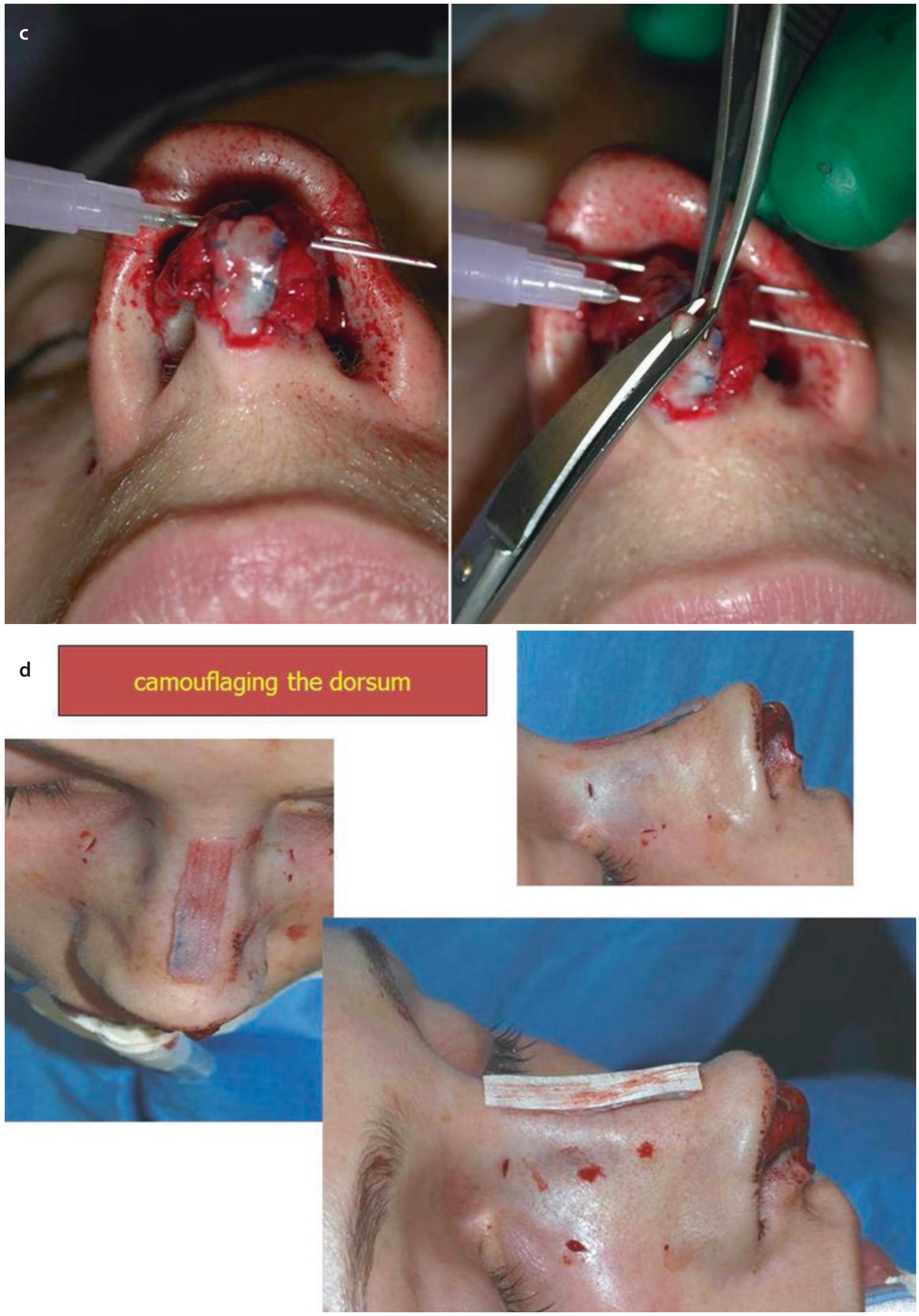


Fig. 6.22 (continued)

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Fig. 6.22 (continued)

6.3.5 Case 5: Inverted-V Deformity Combined with Polly-Beak Deformity

A 30-year-old female presented 10 years after primary septorhinoplasty elsewhere with a polly-beak deformity, hanging columella, inverted-V deformity, and asymmetrical nasal bones. After degloving the nose using the external rhinoplasty approach, the right lateral crus was found to be overresected, but the intermediate crus was still too large, creating asymmetry of the lower lateral cartilages. To begin the reconstruction, cartilage was harvested from the quadrangular septum for extended spreader grafts, a columellar strut graft, and an extended spreader graft. The left lower lateral cartilage was then trimmed, and the excised segment was used to augment the overresected right LLC. Spanning sutures and tip suspension sutures were used to refine and rotate the tip. The extended shield graft was sutured into position and covered with allogenic fascia lata. The soft-tissue triangles were augmented with small cartilage grafts, and the dorsum was also covered with allogenic fascia lata (Fig. 6.23).

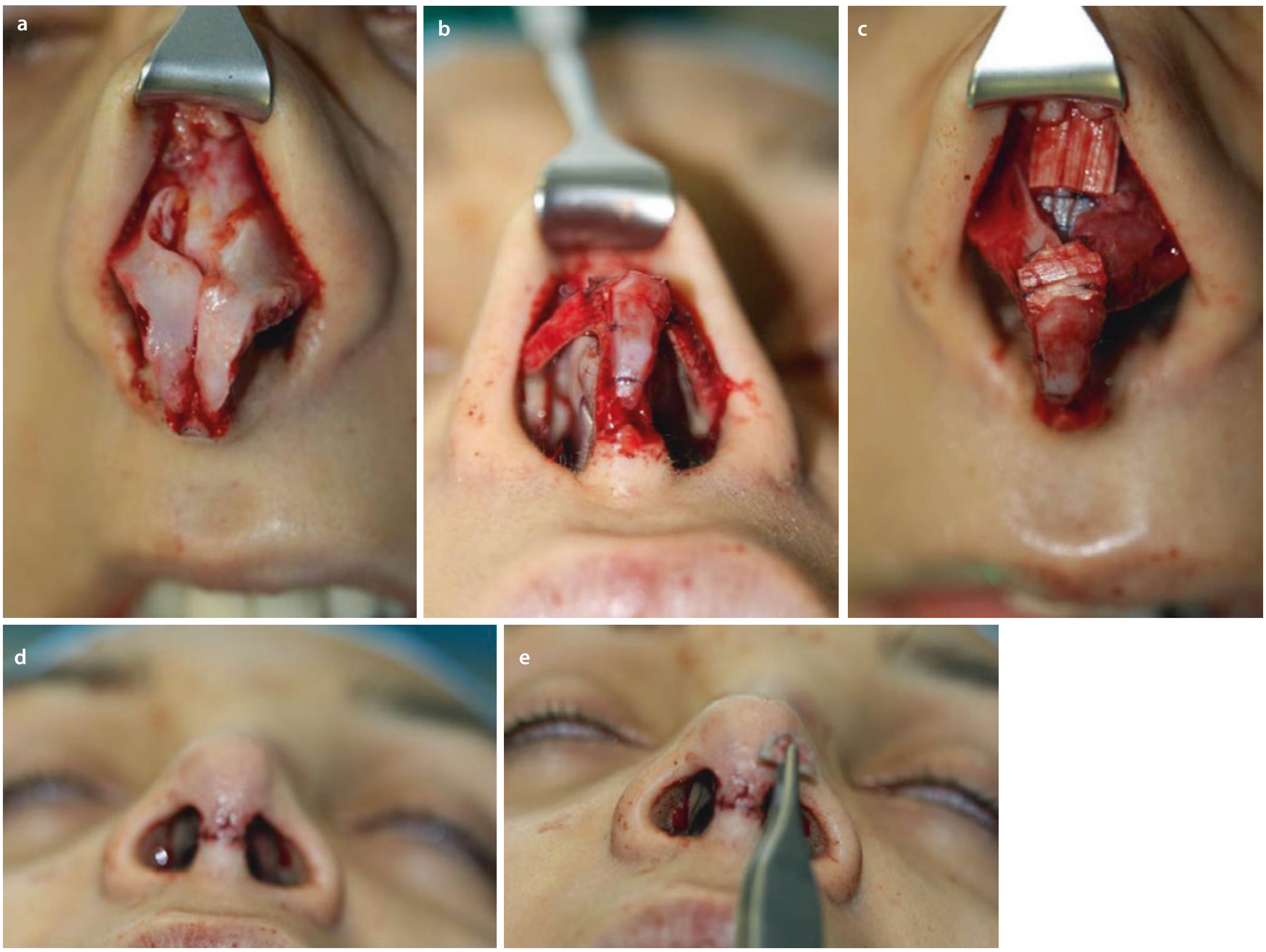
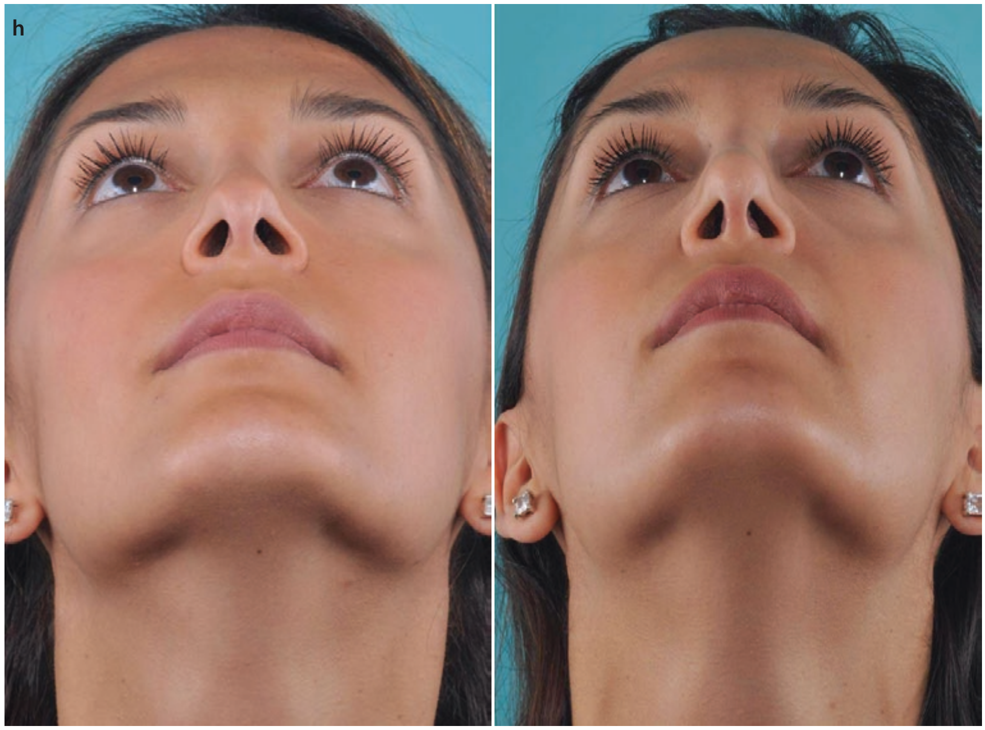


Fig. 6.23 (**a**–**c**) Reconstruction of the caudal framework. (**d**, **e**) Augmentation of the soft triangle. (**f**–**h**) Inverted-V deformity combined with polly-beak deformity. Front view, profile view, base view pre-op/post-op

Fig. 6.23 (continued)

Fig. 6.23 (continued)



6.3.6 Case 6: Insufficient Tip Support with Retracted Columella

A 35-year-old male presented for treatment of previous nasal trauma after four unsuccessful attempts at surgical restoration elsewhere. Examination revealed an overly wide nose with a misshapen tip, a retracted columella, and asymmetrical nostrils. Endonasal examination revealed an absent caudal septum with severe deformity of the remaining quadrangular septum, including unstructured remnants of a previous rib graft.

Surgical exploration using the external rhinoplasty approach revealed a previously placed strut graft fashioned from rib cartilage. However, because the graft was misshapen, malpositioned, and failing to support the tip, it was removed. Additional misshapen fragments of rib were also encountered deeper in the septal partition contributing to airway obstruction, and these were also removed. In order to reconstruct the missing L-strut, bilateral conchal grafts were harvested and sewn together after placing the concavities back-to-back. The cartilages were held with a modified Aiach cartilage clamp while (parallel) running mattress-type sutures were placed for fixation. This resulted in a flat, straight, and rigid cartilaginous construct. After osteotomies to narrow the bony vault, the newly created L-strut was placed into the septal pocket and sutured to the upper lateral cartilages and nasal spine for fixation. Additional support was achieved by suturing the medial crura to the caudal border of the L-strut and by placement of a tip suspension suture. Tip contouring was then achieved with spanning sutures. Augmentation of the nasal dorsum was accomplished using a DC-F graft. The DC-F graft was fashioned from a sleeve of allogenic fascia lata filled with diced remnants of explanted rib cartilage. This combined approach produced a well-supported tip with satisfactory columellar show and a straight dorsum with improved dorsal aesthetic lines (■ Fig. 6.24).

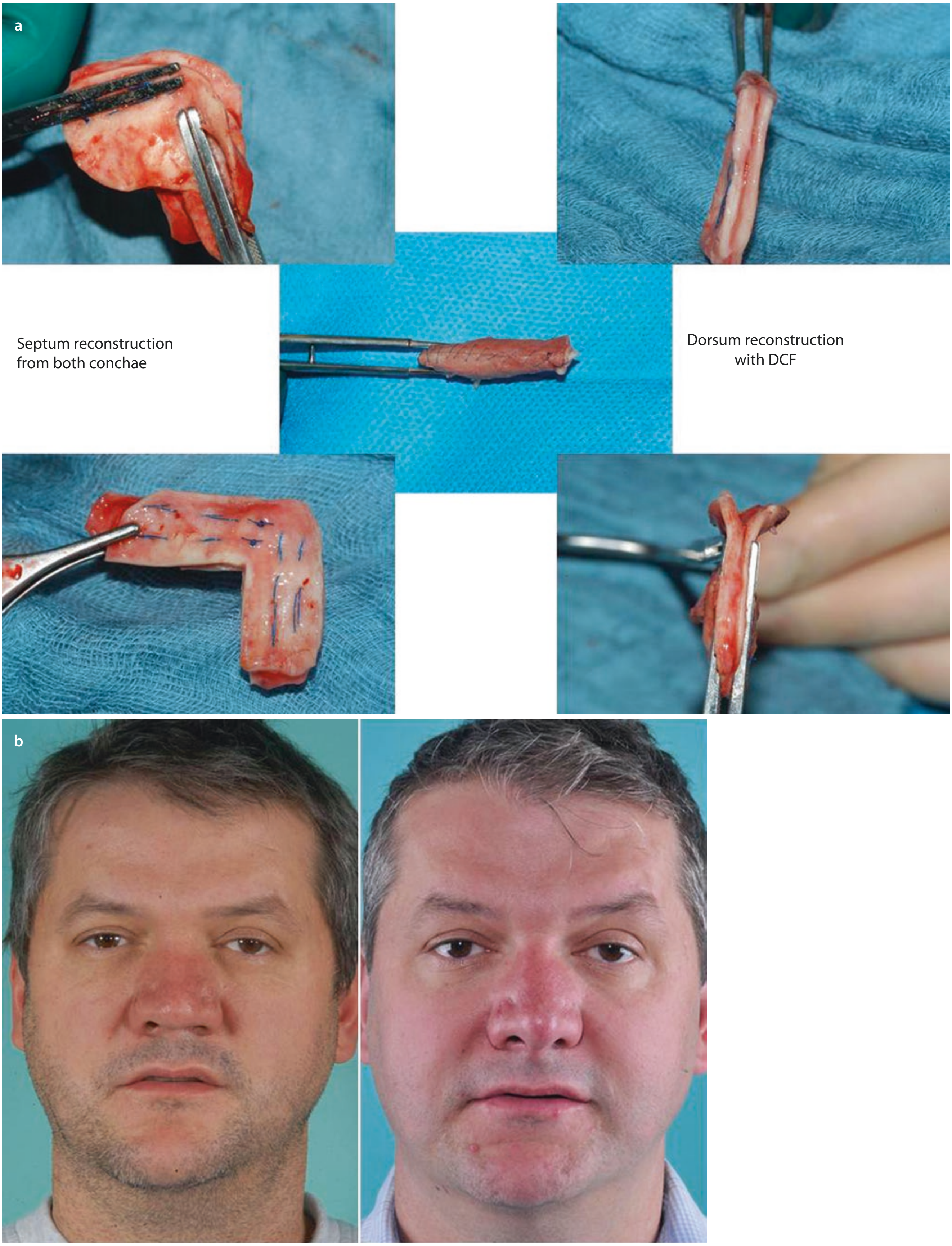


Fig. 6.24 (**a**) Correction of insufficient tip support, retracted columella and low dorsum. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 6.24 (continued)

6.3.7 Case 7: Underresected and Overprojected Dorsal Septum with Underprojected Tip (Sheep's Nose Deformity)

A 51-year-old female presented for revision surgery after two previous failed surgeries elsewhere. Examination revealed a deviated nose with overresected nasal bones and a severely malpositioned central ethmoid complex. The cartilaginous septum was overprojected, and the upper lateral cartilages were both collapsed, resulting in internal valve obstruction. Overprojection of the anterior septal angle in combination with underprojection of the nasal tip resulted in a sheep's nose deformity on profile view.

Using the external rhinoplasty approach, the nose was opened, revealing a severe deformity of the central septum with dislocation of the caudal septum from the nasal spine. However, the L-strut was otherwise normal. After detaching the spine with an osteotomy and fixating it in the midline with microplates and microscrews, the caudal septum was sutured back to the nasal spine for secure fixation. Next, the dorsum was lowered in a composite fashion, and the en bloc specimen was reshaped using a cylindrical fraise. Bilateral extended spreader grafts were sutured in place to widen the pinched middle vault, open the collapsed internal valves, and buttress a columellar strut needed to increase nasal length. The modified and slightly smaller composite hump was then reinserted to produce a smooth and straight dorsal profile. Using suture techniques, LLC projection was increased, and a double-layered cap graft was added for additional tip projection. The tip reconstruction was then covered with a single layer of allogenic fascia lata. One year postrevision, the tip projection appeared slightly too strong and prompted removal of the outermost cap graft. A satisfactory profile was ultimately achieved (▣ Fig. 6.25).

Fig. 6.25 (**a**) Correction of Underresected and overprojected dorsal septum with underprojected tip (sheep's nose deformity). (**b**–**d**) Front view, profile view, base view pre-op/post-op. (**e**) Profile view after revision

Fig. 6.25 (continued)

Fig. 6.25 (continued)

6.3.8 Case 8: Irregular Overprojected Dorsum with Overresected Septum

A 44-year-old female presented after two unsuccessful rhinoplasties. Examination revealed a high radix with an irregular and slightly overprojected dorsum and a round and amorphous nasal tip. The left nasal bone was depressed, and alar retraction was present bilaterally.

Using the open rhinoplasty approach, the residual septum was found to be deformed, overresected, and embedded in a dense mass of scar tissue. Correction was performed using the extracorporeal approach in which the residual septum was removed and rotated by 90°, thereby creating a new dorsum from the posterior bony septum. The bony neoseptum was then thinned and perforated with drill holes to facilitate suture fixation of spreader flaps fashioned from the residual ULC. The cephalic end of the newly fashioned L-strut was secured to a small (dorsal) remnant of ethmoid bone, and the base of the new caudal septum was sutured to the perforated ANS. Residual portions of the quadrangular septum were flattened with a cylindrical drill bit and used to create a columellar strut and to splint the surgically weakened caudal septum. The remnants of the right LLC were reenforced with a thinned cartilage strip from the septum, the weak right lateral crus was splinted with a septal batten graft. Conchal cartilage was then used to create a shield graft, and a spanning suture with combined posterior sling tip suspension was used for tip contouring and stabilization. Free diced cartilage created from the residual concha was used to eliminate contour irregularities of the dorsum (Fig. 6.26).

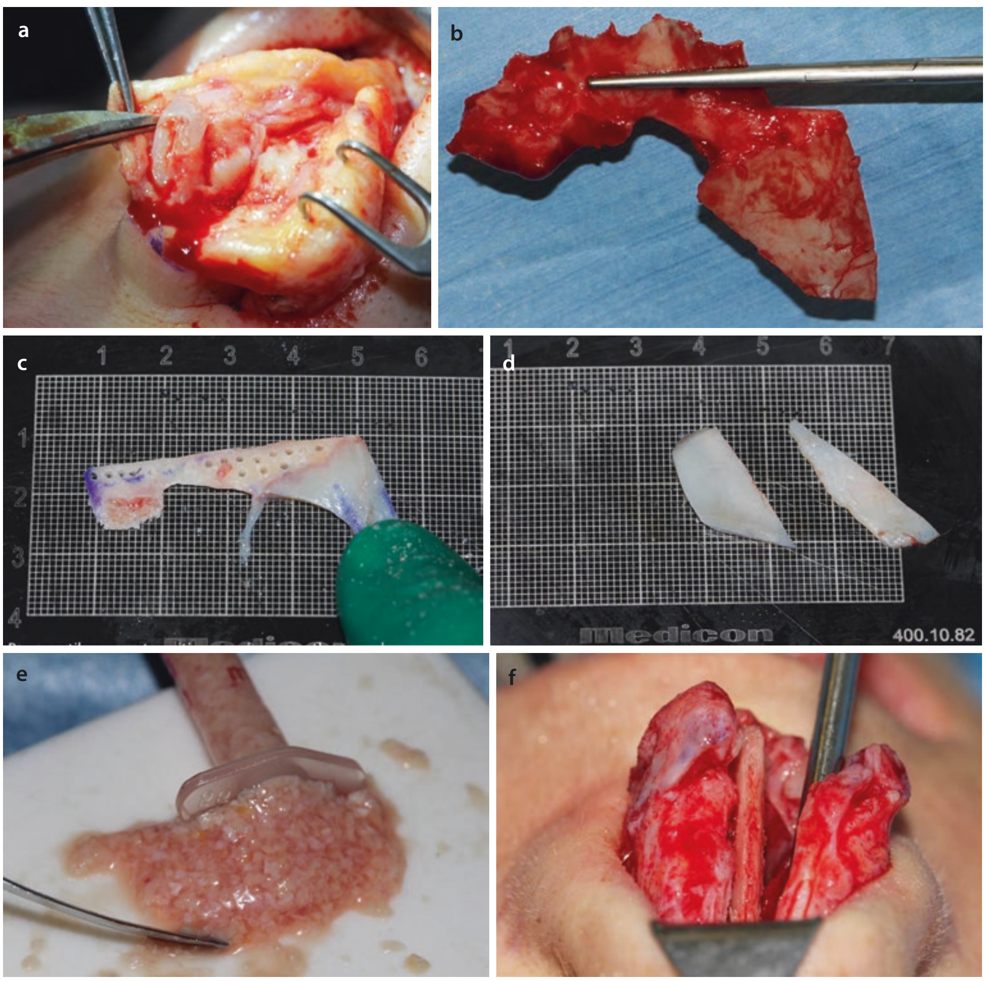


Fig. 6.26 (**a–i**) Dorsal reconstruction with extracorporeal septal reconstruction and tip reconstruction with septal cartilage in an irregular overprojected dorsum with overresected septum and amorphous tip. (**j–l**) Front view, profile view, base view pre-op/post-op

6

Fig. 6.26 (continued)

Fig. 6.26 (continued)

6.3.9 Case 9: C-Shaped Tension-Nose Deformity with Long, Displaced Septum

A 35-year-old male presented after previous rhinoplasty with a tension-nose deformity, a narrow C-shaped dorsum, an overly long nose, and a residual dorsal hump. Endonasal examination revealed an overly long septum displaced to the left of the anterior nasal spine.

Using the open approach, the caudal septum was trimmed at its base and repositioned in the midline. After creation of transverse drill holes in the anterior nasal spine, the caudal septum was secured with nonabsorbable sutures. The dorsal hump was then resected using the component technique, and the overprojected LLCs were used for spreader flaps. Paramedian osteotomies were created with a Lindemann drill bit, and percutaneous transverse and low-to-low lateral osteotomies were used to reconfigure the bony pyramid. After trimming the cephalic margin of the unusually thick LLCs, a lateral crural overlap technique, combined with a medial crural setback, was used for deprojection of the nasal tip. Alar rim grafts were placed for improved alar rim contour (Fig. 6.27).

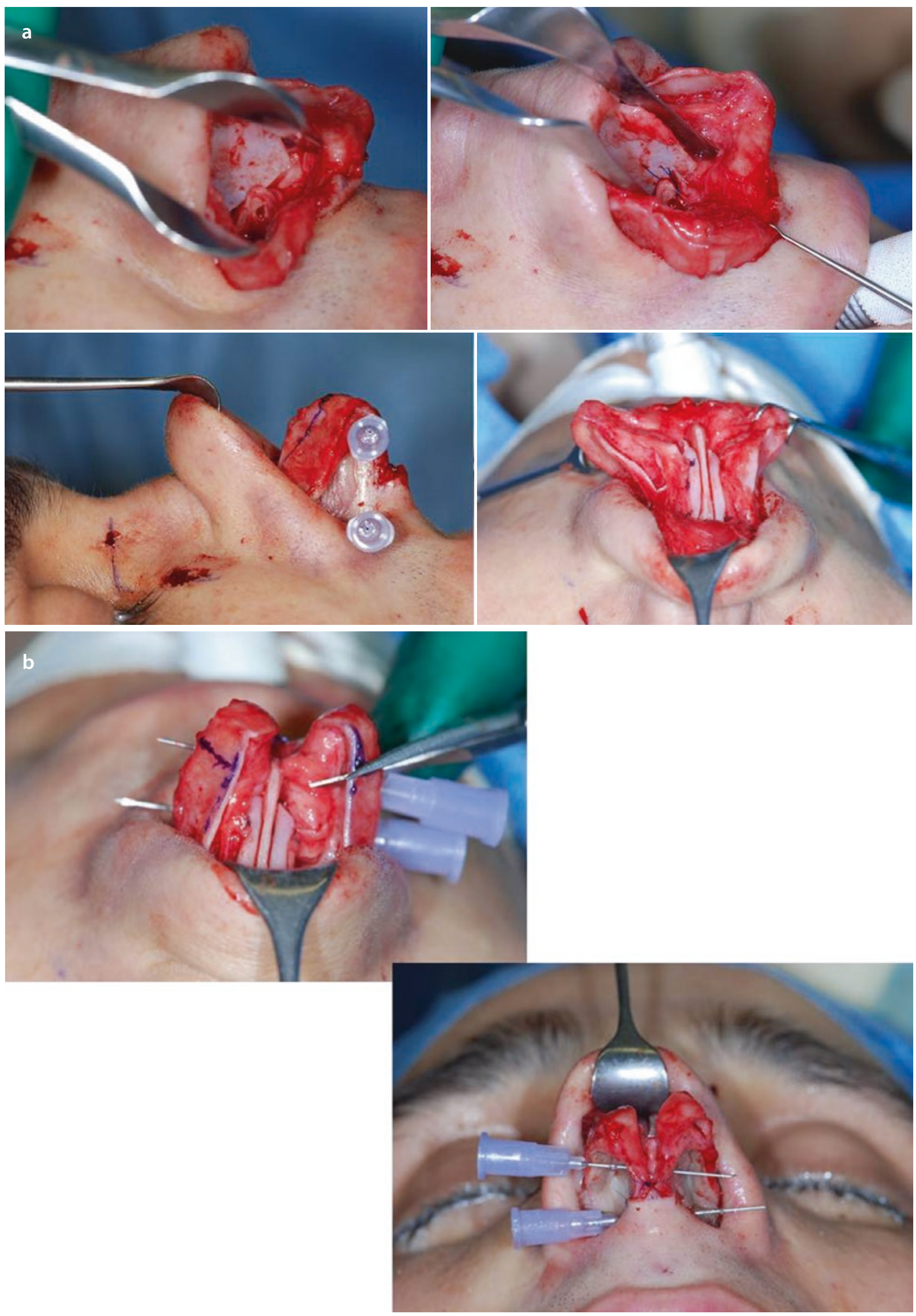


Fig. 6.27 (**a**–**b**) Correction of a C-shaped tension-nose deformity with long, displaced septum. (**c**–**e**) Front view, profile view, base view pre-op/post-op


c
d

Fig. 6.27 (continued)

Fig. 6.27 (continued)

6.3.10 Case 10: Polly-Beak Deformity in a Short Nose

A 52-year-old female presented after two unsuccessful rhinoplasties seeking revision surgery. According to the patient, a silicone dorsal implant was placed during the first surgery and was subsequently removed and replaced with conchal cartilage. Profile examination revealed an overly short nose with a severely obtuse nasolabial angle (130°) and a dorsal hump that was unusually soft on palpation. From the front, the nasal axis was C shaped and deviating to the patient's right side, and the bony pyramid was overly wide. Additionally, the thick-skinned nasal tip was bulbous, and the left alar rim was retracted. A conspicuous straight horizontal columellar scar was also observed on basal view.

Using the open approach, we modified the columellar incision to include a small inverted-V in order to prevent retraction and visibility of the columellar scar. Upon exploration of the dorsum, the hump was observed to be caused by excessive soft-tissue scarring, and no conchal cartilage was observed. Donor cartilage was then harvested from the septum with preservation of a 15-mm L-strut. The strong and straight septal graft material was then subdivided into three different grafts: a columellar strut graft and bilateral LLC replacement grafts to replace missing tip cartilages. To reconstruct the domes, the LLC replacement grafts were carefully thinned using a cylindrical drill bit and then folded and sutured to mimic natural dome cartilages. The grafts were then sutured to the columellar strut graft medially and to the scarred vestibular skin laterally. In addition to improving tip contour, the LLC grafts also served to correct the left alar retraction. Finally, after resecting the soft-tissue mass producing the dorsal hump, the wide bony pyramid was narrowed and straightened using (parasagittal) medial osteotomies combined with percutaneous transverse and (low-to-low) lateral osteotomies (Fig. 6.28).

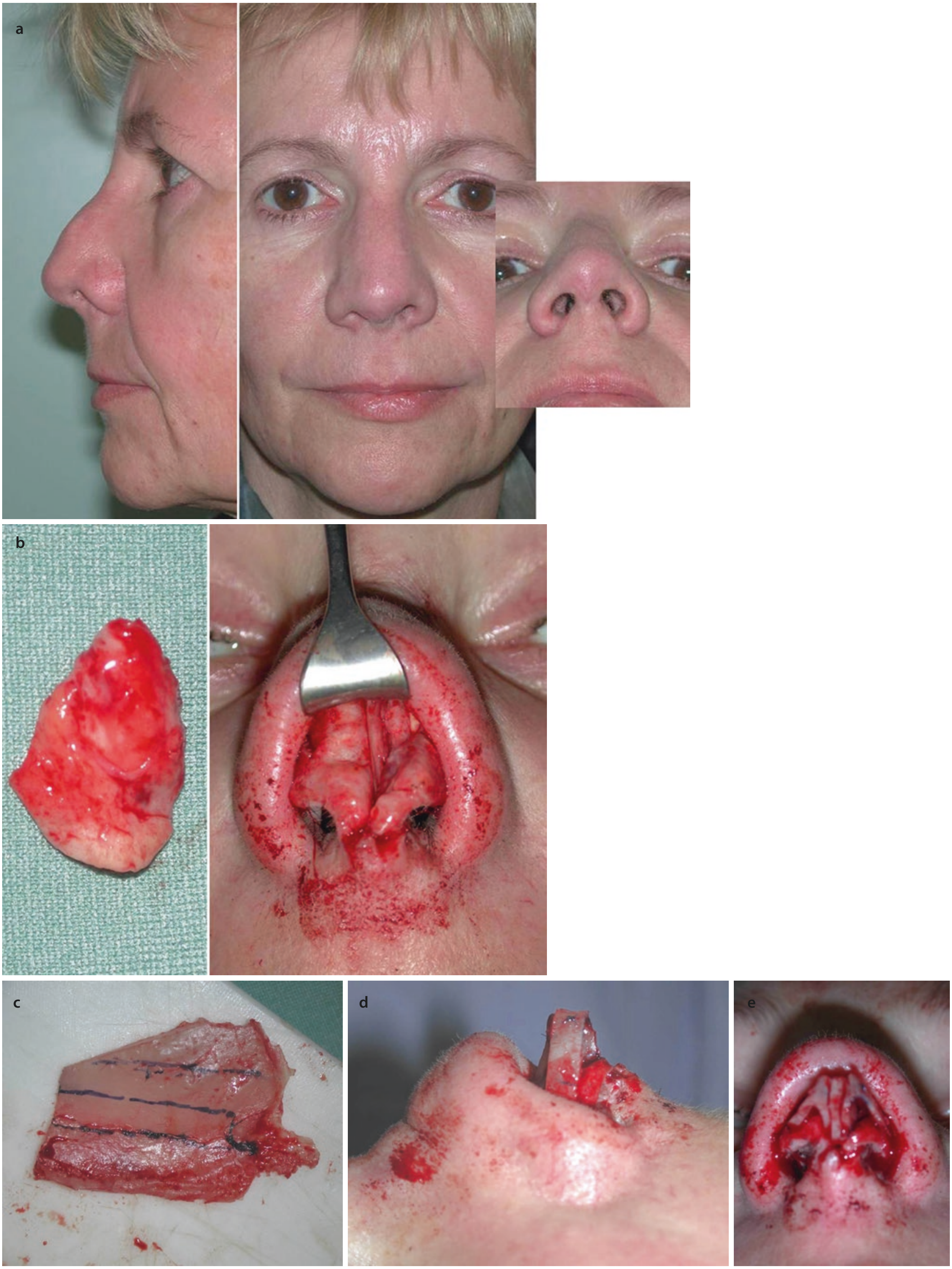


Fig. 6.28 (**a**–**e**) Correction of a polly-beak deformity in an overshorted nose. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 6.28 (continued)

6.3.11 Case 11: Polly-Beak Deformity After Total Resection of the LLC in a Thick-Skinned Patient with Bad Scarring

The technique used was supratip excision. On rare occasions a midline fusiform excision of supratip skin can be used to help reduce skin envelope volume when there is a large discrepancy between the skeletal framework and an overly large and thick skin envelope. By minimizing dead space in the supratip, a well-defined supratip break point is created. To avoid unsightly scarring of the supratip skin incision, closure is performed only in the subcuticular layer, and the wound edges are approximated with adhesive strips.

A 20-year-old female presented for revision rhinoplasty after previous cosmetic nasal surgery at age 15. Examination revealed severe tip ptosis, a prominent polly-beak formation, and deviation of the nasal axis to the patient's left side. A conspicuous transcolumellar scar was also observed at the base of the columella.

Using the malpositioned columellar scar for the open approach, surgical exploration revealed near total resection of both LLCs and replacement with fibrous scar tissue. Lack of tip support resulted in severe tip ptosis. However, the quadrangular septum was previously untouched, permitting harvest of septal cartilage while preserving a 12-mm wide L-strut. Donor septal cartilage was then used to create multiple cartilage grafts. The first graft was used to create a columellar strut graft, and both medial crural remnants were sutured to the graft. Twin LLC replacement grafts were then thinned using the cylindrical drill bit to facilitate folding and suturing of the cartilage in order to create replacement domes and lateral crura. The grafts were then sutured to the columellar strut graft centrally and to the vestibular skin laterally. Intradomal sutures were then used for additional tip refinement. Finally, the bony pyramid was narrowed and straightened with medial, transverse, and lateral osteotomies.

After closure of the skin flap, the scarred and thickened supratip skin failed to conform to the underlying skeletal framework. Consequently, a full-thickness skin ellipse, including the subcutaneous soft-tissue layer, was then excised. Owing to the abundance of excess skin, the wound edges approximated easily, necessitating only minimal suture approximation of the subcutaneous layer (Fig. 6.29).

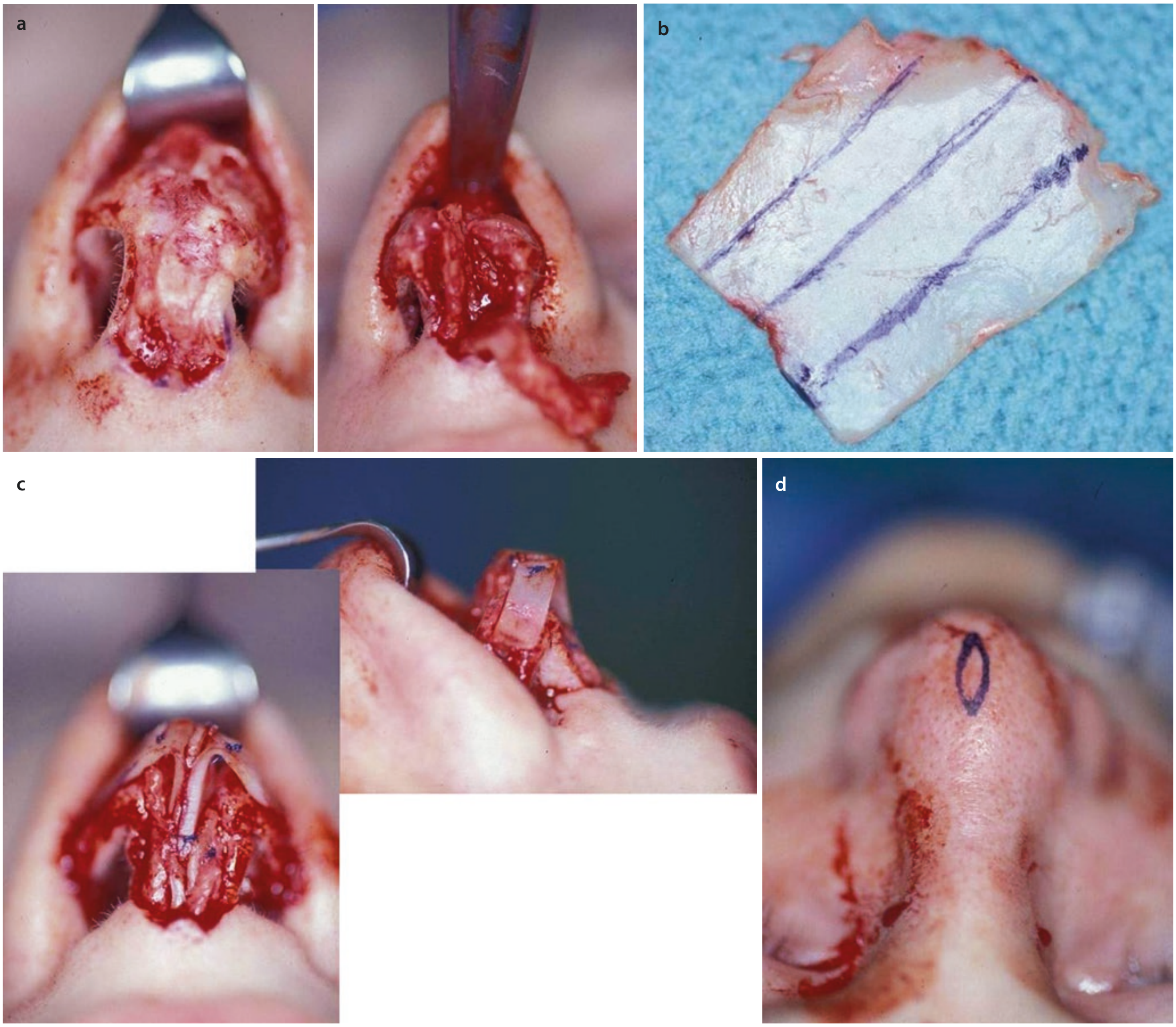


Fig. 6.29 (**a**–**d**) Correction of polly-beak deformity after total resection of the LLC in a thick-skinned patient with bad scarring 10 years follow up. (**e**–**g**) Front view, profile view, base view pre-op/post-op 12 month. (**f**–**j**) Front view, profile view, base view one yr and 10 yr post-op

6

■ **Fig. 6.29** (continued)

Fig. 6.29 (continued)

■ **Fig. 6.29** (continued)

6.3.12 Case 12: Irregular, Overprojected Dorsum with Ptotic Nasal Tip and Severe Septal Deformity

The technique consisted of extracorporeal septal reconstruction using a splinting graft created from ethmoid bone, dorsal augmentation with a DC-F graft, and lateral crural contouring with horizontal mattress sutures.

A 43-year-old female presented for revision rhinoplasty. Examination revealed an irregular and overprojected dorsum and a wide and ptotic nasal tip. Endonasal examination revealed synechiae in the right nasal airway and a severe septal deformity.

Surgical exploration using the external rhinoplasty approach revealed an irregular double-layered conchal graft that had been removed from the nasal dorsum. The anterior septum had been overresected, and the residual septum was weak and misshapen. After parasagittal medial osteotomies and fracturing of the ethmoid plate, the residual septum was removed in its entirety. Previous lateral osteotomies had been performed much too high on the bony side wall, necessitating narrowing of the bony pyramid with percutaneous transverse and (low-to-low) lateral osteotomies. A piece of ethmoid bone was then thinned, perforated, and used to splint the weak anterior septum after removing deformed segments. A spreader graft was then applied on the opposite side. After reimplanting the neoseptum, it was sutured to the upper lateral cartilages (ULC). The base of the new caudal septum was then trimmed to the desired height and sutured to drill holes within the ANS. Tip support was augmented using a columellar strut, and the concavity of the left lateral crus was eliminated using horizontal mattress sutures. A diced cartilage-fascia graft was constructed from deep temporalis fascia and residual septal cartilage. The cephalic end of the DC-F graft was sutured closed, and paired percutaneous guiding sutures were used to position the DC-F augmentation graft on the nasal dorsum. After suturing the columellar incision, the DC-F was molded to the desired shape using digital pressure, and the excess diced cartilage that was expressed from the DC-F graft was removed via suction through the marginal incisions. Finally, the dorsal contour was stabilized with tape, the marginal incisions were sutured closed, and quilting sutures were added to further stabilize the neoseptum (Fig. 6.30).

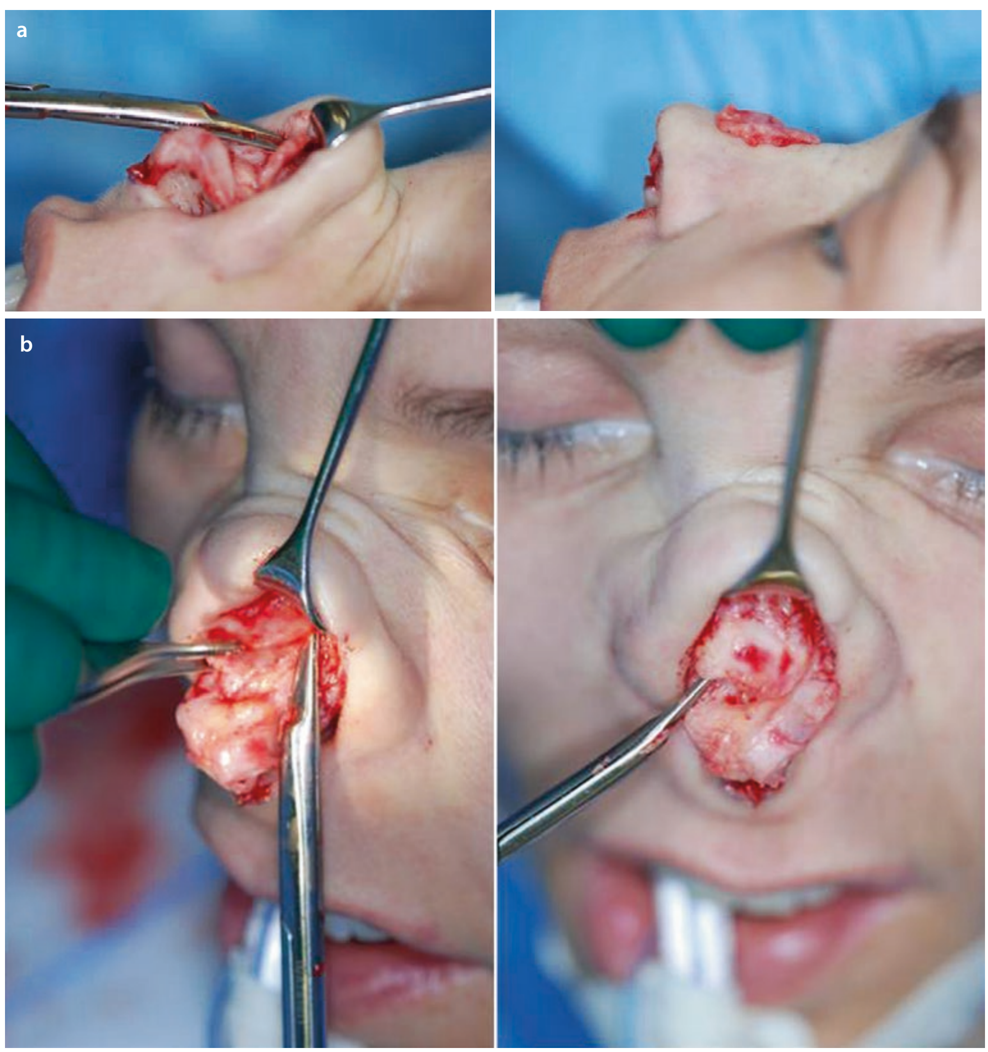


Fig. 6.30 (**a**–**b**) Irregular, overprojected dorsum with ptotic nasal tip; severe septal deformity with overresection of the anterior border. (**c**–**d**) Extracorporeal septal reconstruction. (**e**) Tip reconstruction and dorsal augmentation with DC-F graft. (**f**–**h**) Front view, profile view, base view pre-op/post-op

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■ Fig. 6.30 (continued)

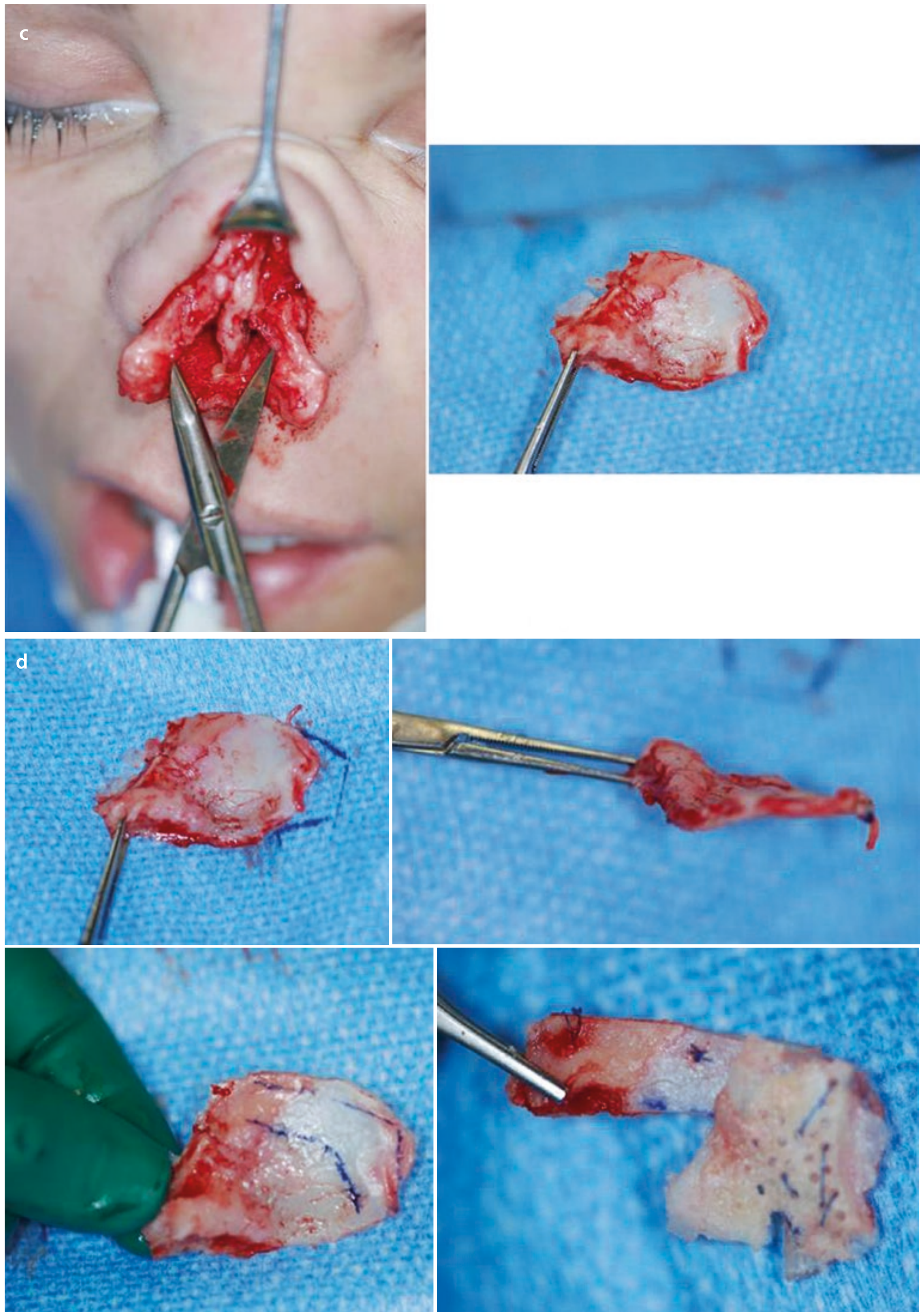


Fig. 6.30 (continued)

■ **Fig. 6.30** (continued)

6.3.13 Case 13: Overresection of the Dorsum with Saddle-Nose Deformity Combined with Inverted-V and Polly-Beak Deformity

The technique consisted of total reconstruction of the lower nasal framework using rib cartilage and saddle-nose repair using a DC-F graft.

A 52-year-old female presented after two unsuccessful rhinoplasties for revision surgery. Examination of the dorsum revealed a severe saddle-nose deformity, deviation of the nasal axis to the right side, and a depressed left nasal bone. The tip was round with bilateral alar retraction (seagull deformity). Endonasal examination revealed collapsed internal nasal valves.

Using the external rhinoplasty approach, exploration revealed severe scarring and subtotal resection of both LLCs. The anterior septum had been cut vertically, creating a sharp angulated edge. The septal deformity was treated in situ by shaving the deflection and splinting the residual cartilage with a thin ethmoid splinting graft. Owing to depletion of septal graft tissue, a 6-cm segment of the tenth rib was harvested for LLCs and dorsal reconstruction. Despite partial calcification, the graft was cut vertically into multiple 1.5-mm thick strips. The widest strip of rib cartilage was then used to create a columellar strut graft. The posterior edge of the graft was sutured to the ANS in the midline. Two additional rib grafts were used as spreader grafts to straighten the cartilaginous nasal axis, and the bony pyramid was straightened with parasagittal medial osteotomies followed by percutaneous transverse and low-to-low lateral osteotomies. Additional narrow strips of rib cartilage were then thinned using a cylindrical drill bit. However, upon attempting to fold the partially calcified rib cartilage, a fracture occurred at the neodome. Consequently, the contralateral graft was transected in the same location, and the corresponding segments were then suture-approximated in the manner of a vertical dome division. A shield graft was added for further stabilization and contour refinement. Finally, the remaining cartilage was diced for creation of a DC-F graft fashioned from allogenic fascia lata. After augmentation of the saddle deformity with the DC-F graft, an additional layer of allogenic fascia lata was placed on the tip for additional augmentation and smoothing (Fig. 6.31).

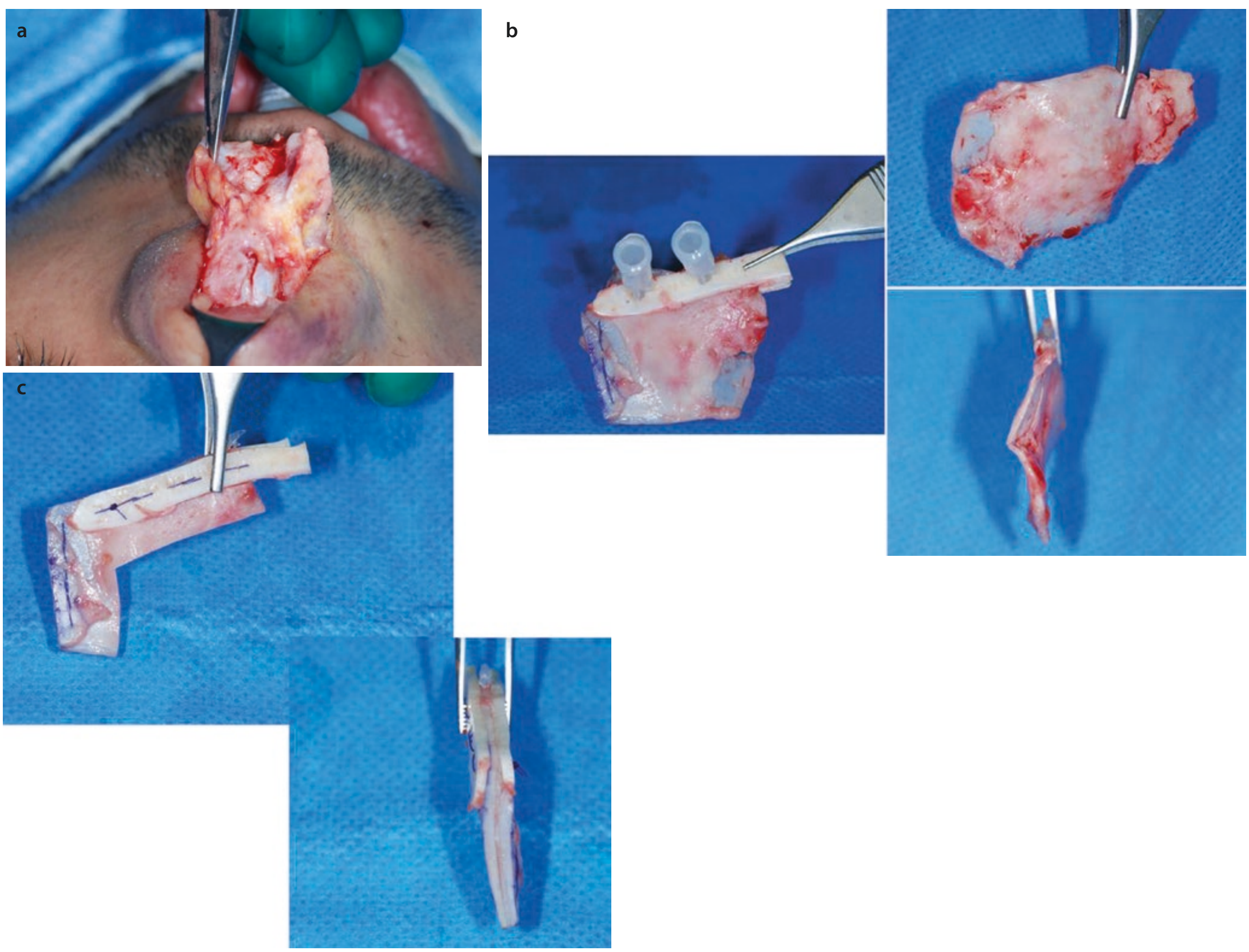
Fig. 6.31 (**a**) Correction of the overresected dorsum with saddle-nose deformity, combined with inverted-V and polly-beak deformity. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 6.31 (continued)

6.3.14 Case 14: Overresected Dorsum Combined with Polly-Beak Deformity

A 27-year-old male presented after previous rhinoplasty with an overresected dorsum and polly-beak deformity. Alar depressions were present bilaterally from concave LLCs. Endonasal examination also revealed a severe residual septal deformity contributing to nasal obstruction.

Using the open approach, dissection was complicated by severe surgical scarring and by a compound septal deformity involving all three anatomic planes. Owing to severe deformity of the septum, an extracorporeal septal reconstruction was required for correction. Straightening of the dorsal L-strut was accomplished by scoring the deformed cartilage and applying spreader grafts harvested from rib cartilage. The caudal septum was reinforced with a batten graft also fashioned from rib. After straightening the bony pyramid with parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies, the neoseptum was reimplanted and sutured to the ULC as well as to the nasal bones after creating paired osseous drill holes. Similarly, the caudal septum was also sutured to drill holes created within the ANS, and the medial crura were sutured to the caudal septum using a tongue-in-groove type fixation. After correcting the lateral crural concavities with bilateral cephalic fold-under flaps using the cephalic margin, a tip suspension suture with an anterior sling was used to keep the infratip lobule in position and thereby prevent tip ptosis. The dorsum was reconstructed using a DC-F constructed from allogenic fascia lata filled with finely diced residual rib cartilage. Rim grafts were also placed to improve alar contour (◘ Fig. 6.32).



◘ **Fig. 6.32** (**a**–**c**) Correction of the overresected dorsum combined with polly-beak deformity by extracorporeal septal reconstruction. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 6.32 (continued)

■ **Fig. 6.32** (continued)

6.3.15 Case 15: Overresected and Deviated Dorsum

A 38-year-old female presented with a deviated nose and an overresected bony and cartilaginous dorsum after previous rhinoplasty. The nostrils were asymmetrical owing to asymmetry of the alae following a unilateral (right-sided) alar base resection. Both alar rims were retracted, and endonasal examination revealed a badly deformed nasal septum.

After opening the nose via the external approach, severe scars were found covering a deformity and malposition of the right lateral crus. Septal dissection revealed a weak caudal septum and deviation of the central septum. The deformed septal segments were then harvested, including the adjacent perpendicular plate. An 8.0-cm segment of the left tenth rib was also harvested and split vertically into 1.5-mm thick strips. Two strips were used as extended spreader grafts and sutured to the residual dorsal septum for straightening and widening of the internal nasal valve. A straight piece of septal cartilage was used as a columellar strut graft, which was sutured to the extended spreader grafts and to the ANS. After dissecting the lateral crus from the vestibular skin, it was transposed to a symmetrical position and contoured with a batten graft for correction of the right alar retraction. The tip was contoured using a transdomal suture and then covered with a soft-tissue graft. On the left side, the alar retraction was treated with a large alar rim graft. After partially closing the skin flap, free diced cartilage (FDC) was used for smoothing and augmenting the dorsum. A V-to-Y plasty was performed on the right side to further improve nostril symmetry (▫ Fig. 6.33).

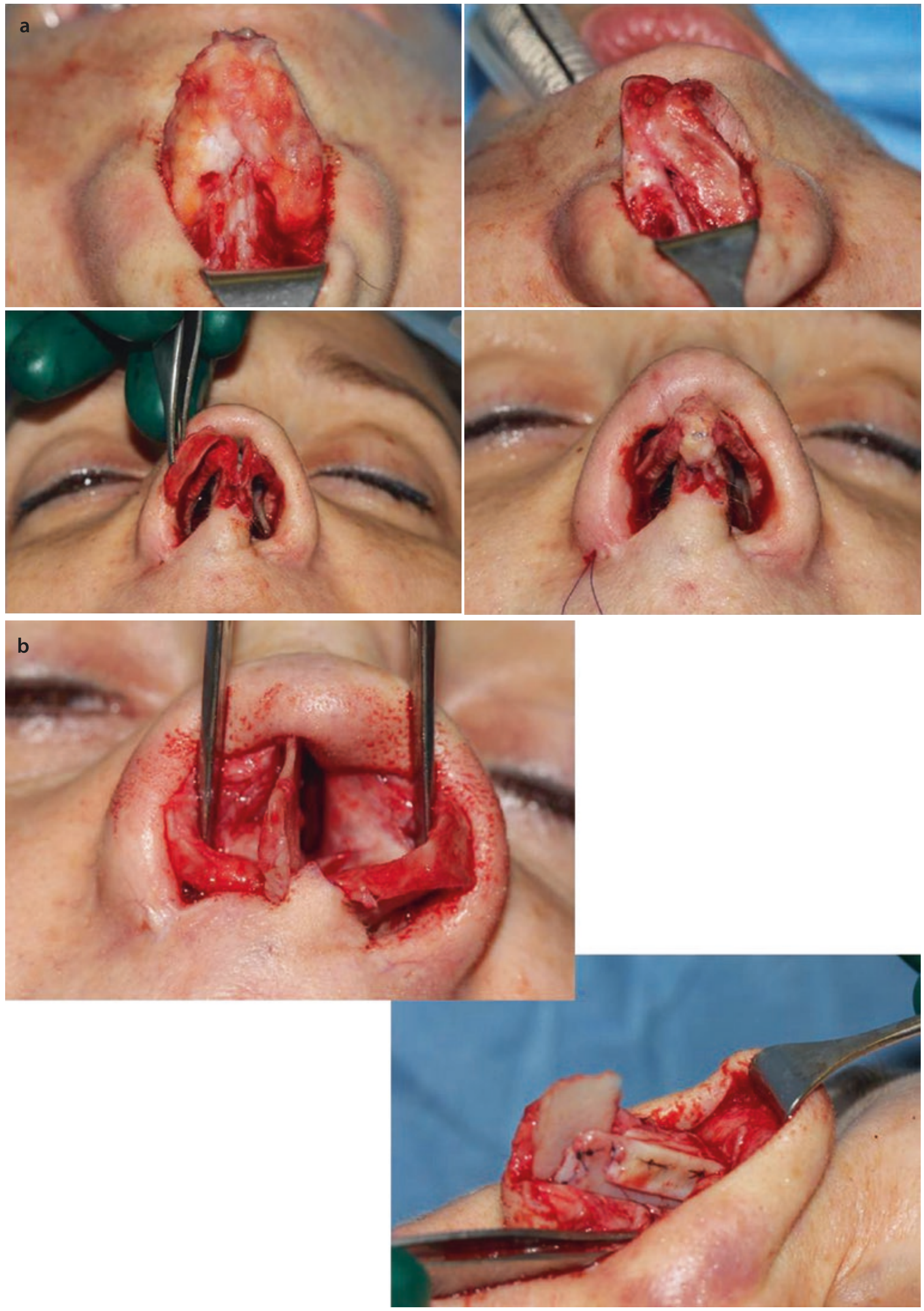


Fig. 6.33 (**a**–**d**) Reconstruction of overresected and deviated dorsum. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 6.33 (continued)

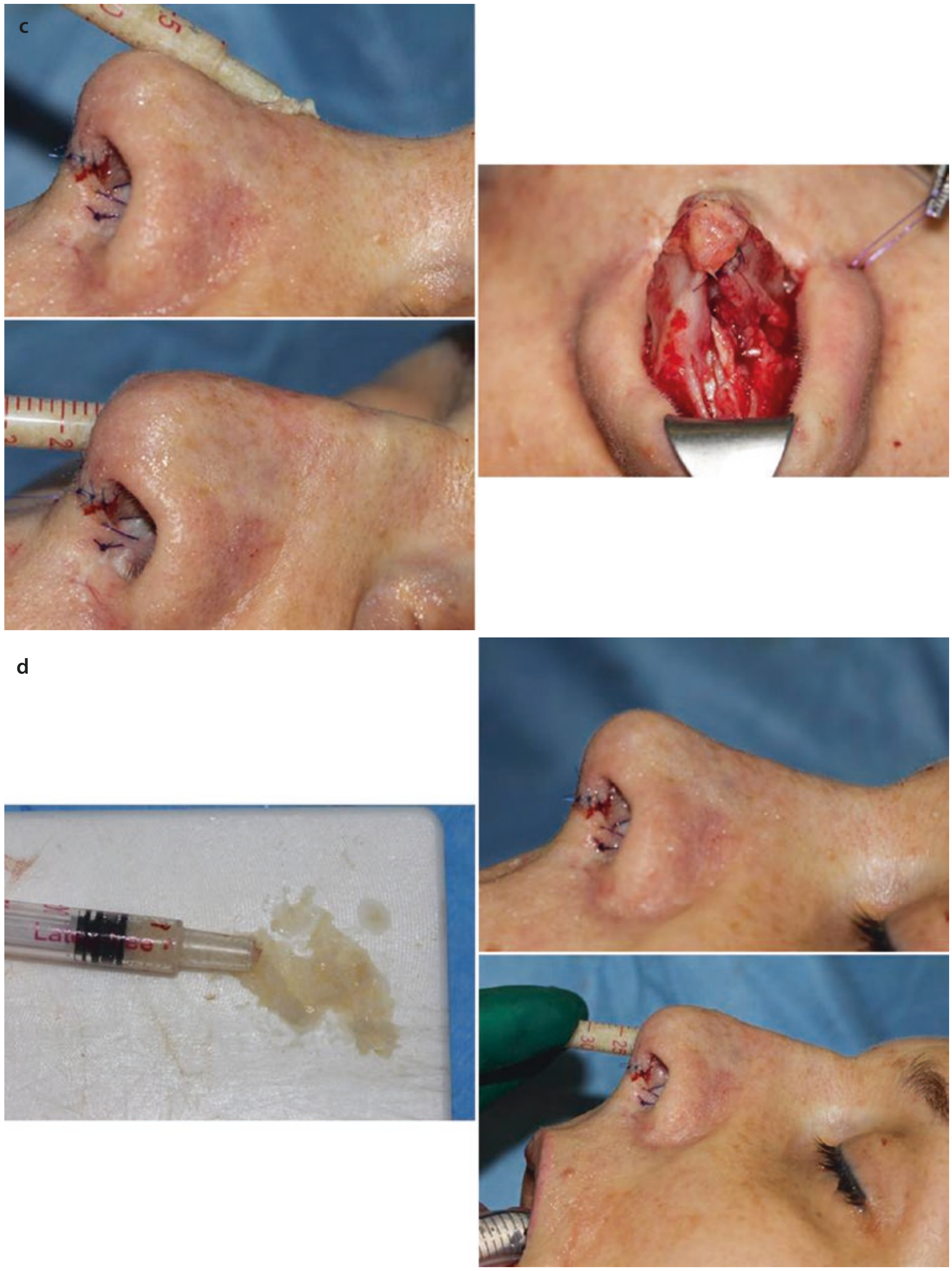


Fig. 6.33 (continued)

■ **Fig. 6.33** (continued)

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Primary Augmentation of the Dorsum

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_7

7.1 Surgical Principles in Primary Saddle-Nose Deformity

Although saddle-nose deformities are present in approximately 20 % of all rhinoplasties, the extent of saddle collapse varies widely. Hence, a wide variety of techniques are necessary to correct saddle noses. Because all saddle-nose defects arise from skeletal deficiency, augmentation is the primary means of surgical treatment. We prefer to use autologous augmentation materials for this purpose, with one exception: Tutogen (allogenic) fascia lata (Tutoplast® Inc., Neunkirchen am Brand, Germany). Tutoplast fascia lata is a gamma radiation processed human allograft which we have used successfully in over 3000 patients during the past 8 years (Fig. 7.1). Soaking the graft in antibiotic solution is necessary to rehydrate the graft and reduce infection risk. In addition to the avoidance of a donor site scar, fascia lata offers an ideal structure and stiffness for use in augmentation rhinoplasty. Conversely, autologous fascia lata lacks adequate stiffness, necessitating the use of percutaneous stay sutures to guide graft positioning and to prevent graft displacement.

As an alternative to allogenic fascia lata, we also use autologous temporalis fascia for dorsal augmentation (Fig. 7.2). However, autologous temporalis fascia has different biomechanical properties when compared to Tutoplast fascia lata. Since temporalis fascia is much thinner, the camouflage effect is reduced, and the comparative lack of graft stiffness necessitates the use of stay sutures or subcutaneous fixation sutures to maintain proper positioning. When used for radix augmentation, temporalis fascia can be compressed and suture sculpted to achieve the desired shape, and when placed over the nasion, the thick overlying skin of the radix serves to conceal irregularities in graft contour. In addition to soft-tissue augmentation, we also commonly perform dorsal augmentation using autologous cartilage harvested from a variety of donor sources including the tragus (Fig. 7.3), concha (Fig. 7.4), septum (Fig. 7.5), and rib (Fig. 7.6).

For some time, we have been using free diced cartilage (FDC) not only for dorsal refinements but also for augmentation, specifically if there is a minor contour deficiency. Cartilage harvested from the ear or rib—we avoid septal cartilage since its unique properties make it better suited to other purposes—is diced finely until it has a paste-like consistency and can be placed through the tip of a tuberculin syringe. The primary advantage of this material is its excellent malleability and reliable durability (Fig. 7.7).

We do not feel that autologous bone has a role in dorsal augmentation, and we have no clinical experience with bone grafting.

Prior to surgery, it must be decided if a full-length dorsal augmentation is preferable to a focal dorsal augmentation. Because a full-length augmentation avoids visible separations between the dorsum and the adjacent graft material, we often prefer to resect portions of the dorsum in order to facilitate a full-length (and thus far more uniform) dorsal restoration. Full-length grafts have the added advantage of creating more uniform and natural-appearing brow-tip aesthetic lines.

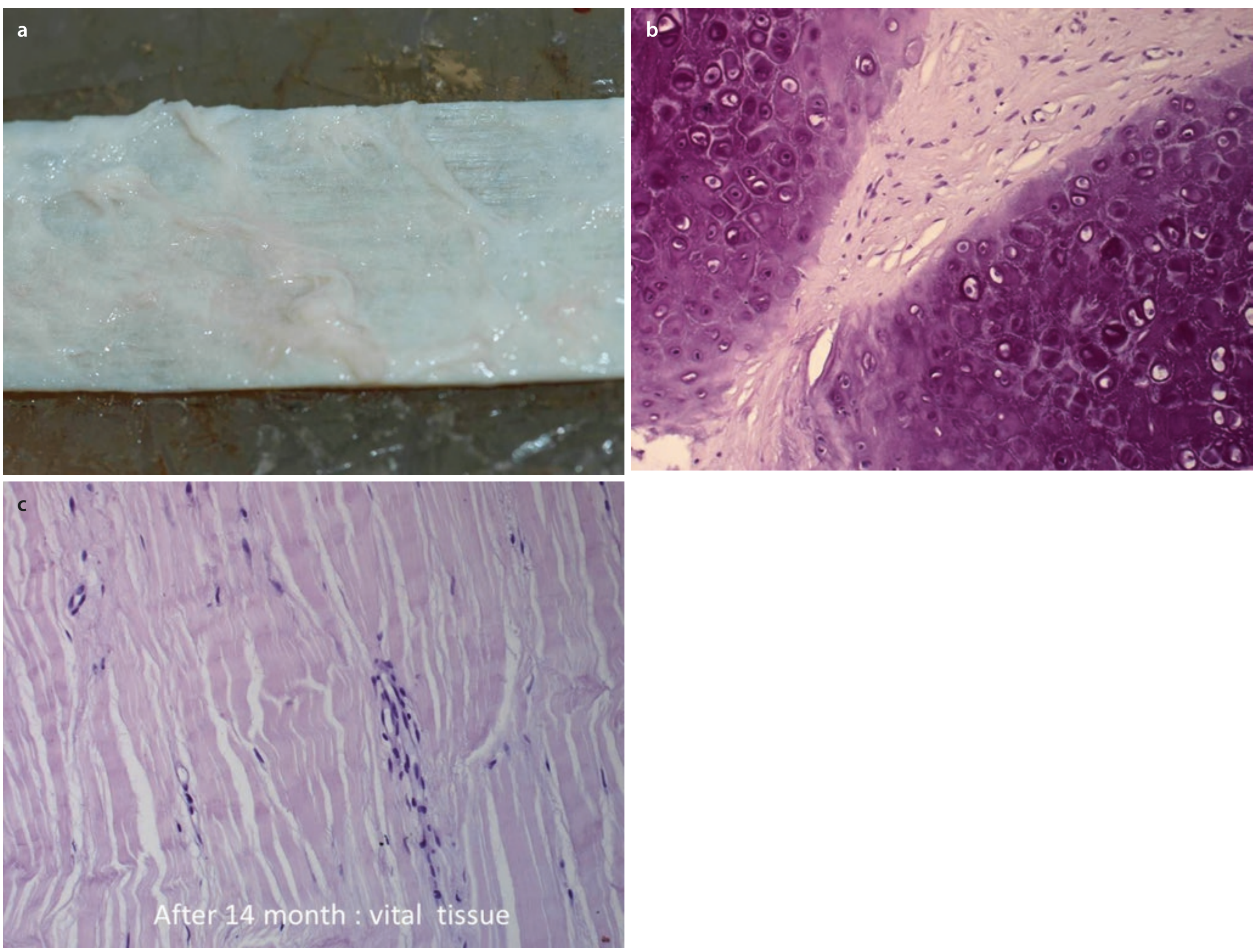
Although full-length augmentation is often preferable for comparatively large defects of the nasal dorsum, minor saddle indentations involving only a small portion of the dorsum are best managed with small precision-fabricated grafts custom-tailored to the defect. For this purpose, we prefer Tutoplast fascia lata, cephalic portions of the lower lateral cartilage (Fig. 7.8), tragal cartilage grafts (Fig. 7.3), or septal cartilage (Fig. 7.9) when available. Tragal cartilage is a particularly well-suited graft material for small-sized defects since we can easily harvest a 12–16-mm-wide, flat, and uniformly thick cartilage specimen with minimal donor site morbidity. When harvesting tragal cartilage, we also routinely leave behind a small outer rim of cartilage to preserve the tragal contour. Tutoplast allogenic fascia lata is available in large quantities and is well suited to virtually any sized defect. It can also be used as a single layer or as multiple layers. We have previously used as many as six layers of Tutoplast with good results, and Tutoplast can also be used to camouflage irregularities in underlying autologous cartilage grafts. Another effective method for focal dorsal augmentation is the excised cephalic remnants of the lower lateral cartilages or free diced cartilage. Noses with overly wide and bulky nasal tips often provide adequate amounts of suitable augmentation material following the cephalic trim procedure (Fig. 7.8). Morselized septal cartilage is another potential source of augmentation material (Fig. 7.9). However, the limited supply of septal cartilage must often be prioritized for other needs, and care must be taken to avoid crushing septal cartilage since unwanted chondrogenesis and/or chondrocyte mortality may lead to unacceptable long-term results.

If the saddle-nose deformity requires significantly more volume, a larger graft is required, and we often use conchal cartilage for these defects. In order to adapt the conchal graft to the appropriate shape, we incise the concave conchal surface in a grid-like pattern, leaving the outer perichondrium intact to maintain graft integrity (Fig. 7.10). When required, a double-layered graft can be used for additional graft thickness. Stability of the two-layered "sandwich" graft is enhanced by suturing the grafts in a reciprocal orientation.

When even greater volume replacement is required, our workhorse technique is the diced cartilage-fascia (DC-F) graft. Originally introduced under the moniker "Turkish delight" by Erol Onur, oxidized cellulose polymer was initially used to envelop the diced cartilage, but long-term results suffered from substantial cartilage resorption. However, the modified technique introduced by Rollin K. Daniel, which uses temporalis fascia to encase finely diced cubes of autologous cartilage measuring no more than 0.2–0.4 mm^3, has virtually eliminated the problem of cartilage resorption. In order to create a uniform fascial sleeve, we use a tuberculin syringe with its tip amputated to serve as an assembly scaffold. The fascia is first wrapped around the syringe and temporarily held in position with short hub needles (Fig. 7.11). Once secured, the fascia is trimmed and sewn lengthwise to create a single longitudinal seam. After sewing the distal (cephalic) end of the sleeve shut, the syringe is then loaded with the desired amount of diced cartilage, and the cartilage is injected into the fascial sleeve (◘ Fig. 7.12). After placement of the assembled DC-F graft into the subcutaneous pocket, we close the (open rhinoplasty) transcolumellar incision before assessing the final nasal contour. To facilitate adjustments in graft size, the proximal end of the sleeve is left open so that excess cartilage can be "milked" from the graft and removed via the marginal incision as needed. We have observed equivalent long-term results using both autologous temporalis fascia and allogenic fascia lata for sleeve construction, and diced cartilage can be constructed from septal, conchal, and rib cartilage (or combinations therein) with equal reliability.

In patients with severe dorsal defects, the solitary use of malleable augmentation materials is ill-advised since a structurally sound skeletal framework is missing. In these cases, a structural framework of *solid* costal cartilage must first be created to provide the necessary foundation for surface contour grafting (◘ Fig. 7.13). Because solid rib cartilage grafts are notoriously prone to warping, special precautions must be taken when using rib cartilage. Perhaps the most important precaution is the concept of "balanced carving," in which the graft is symmetrically harvested from the central core of the costal cartilage. In this manner the intrinsic stresses of the inner and outer cartilage components are balanced. Next, the graft is submerged in saline for a long as possible to identify any intrinsic warping tendencies not addressed by concentric carving. When identified prior to placement, warped grafts can sometimes be carved asymmetrically to balance out asymmetric stresses. Although some surgeons use a Kirschner wire to skewer the graft longitudinally for added support, we have no experience with this technique. Instead, we prefer a thick, and therefore strong, segment of solid rib cartilage, coupled with a DC-F overlay graft, for total dorsal reconstruction. As an alternative to the solid rib graft, for a while we have been using cartilaginous beam grafts consisting of two or three layers of 2–3-mm-thick stripes from rib cartilage fixed against each other.

Further stabilization is first achieved by attaching a columellar strut graft using the tongue-in-groove configuration for secure unification (◘ Fig. 7.13). If a straight segment of rib cartilage is unavailable, the columellar strut can also be fashioned from a double-layered conchal cartilage graft.



◘ **Fig. 7.1** (**a**) Allogenic fascia lata after rehydration. (**b**) Histology of explanted graft 12 months after initial placement. (**c**) Histology of explanted graft 14 months after initial placement

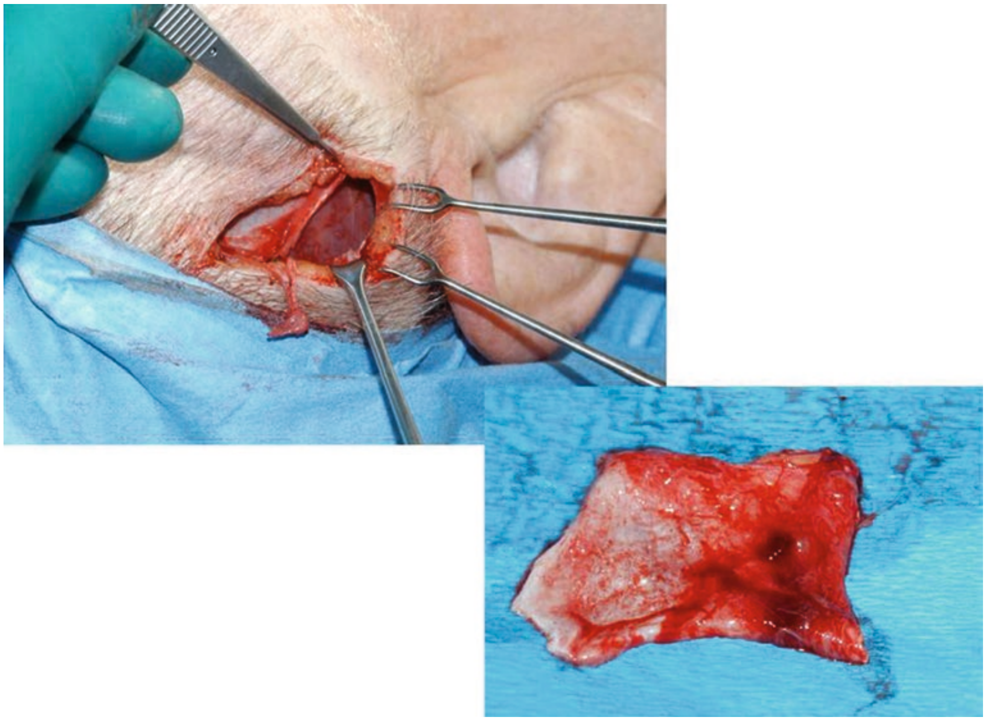


Fig. 7.2 Autologous temporalis fascia

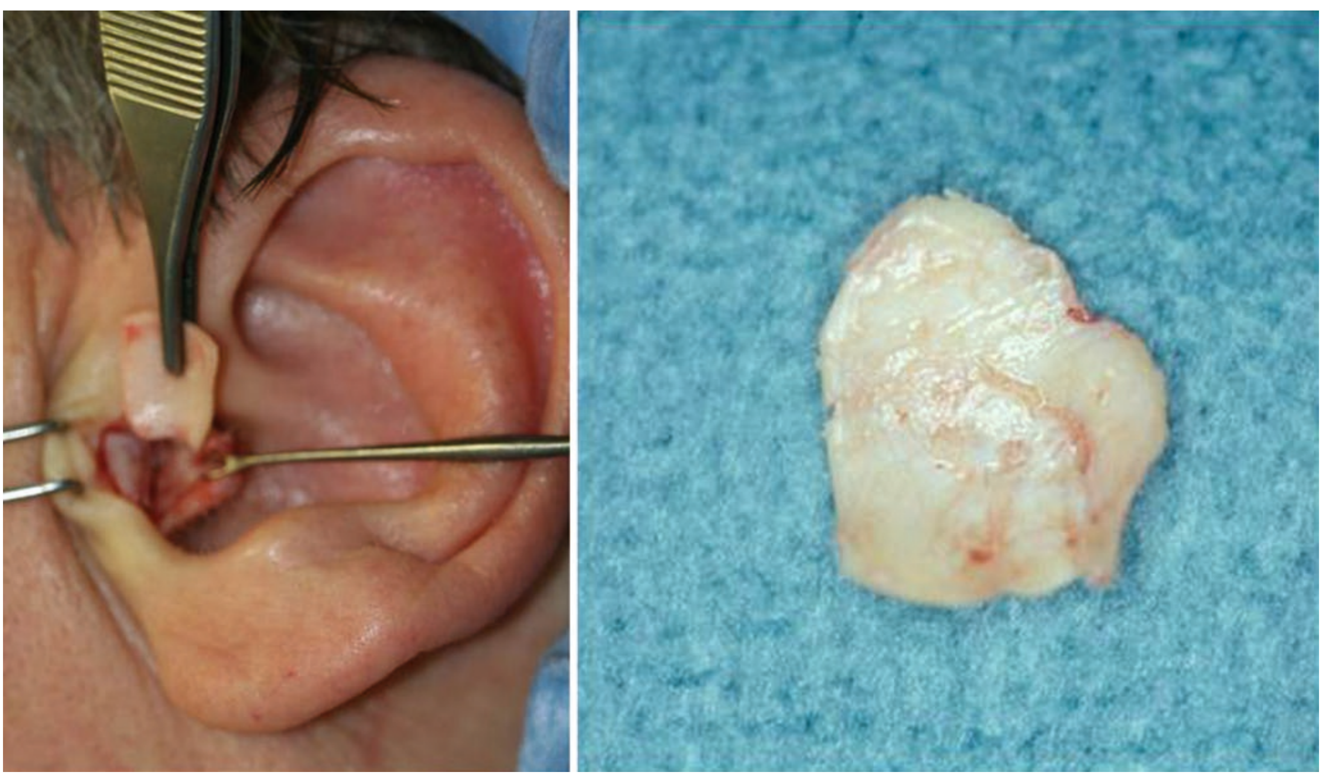


Fig. 7.3 Tragal cartilage

Fig. 7.4 Conchal cartilage

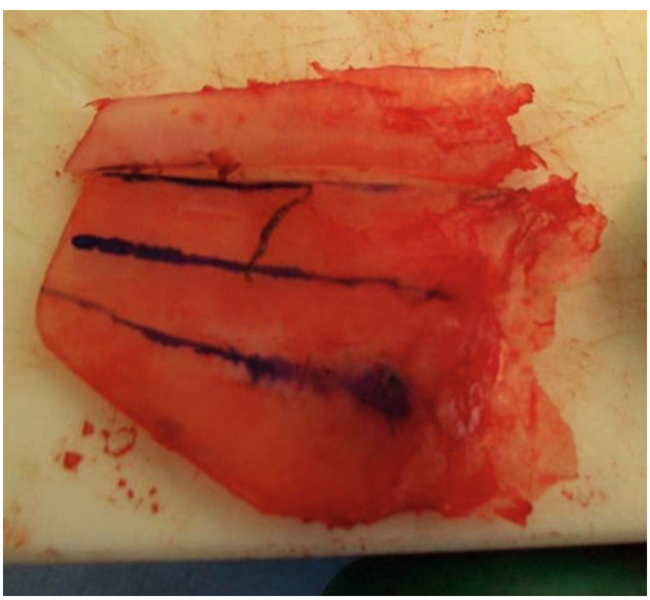


Fig. 7.5 Septal cartilage

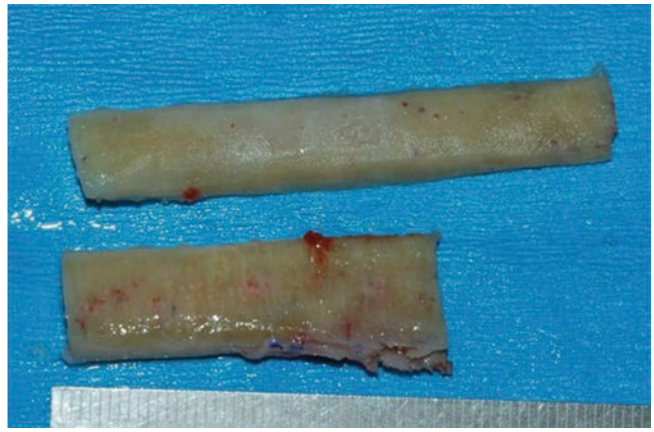


Fig. 7.6 Solid rib cartilage

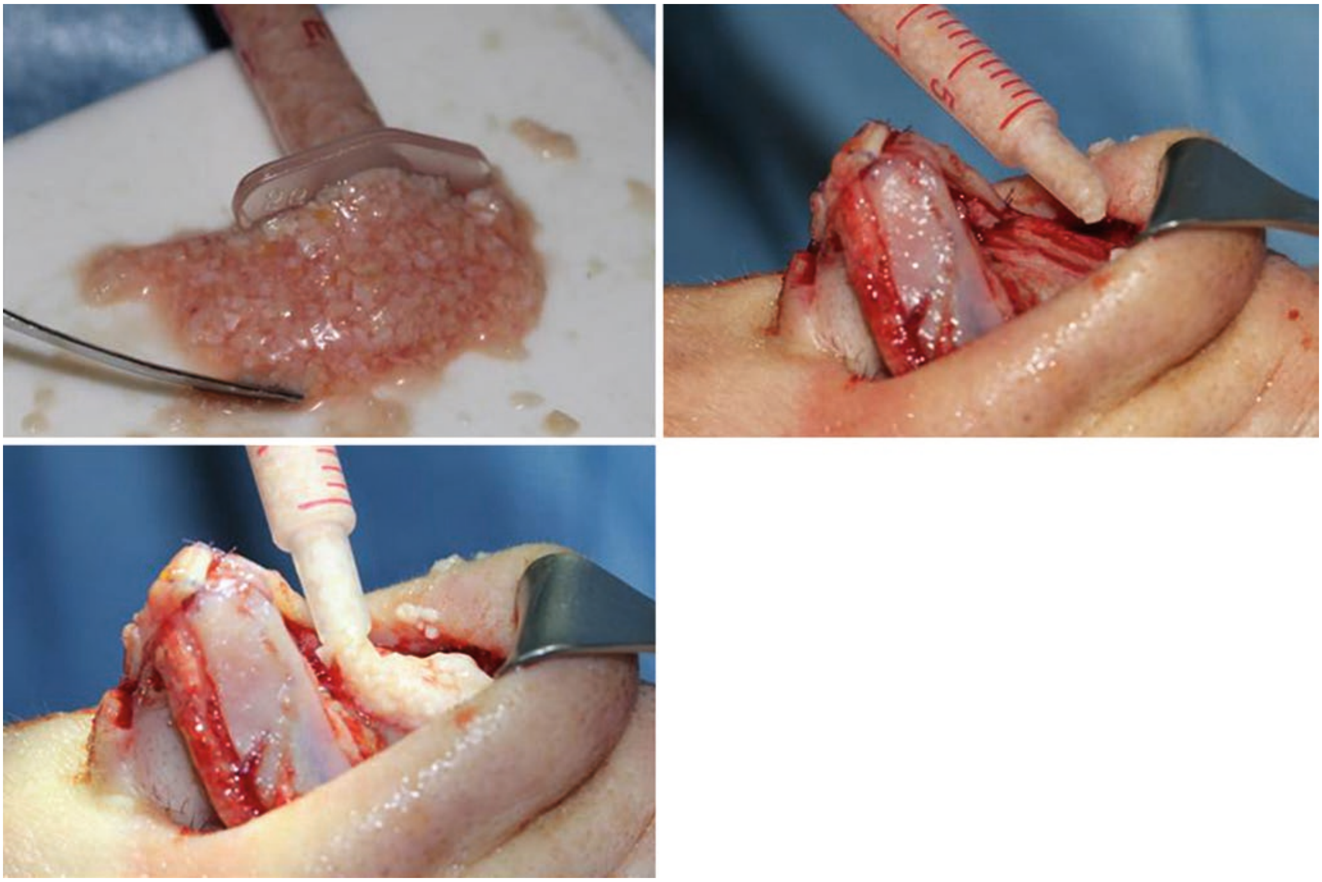


Fig. 7.7 Finely diced cartilage for using as free graft (FDC)

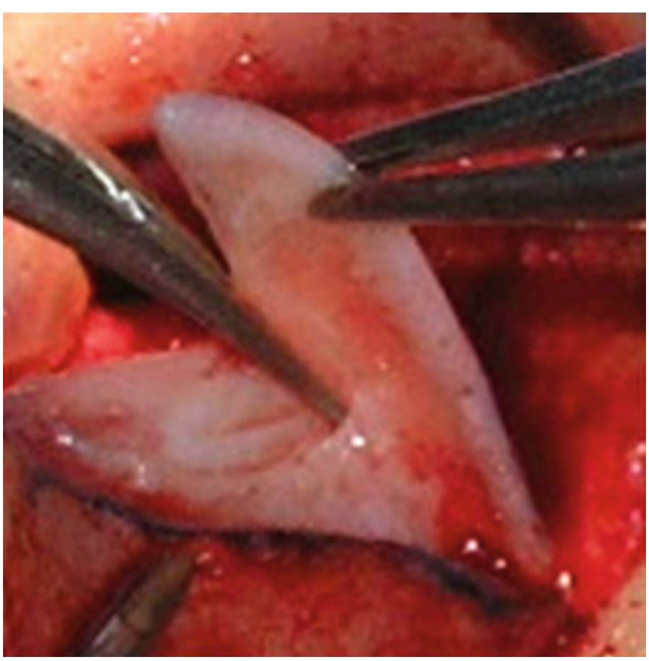


Fig. 7.8 Cephalic portion of the lower lateral cartilages for augmentation

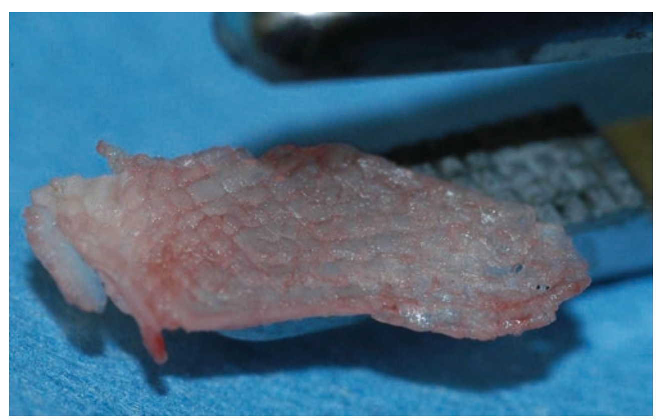


Fig. 7.9 Morselized septal cartilage

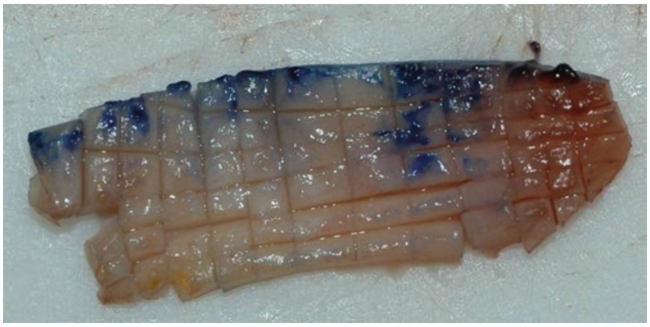


Fig. 7.10 Flattened conchal cartilage graft after cross hatching

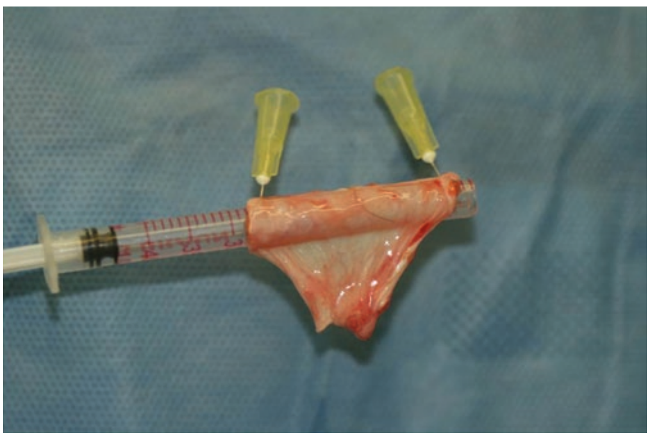


Fig. 7.11 Tuberculin syringe with autogenous temporalis fascia attached

Fig. 7.12 DC-F with allogenic fascia lata

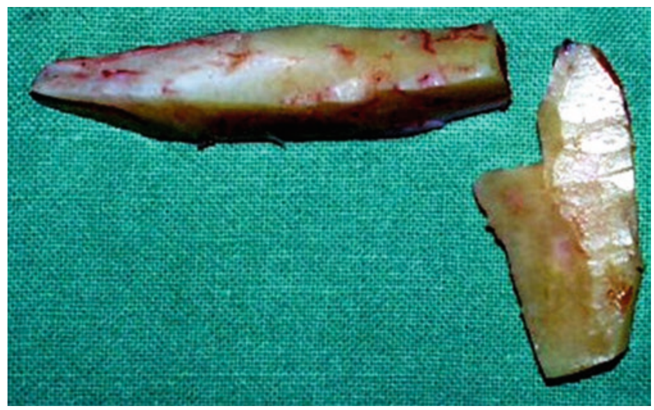
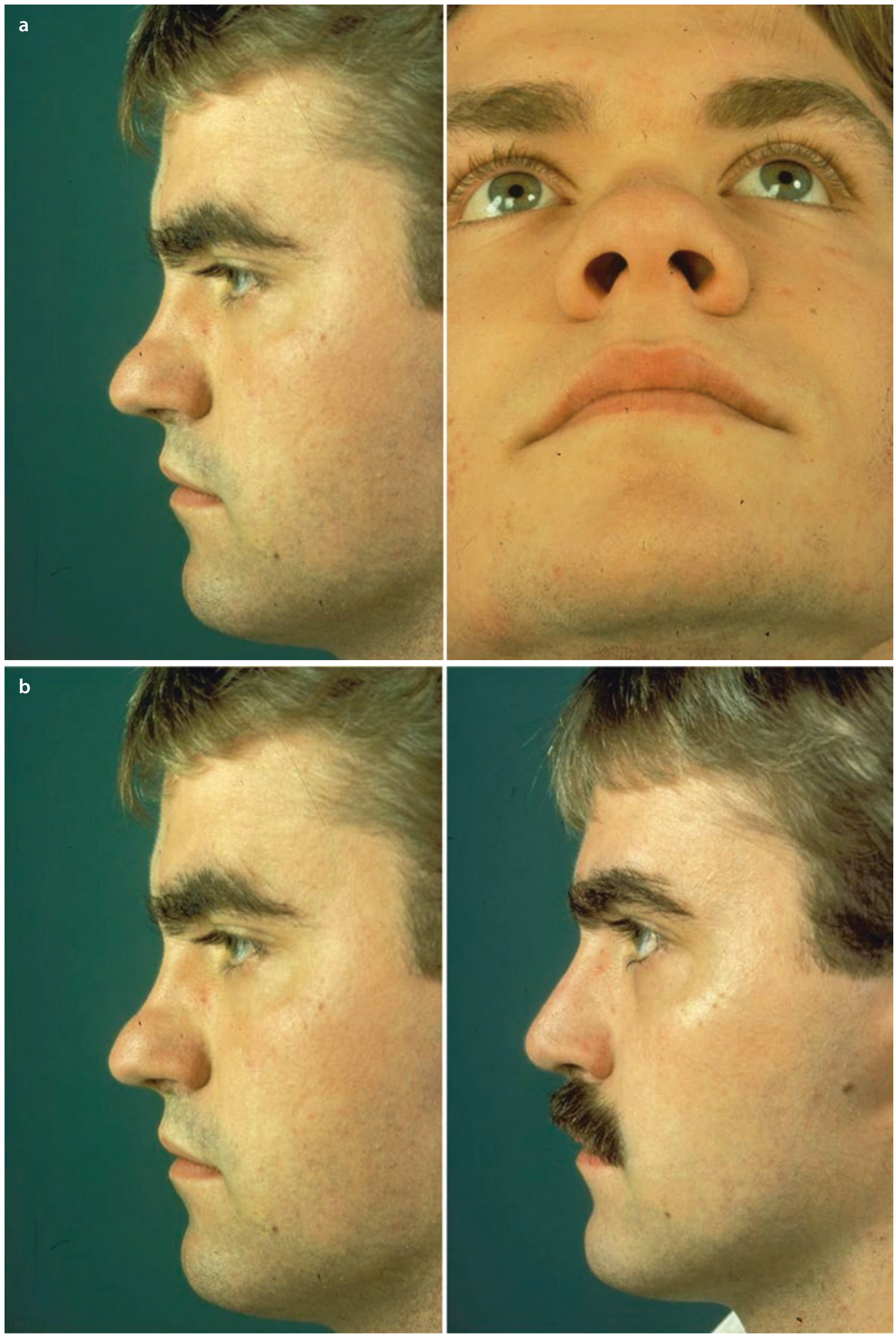


Fig. 7.13 Two-part solid rib cartilage graft consisting of dorsal replacement graft and integrated columellar strut graft

7.2 Case Studies

7.2.1 Case 1: Augmentation with Cephalic Portion of LLC

A 21-year-old male presented for cosmetic rhinoplasty complaining of a large nasal tip and a weak nasal dorsum. Examination revealed a wide and bulky nasal tip, thick nasal skin, and a low nasal dorsum. Treatment included resection of the LLC cephalic margin via a closed rhinoplasty approach. Tip contour was further enhanced with vertical dome division and contouring sutures. The resected portions of the LLC were then used for dorsal augmentation (▣ Fig. 7.14).



▣ **Fig. 7.14** (a–c) Augmentation with cephalic portion of LLC

Fig. 7.14 (continued)

7.2.2 Case 2: Dorsal Reconstruction by Extracorporeal Septal Reconstruction with PDS Foil

A 17-year-old female presented after severe nasal trauma in childhood extreme saddling of the whole dorsum with blocking on both sides. The bony pyramid was very wide.

Using a closed approach with hemitransfixion incision, we started to dissect both upper tunnels, but the scarring was so bad that we switched to the open one and transected the columella with a stair-step incision. After completing the dissection, the ULCs have been split from the septum, the perpendicular plate was fractured by pressing a 5-mm chisel, and then the remnants of the septum could be removed in a big block of scars. There was not enough cartilage for reconstructing a neoseptum, so that we harvested the concha from a posterior approach. We folded a double-layered sandwich graft, sutured smaller plane cartilages to a PDS foil, and fixed both together. After parasagittal oblique and low-to-high lateral osteotomies from a sublabial access, the PDS foil with the cartilages was replanted and fixed to the ULC and the perforated ANS. The dorsum was covered with a full-length cartilage graft from a septal spur together with a full-length allogenic fascia lata graft. The medial crura have been fixed to the sandwich graft and a transdomal suture narrowed the domes (Fig. 7.15).

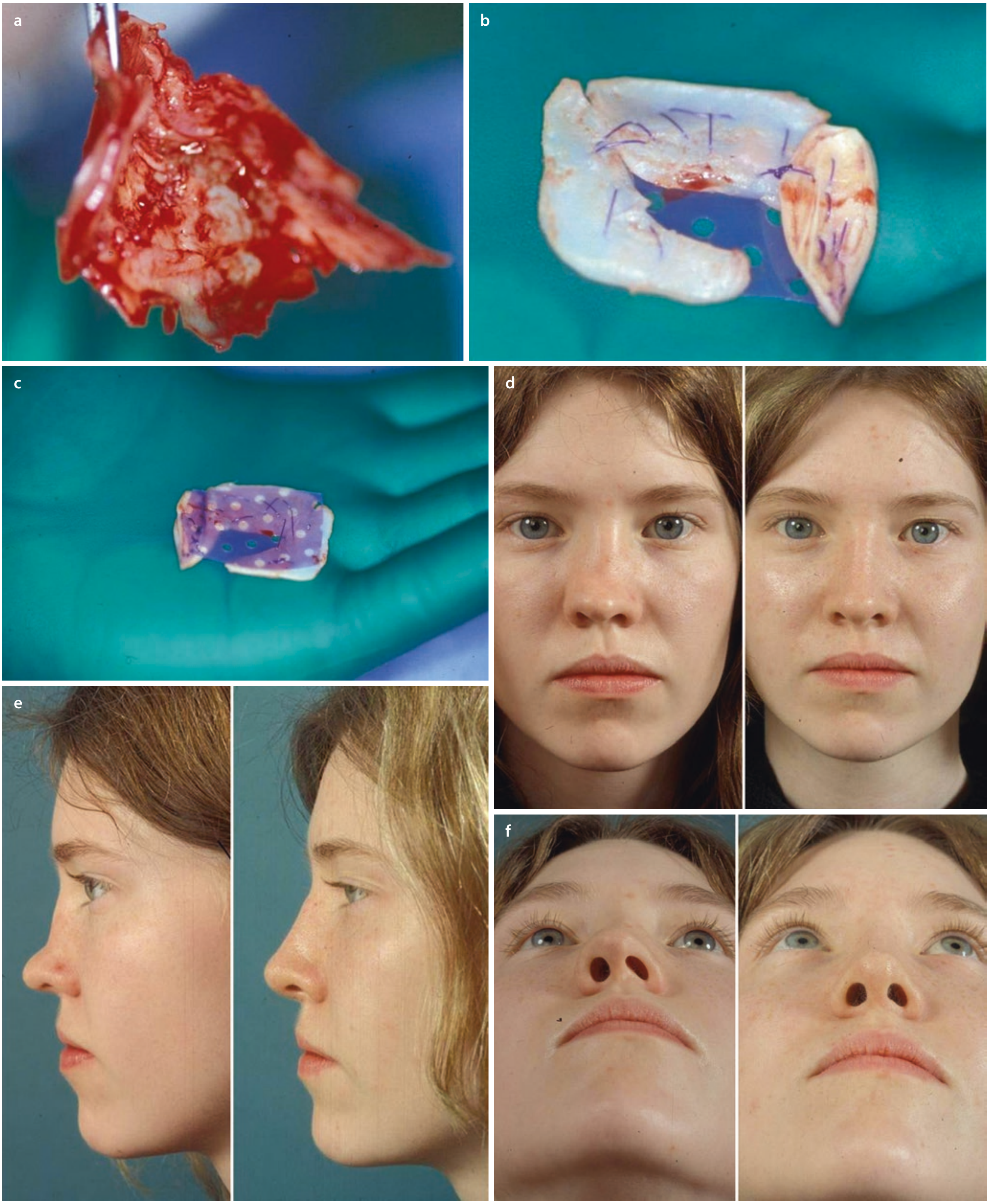
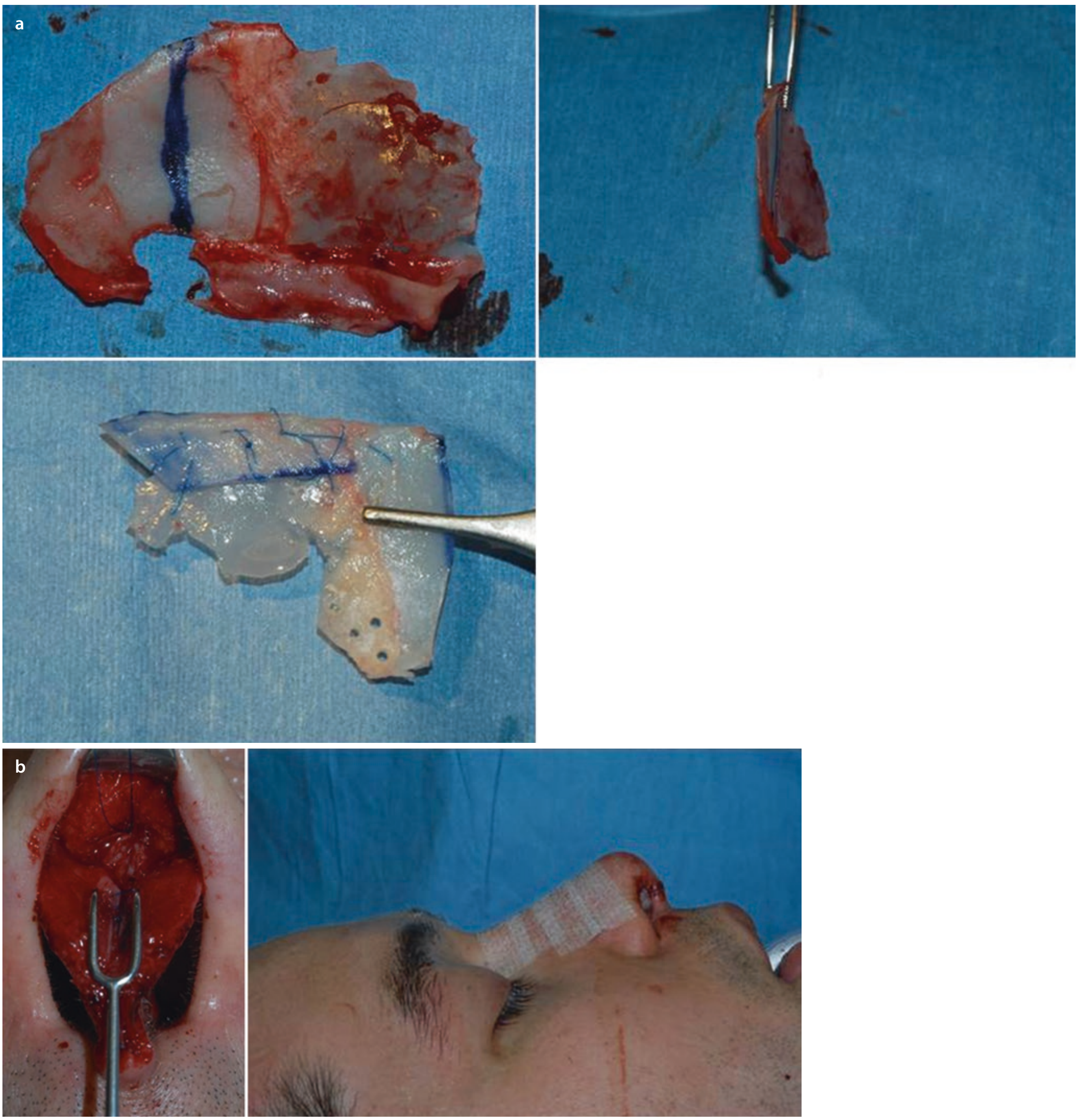


Fig. 7.15 (**a**–**c**) Dorsal reconstruction by extracorporeal septal reconstruction with PDS foil. (**d**–**f**) Front view, profile view, base view pre-op/post-op. (**g**–**i**) 9 years follow up

Fig. 7.15 (continued)

7.2.3 Case 3: Dorsal Reconstruction by Extracorporeal Septal Reconstruction

A 27-year-old male presented with nasal airway obstruction resulting from a post-traumatic septal deformity and saddle-nose collapse. Treatment included an extracorporeal septoplasty in which the caudal septum was excised and the posterior portion of the quadrangular cartilage was used to create a new L-strut. The deformed caudal septum was then used for spreader grafts, and the newly created construct was then reimplanted using drill holes in the nasal bones and nasal spine for suture fixation. Additional stability was achieved with suture fixation to the upper lateral cartilages. In this patient, the saddle-nose deformity was corrected using only L-strut reconstruction via the extracorporeal technique (◘ Fig. 7.16).



◘ **Fig. 7.16** (**a**–**b**) Dorsal reconstruction by extracorporeal septal reconstruction. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 7.16 (continued)

Fig. 7.16 (continued)

7.2.4 Case 4: Augmentation with Conchal Cartilage and Allogenic Fascia

A 15-year-old female presented for rhinoplasty with a history of childhood nasal trauma complicated by septal abscess formation. Examination revealed a short, underdeveloped nose with a prominent saddle-nose deformity. Endonasal examination revealed partial absence of the quadrangular septum.

Treatment involved removal of the entire residual septum, rotating the specimen 180° so that the lower border became the new nasal dorsum, and then reimplanting and suturing the construct to both the nasal spine and the ULCs. The septal construct was then augmented with residual pieces of the septum and covered by a three-layered conchal cartilage graft concealed beneath allogenic fascia lata. A double-layered shield graft covered in soft tissue was also used for nasal lengthening (Fig. 7.17).

Fig. 7.17 (**a–b**) After extracorporeal septal reconstruction the remaining saddle was corrected with residual parts of septal cartilage, covered with allogenic fascia lata lengthening by shield grafts. (**c–e**) Front view, profile view, base view pre-op/post-op

Fig. 7.17 (continued)

■ **Fig. 7.17** (continued)

7.2.5 Case 5: Reconstruction of the Anterior Septum with Double-Layered Conchal Graft and Augmentation with DC-F from Allogenic Fascia and Diced Cartilage

A 17-year-old female presented with a post-traumatic nasal deformity resulting from childhood trauma and a likely septal abscess. Examination revealed a largely absent caudal septum leading to columellar retraction and a saddle-nose deformity with a widened and splayed nasal dorsum.

Surgical reconstruction of the anterior septal L-strut involved placement of a double-layered conchal graft harvested from both ears and sutured to the ULCs and a nasal spine drill hole. Severely buckled medial crura were straightened by suture fixation to the leading edge of the new caudal septum. Tip refinement was accomplished using cephalic fold-under flaps (lateral crural underlay technique), and the dorsum was augmented using a DC-F graft fashioned from diced rib cartilage and allogenic fascia lata (◘ Fig. 7.18).

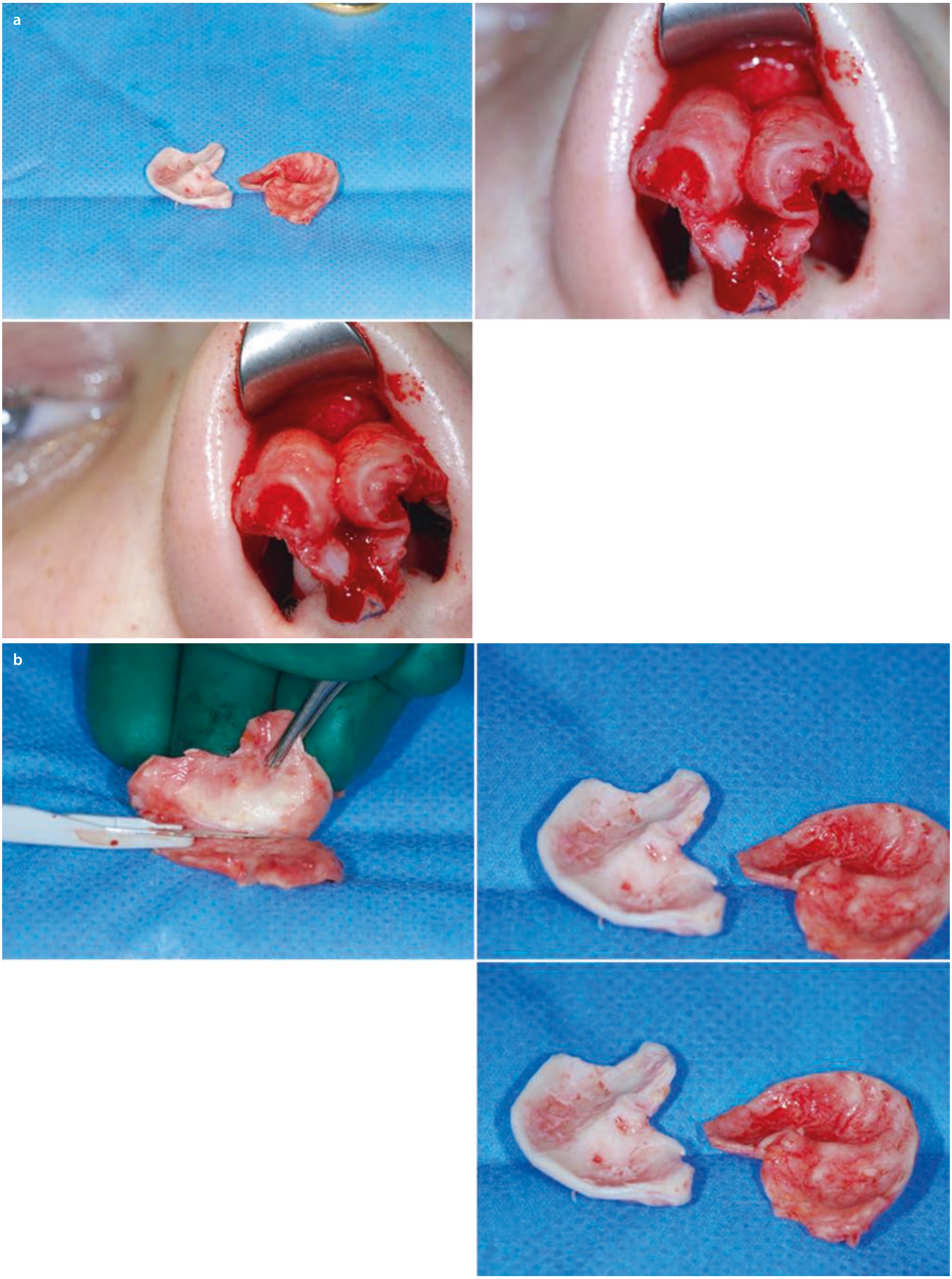


Fig. 7.18 (**a**–**c**) Reconstruction of the anterior septum with double-layered conchal graft and augmentation with DC-F from allogenic fascia and diced cartilage. (**d**–**f**) Front view, profile view, base view pre-op/post-op

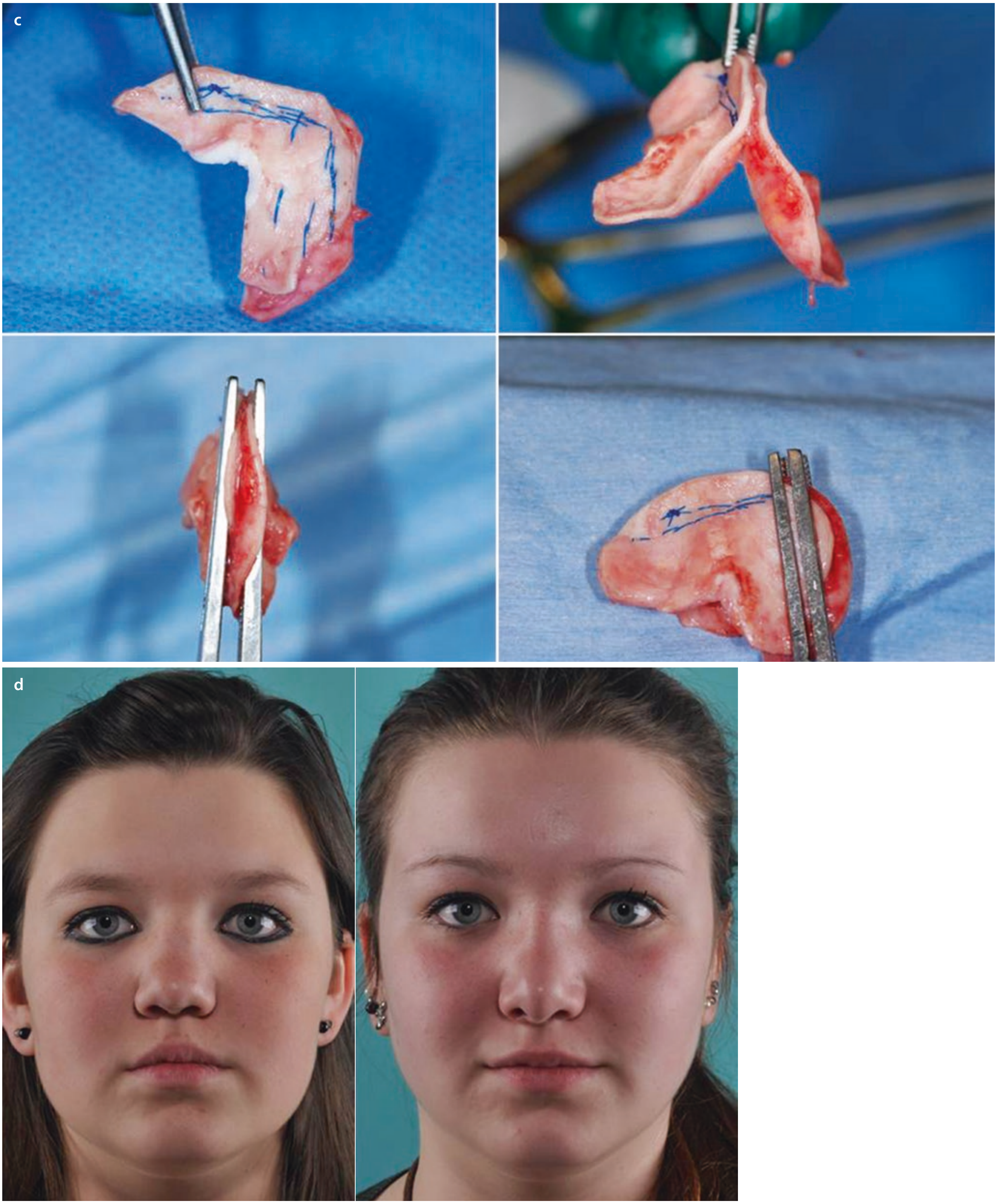


Fig. 7.18 (continued)

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Fig. 7.18 (continued)

7.2.6 Case 6: Dorsal Reconstruction by Solid Graft

A 19-year-old female presented with a severe post-traumatic saddle-nose deformity resulting from childhood trauma followed by septal surgery. Owing to soft-tissue scarring and contracture, a solid framework of rib cartilage was required for reconstruction. Two components were used: a large dorsal augmentation graft with a groove cut in the distal end and a large anterior septal replacement graft with a reciprocal "tongue" carved into the upper cephalic border. Suture fixation was used to secure the tongue-in-groove interdigitation of the two solid rib grafts. High closing tension at the transcolumellar incision was offset with a layered skin closure (Fig. 7.19).

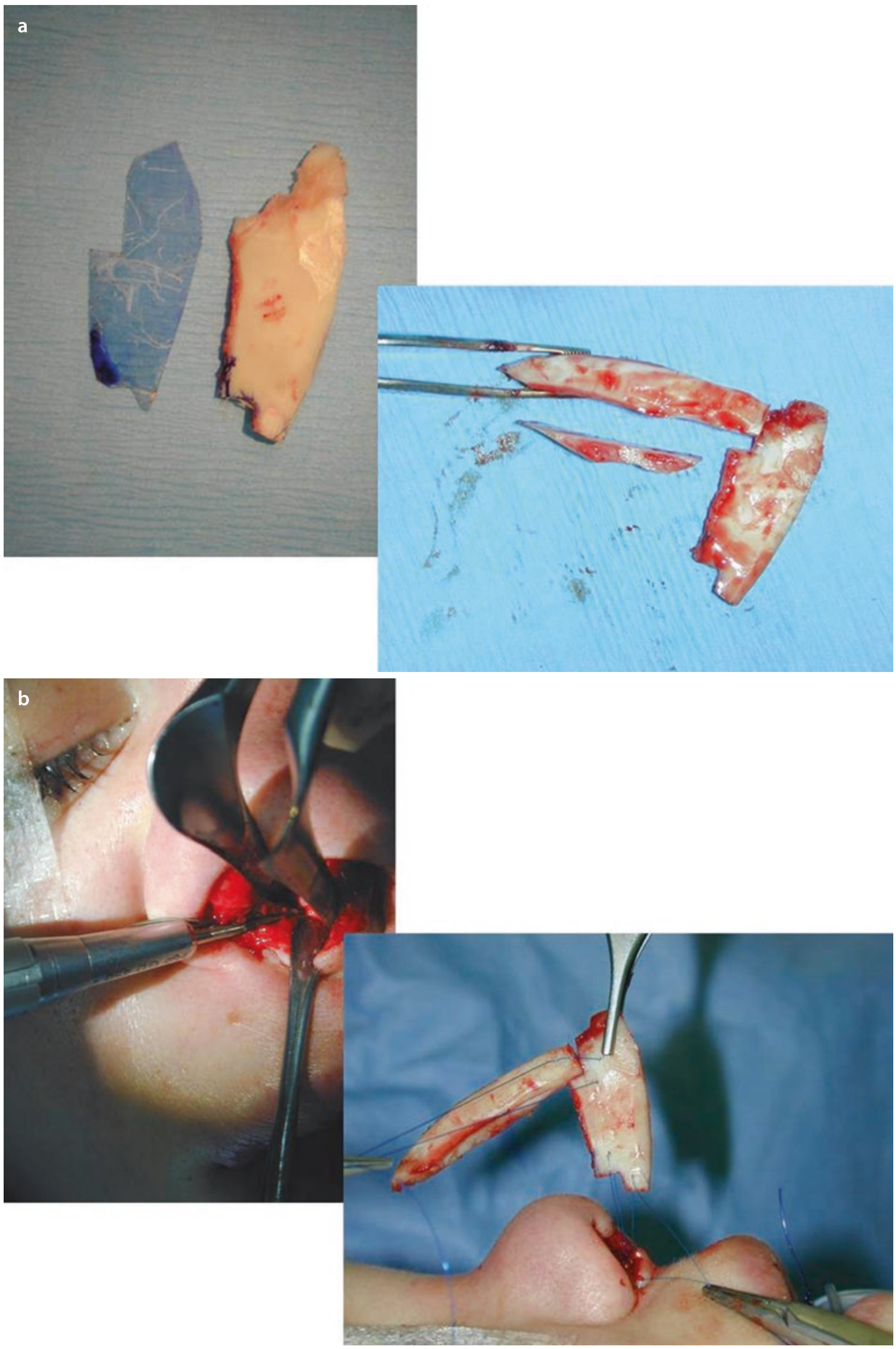
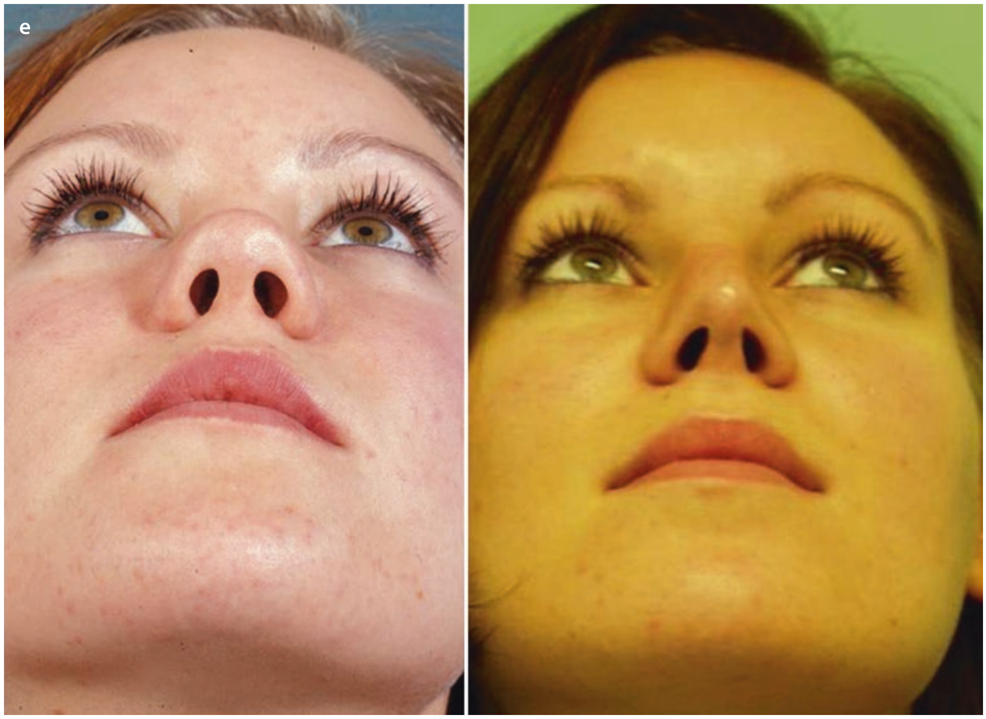


Fig. 7.19 **(a–b)** Dorsal reconstruction by solid rib graft combined with solid septal replacement graft. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 7.19 (continued)

Fig. 7.19 (continued)



7.2.7 Case 7: Dorsal Reconstruction with DC-F

A 35-year-old male presented with a severe saddle-nose deformity resulting from years of competitive boxing. Surgical exploration revealed overlapping layers of septal cartilage and thickening of the bony septum up to 5 mm in width. Treatment involved extracorporeal reconstruction of the septum with thinning of the bony segments. Fixation of the reimplanted construct included drill hole fixation at the nasal spine and nasal bones and suture fixation to the upper lateral cartilages. A double-layered conchal graft was used to increase tip projection, and left-over conchal cartilage was diced and combined with allogenic fascia lata to create a DC-F dorsal onlay graft (Fig. 7.20).

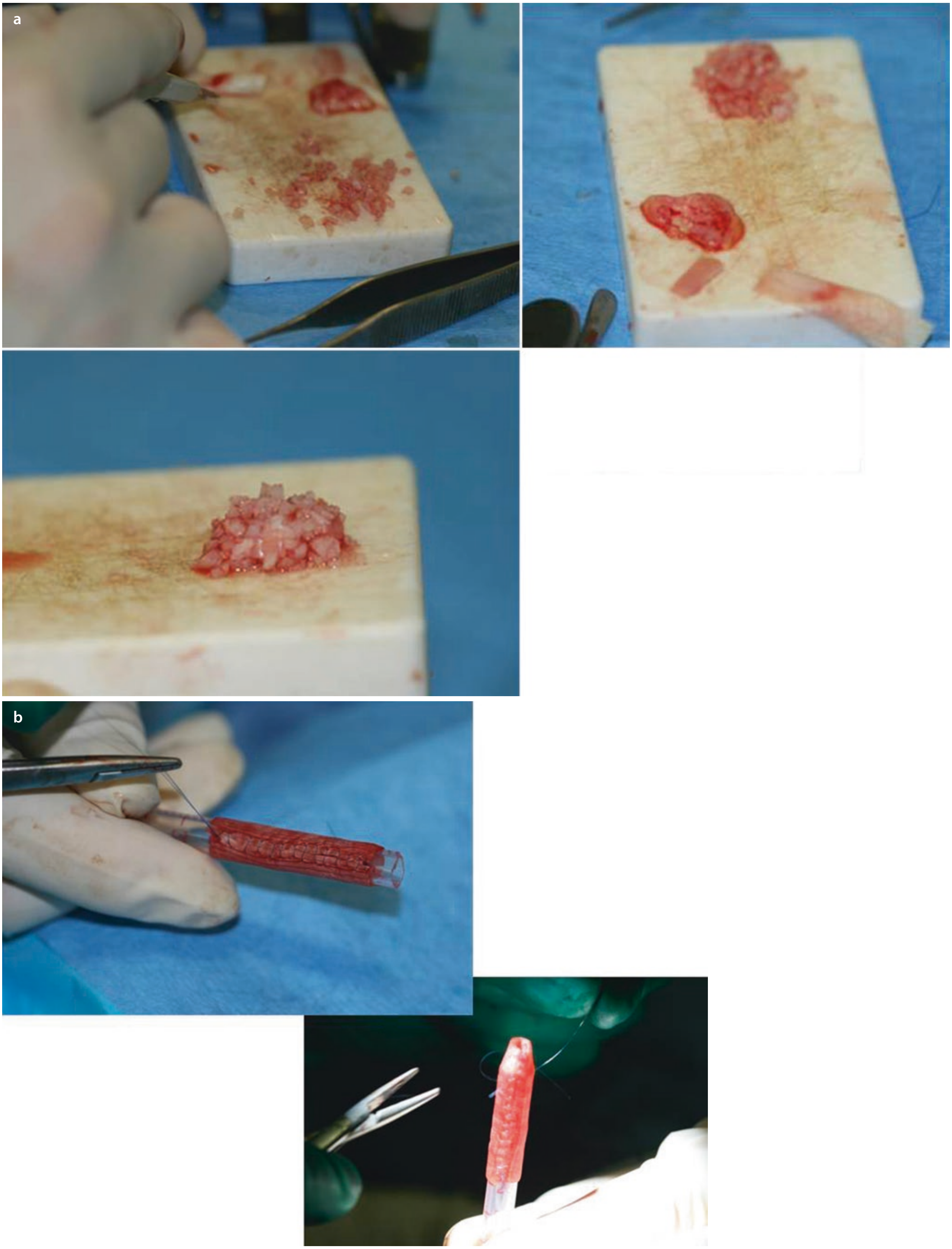


Fig. 7.20 (**a**–**b**) Dorsal reconstruction with DC-F (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 7.20 (continued)

Fig. 7.20 (continued)

7.2.8 Case 8: Dorsal Reconstruction with DC-F

A 34-year-old male presented after a criminal attack severe saddle-nose deformity. We planned a nose reconstruction with a DC-F from allogenic fascia lata and autologous diced rib cartilage. The fascia lata was soaked with gentamicin solution and sutured over a tuberculin syringe for tubing. The tenth rib was harvested subperichondrially from a 4-cm incision. To reduce any pains, we put a catheter installing 10 cm of 2 % ropivacaine as a local anesthetic. This was sucked out after 30 min.

The rib cartilage was cut horizontally in 2-mm-thick strips. One was used later on as a columellar strut; the residual ones have been diced very finely for the DC-F.

Starting with an open approach technique, the epiperichondrial/subperiosteal dissection of the dorsum was extremely difficult because of severe scars.

The cephalic parts of the LLC have been trimmed, and a columellar strut from the rib was placed. The medial crura have been fixed to the strut; the domes have been contoured by a transdomal suturing. To avoid later drooping, a tip suspension suture with anterior sling has been placed. Then the DC-F was put onto the dorsum with two guiding sutures. The fascia tube was closed only cranially. After putting back the flap and closing the columella incision with 6-0 nylon, the overfilled DC-F was preciously molded by digital finger pressure, and the excess of diced cartilage could be sucked out before closure of the infracartilaginous incision. Then an elastic paper tape, a sticking plaster, and a plaster of Paris were applied for 2 weeks (◘ Fig. 7.21).

Fig. 7.21 (**a**) Dorsal reconstruction with DC-F. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 7.21 (continued)

7.2.9 Case 9: Dorsal Reconstruction with DC-F

A 19-year-old male presented with a short nose and low nasal dorsum. There was no history of nasal trauma. Treatment involved harvesting the central quadrangular cartilage to create a columellar strut graft which was positioned to counter-rotate the tip and lengthen the nose. To immobilize the strut, extended spreader grafts were placed bilaterally. The dorsum was augmented using a DC-F graft fashioned from diced conchal cartilage and a sleeve of allogenic fascia lata (Fig. 7.22).

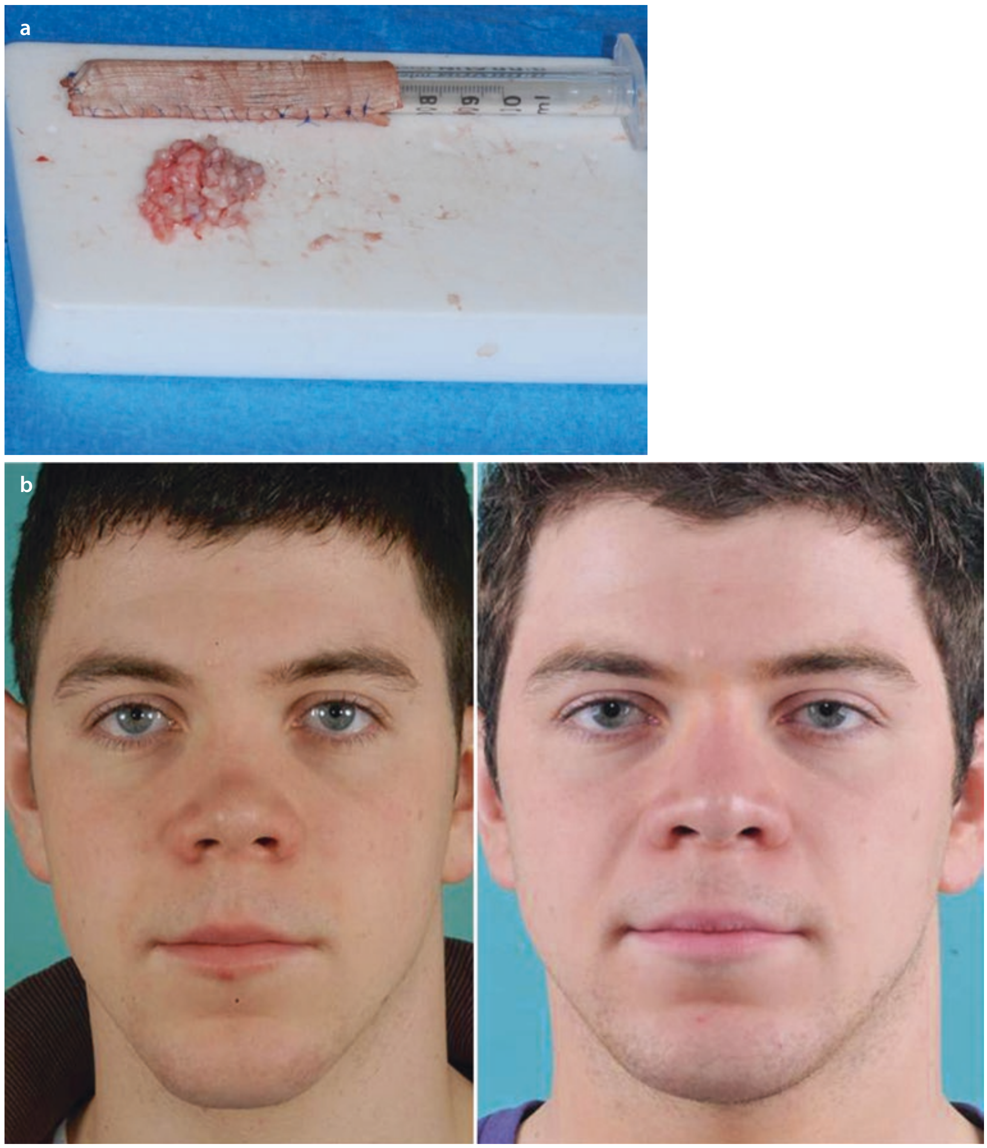


Fig. 7.22 **(a)** Dorsal reconstruction with DC-F. **(b–d)** Front view, profile view, base view pre-op/post-op

■ **Fig. 7.22** (continued)

7.2.10 Case 10: Dorsal Reconstruction of Ethnically Low Dorsum

A 32-year-old colored female presented a long nose with flat dorsum and deep radix. The tip and the nasal base have been very wide. After harvesting the tenth rib from the right side, an open approach technique was used. After extramucous dissection of the dorsum and splitting the ULC from the septum, a cartilage graft from the central part of the septum has been harvested for a columellar strut, but the cartilage was too thin and weak and could be used only for a shield graft. However, the tip of the rib graft was very straight and strong and worked perfectly as a columellar strut. The nasal pyramid was narrowed after parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies. The parasagittal osteotomy has been performed with a Lindeman fraise in order not only to get a straight cut but to remove some bone at the same time.

The tip was narrowed by transdomal sutures, and spanning sutures after the lateral crura have been strengthened by a fold-under flap technique. That means that the cephalic portion has been flipped under the lateral crus after dissecting off the vestibular skin. So an iatrogenic concavity of the lateral crura could be avoided. To rotate the tip upward and keep it in position, a suspension suture with anterior sling was fixed.

After these steps, a pattern of the dorsal defect was made with some strongly rolled gauze, and according to that a DC-F from allogenic fascia lata and finely diced cartilage from the rib was build. It was brought in position with two guiding sutures, but it seemed that we needed more volume. Therefore, we put another layer of allogenic fascia on top of the DC-F.

Originally, we had planned a sill and alar base resection, but by increasing the projection, it was not necessary anymore. After 1 year, we had to perform a minor revision, because the DC-F had shifted to the right and seemed too bulky. We sutured a new tube from allogenic fascia lata, diced the solid mass of the previous DC-F again, and built a new graft. The tip projection was reduced by columella shortening, and then it became necessary to reduce also the alar base and to perform a sill resection. To improve the tip complex, a conchal graft was placed for reconstruction of the infratip lobule (◘ Fig. 7.23).

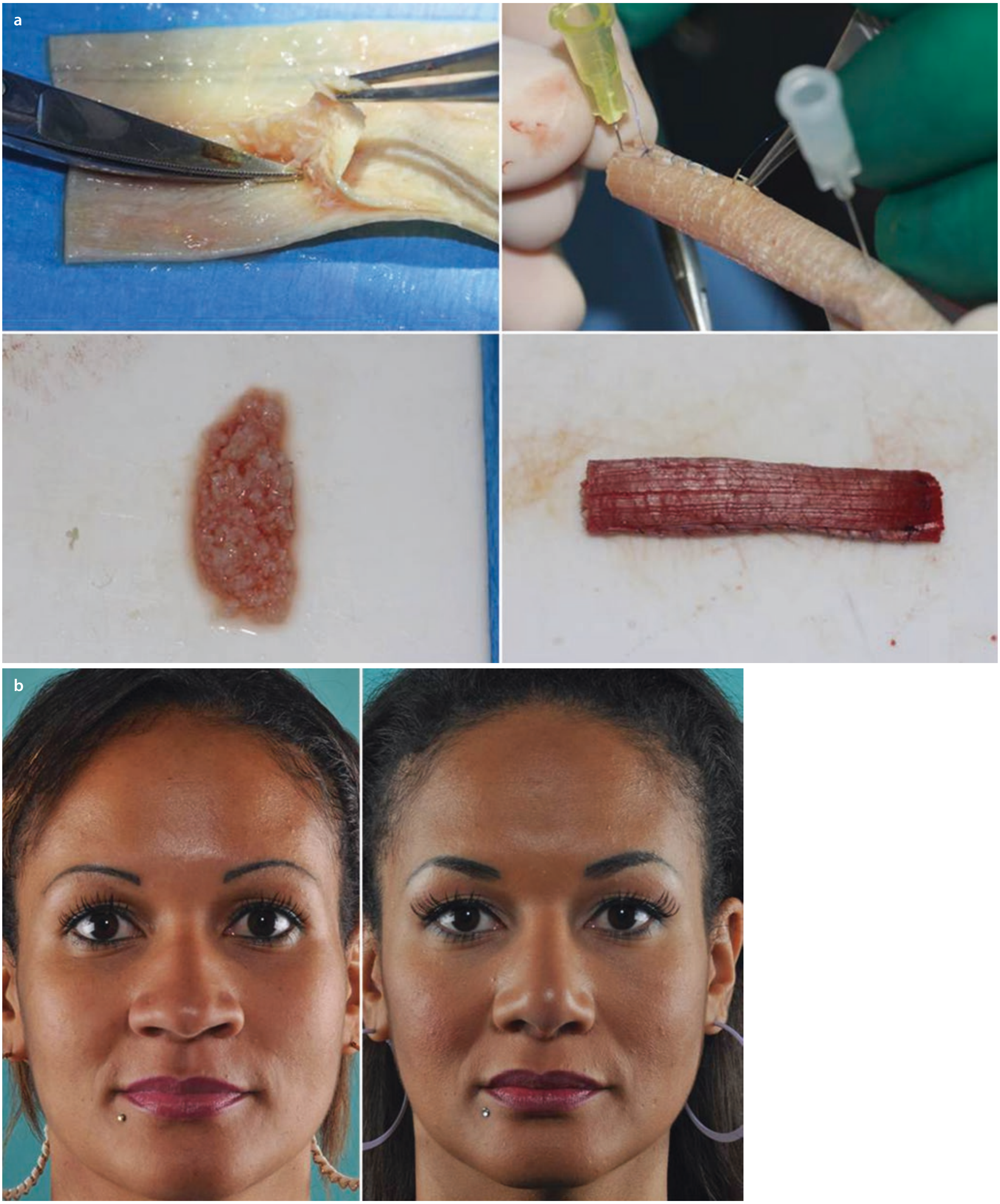
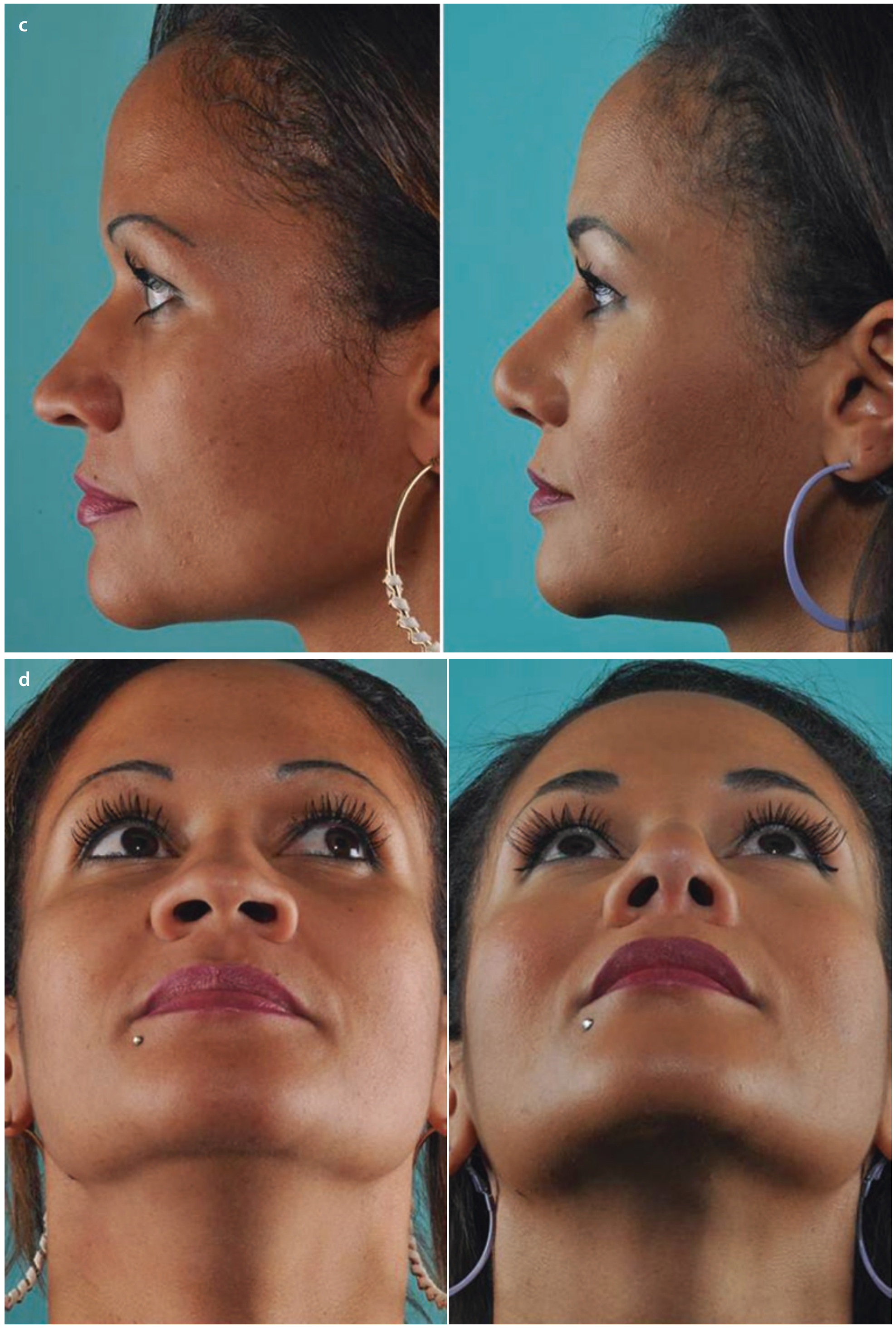


Fig. 7.23 (**a**–**d**) Dorsal reconstruction of ethnic saddle nose. (**a**) Cleaning the allogenic fascia from adherent soft tissue and manufacturing a DCF graft. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 7.23 (continued)



Technique: Fabrication of a Double-Layered "Sandwich" Graft from Conchal Cartilage

When septal cartilage is unavailable, a double-layered columellar strut graft fashioned from conchal cartilage offers a suitable alternative. The double-layered "sandwich" graft is both rigid and straight, making an ideal columellar strut graft, and a satisfactory amount of donor cartilage can be harvested from the ear without alteration in auricular shape. The *cymba concha* is used for "sandwich" graft fabrication and is harvested with the posterior perichondrium still attached. The fusiform-shaped cymba concha is then divided lengthwise, leaving the perichondrium intact, so that reciprocal halves remain joined by perichondrium. Irregularities in cartilage thickness are then eliminated, and the cartilages are then sutured "back to back" using a modified Aiach clamp and 4-0 Prolene on a small Keith needle to create a strong, straight, and flat "sandwich" graft.

7.2.11 Case 11: Dorsal Reconstruction of Ethnic Saddle Nose and Narrowing of Alar Base

A 25-year-old female presented with a congenitally low nasal dorsum, a poorly supported and underprojected nasal tip, and overly wide nostrils. Treatment included placement of a double-layered columellar strut graft fashioned from conchal cartilage, supported by two small extended spreader grafts created from septal cartilage. The remaining conchal cartilage was combined with conchal cartilage harvested from the contralateral ear and a sleeve of allogenic fascia lata to create a DC-F graft for dorsal augmentation. The DC-F graft was then covered with two additional layers of allogenic fascia lata. A nasal base resection with partial excision of the nostril sills completed the procedure (Fig. 7.24).

Fig. 7.24 **(a–d)** Dorsal reconstruction of ethnic saddle nose combined with lengthening the nose by a columellar strut, kept in position by two extended spreader grafts. (**e**–**g**) Front view, profile view, base view pre-op/post-op

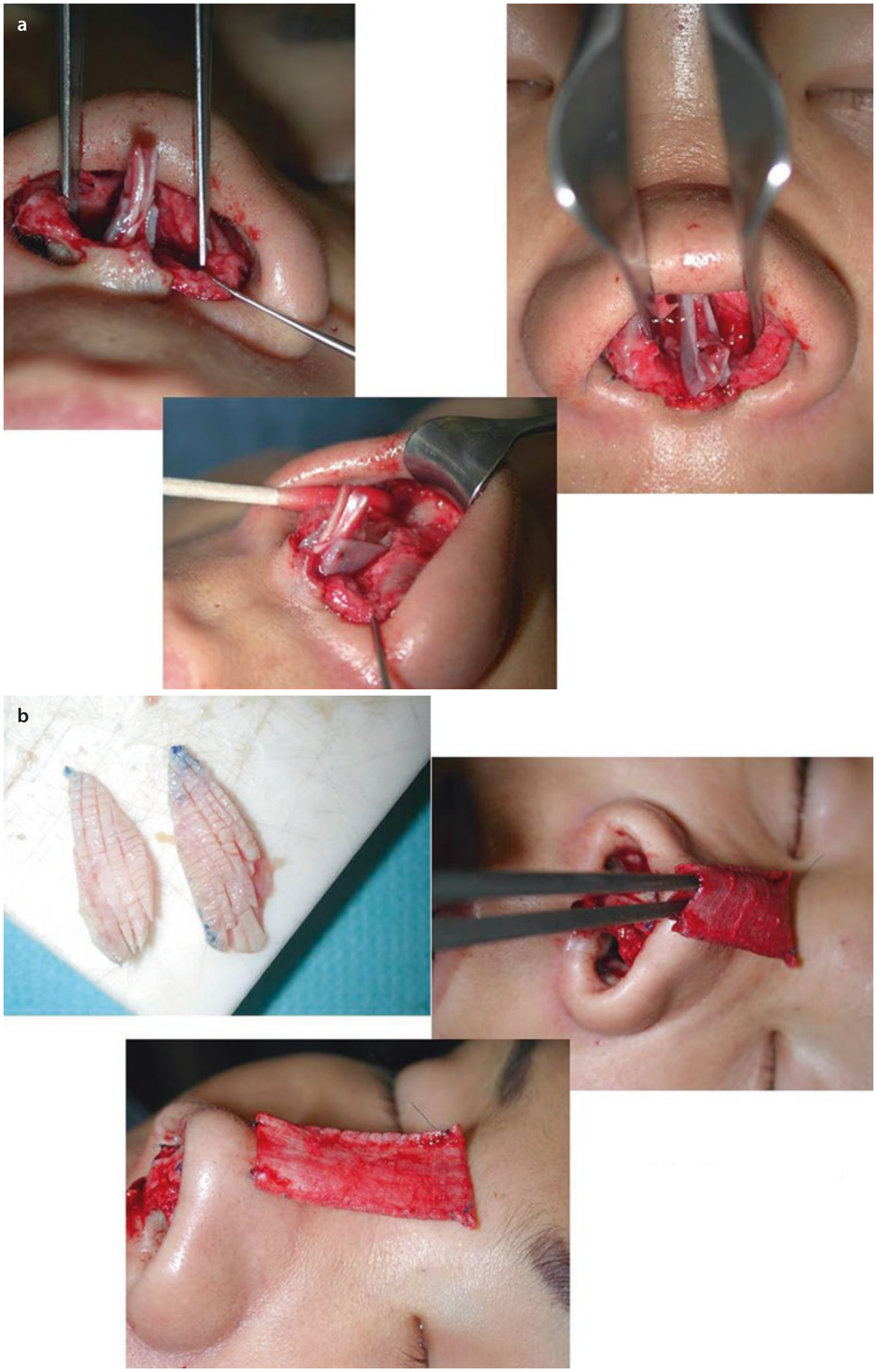


Fig. 7.24 (continued)

■ **Fig. 7.24** (continued)

Fig. 7.24 (continued)

7.2.12 Case 12: Dorsal Reconstruction with DC-F After Septal Abscess in Childhood

A 19-year-old female presented with a saddle-nose deformity, a wide and bulbous nasal tip, and a damaged septum from a childhood septal abscess. The bony pyramid was also very wide.

After harvesting an 8.0 cm cartilaginous segment of the eighth rib, we placed a percutaneous catheter into the rib donor site to permit infusion of 10.0 cc of ropivacaine as needed for pain control. Twenty minutes after injection of the anesthetic, the residual anesthetic is suctioned from the donor site, and the process is repeated over the next 48 h whenever the patient complains of donor site pain.

Using an open rhinoplasty approach, surgical exploration revealed severe deformities of the LLCs and septum. The septum was removed completely for extracorporeal reconstruction. From the septal specimen, a 25.0 × 20.0 mm straight segment was thinned using a cylindrical drill bit. This was then used like a septal extension graft and sutured to the ANS via a transosseous drill holes. To further stabilize the graft, two firm 10.0-mm-wide extended spreader grafts fashioned from rib cartilage were sutured to the neoseptum and to the nasal bones via osseous drill holes placed within the nasal bones. The ULCs were then sutured to the neoseptum for further support and to widen the internal nasal valves. Prior to placement of the septal construct, the bony pyramid was narrowed using parasagittal medial osteotomies created with a 1.0 mm Lindemann (electric) drill bit. This allowed removal of bone along the osteotomy line for better narrowing of the bony vault with percutaneous low-to-low lateral and transverse osteotomies. The deformed lateral crura were flattened by cephalic fold-under flaps (lateral crural underlay technique), and the acute left dome was corrected using an extended under batten graft, where the tip of the graft was pushing and rounding the dome. Then the residual rib was then diced to a very fine consistency and used to create a DC-F graft from a tube of allogenic fascia lata. The DC-F graft was sutured shut at the cranial end and left open at the distal end. The DC-F graft was then positioned in the subcutaneous pocket over the dorsum using two guiding sutures sewn to the cranial end and passed through the lower glabella. After closing the skin flap at the columella, the dorsum was molded using finger pressure, and the extruded (excess) diced cartilage was removed from beneath the skin flap with suction. The marginal incisions were then closed (Fig. 7.25).

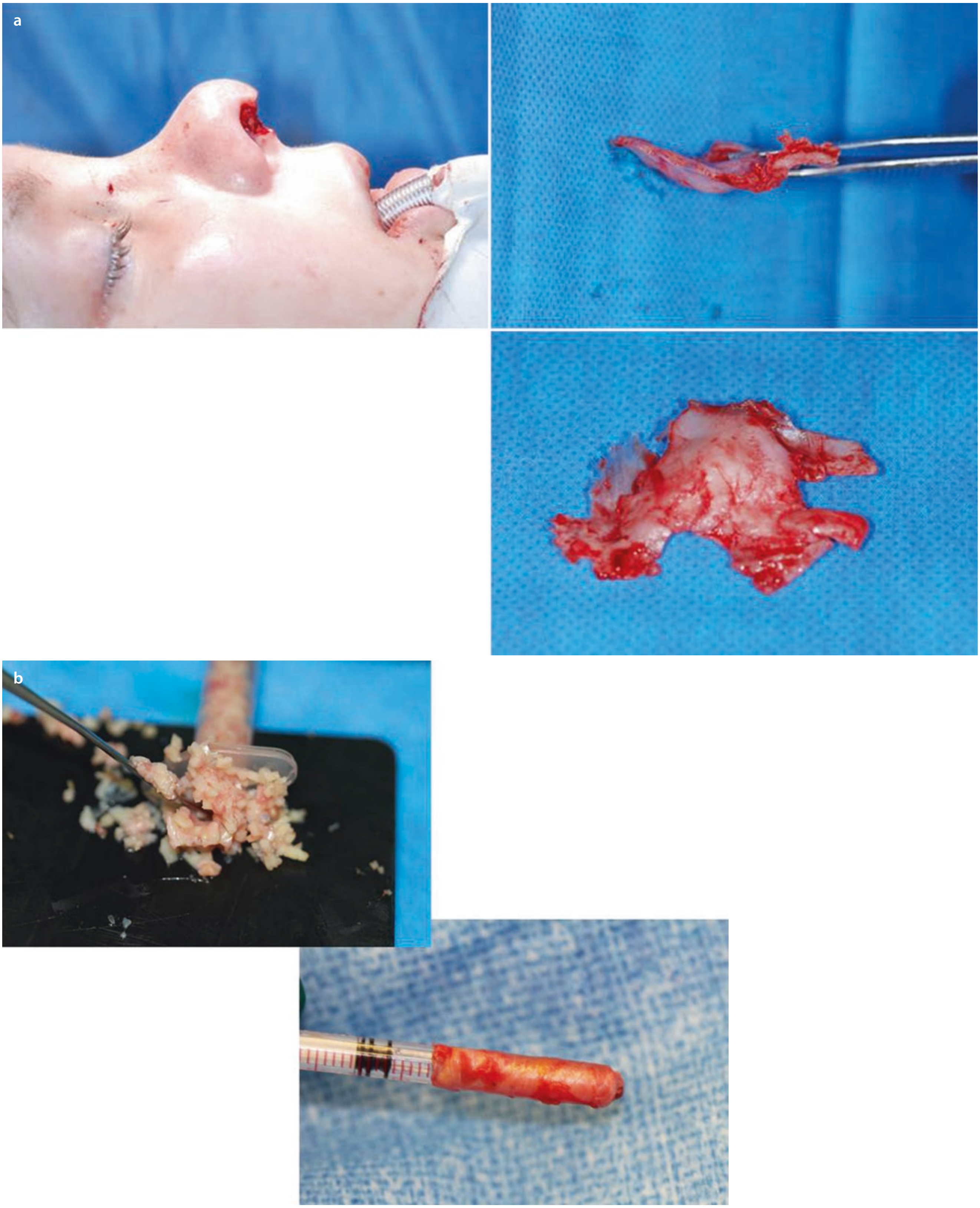


Fig. 7.25 (**a**–**c**) Dorsal reconstruction with extracorporeal septal reconstruction and DC-F graft after septal abscess in childhood. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 7.25 (continued)

7

■ **Fig. 7.25** (continued)

7.2.13 Case 13: Complex Dorsal Reconstruction of Binder Syndrome Deformity

An 18-year-old female with Binder syndrome presented for augmentation rhinoplasty. Examination revealed a wide, flat nose with partial atresia of the premaxilla and nasal dorsum. Treatment initially involved construction of a structural neo-framework from solid rib cartilage to increase nasal base projection. A notched premaxillary augmentation graft fashioned from solid rib cartilage was used as a platform to support a large columellar strut graft also fashioned from solid rib cartilage. The alar cartilages were also reconstructed from rib cartilage using the "graft-bending" technique (see Chap. 4: Treatment of the Under-Supported Nasal Tip). Augmentation of the dorsum was achieved using a large DC-F graft fashioned from diced rib cartilage and allogenic fascia lata. Owing to the dramatic increase in tip projection, unusually high closing tension resulted in focal but temporary underperfusion of the nasal tip skin. However, the problem fully resolved after only 2 weeks (Fig. 7.26).

■ **Fig. 7.26** (**a**–**c**) Complex dorsal reconstruction of Binder syndrome deformity. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 7.26 (continued)

7

Fig. 7.26 (continued)

7.2.14 Case 14: Augmentation of a Severe Congenital Saddle Nose with Simultaneous Bulbous Tip Correction

A 22-year-old female presented with congenital hypoplasia of the nasal dorsum and a "ski slope" nasal profile. In addition, the tip was overrotated, slightly overprojected, and bulbous.

Using the open rhinoplasty approach, dysmorphic LLCs, characterized by bulbous lateral crura, abnormally narrow intermediate crura, and buckling at the lateral crural junction were observed. Treatment began with excision of the interdomal soft tissues. Following degloving of the anterior septal angle, submucosal tunnels were created on both sides of the dorsal septum, and the upper lateral cartilages were then sharply divided. Next, a large piece of quadrangular cartilage was harvested for use as a septal extension graft. The graft was sutured to the left side of the caudal septum using a side-to-side fixation technique. The overly wide but underprojected bony pyramid was then narrowed using parasagittal medial osteotomies followed by bilateral percutaneous transverse and lateral (low-to-low) osteotomies. Using a sliding medial crural overlap technique, the tip cartilages were simultaneously counter-rotated and deprojected. Tip narrowing was then accomplished using bilateral cephalic fold-under flaps, followed by placement of dome-unit and transdomal tip sutures. Additional nasal lengthening was achieved with shield graft placement. Finally, dorsal augmentation was restored using a diced cartilage and fascia (DC-F) graft fabricated from autologous rib cartilage and allogenic fascia lata. After fabricating the fascial sheath, the proximal end was sutured closed and intentionally overfilled with diced cartilage. Paired percutaneous guiding sutures, placed at the cephalic end, were then used to position the graft and were retained to stabilize the graft for the first week. To establish the final graft contour, the transcolumellar incision was sutured closed, and the overfilled graft was then molded using digital pressure. Excess material produced by digital molding was then removed with suction via the marginal incisions. Using a needleless tuberculin syringe, ultrafine diced cartilage was then injected along the dorsal sidewalls for final smoothing (Fig. 7.27).

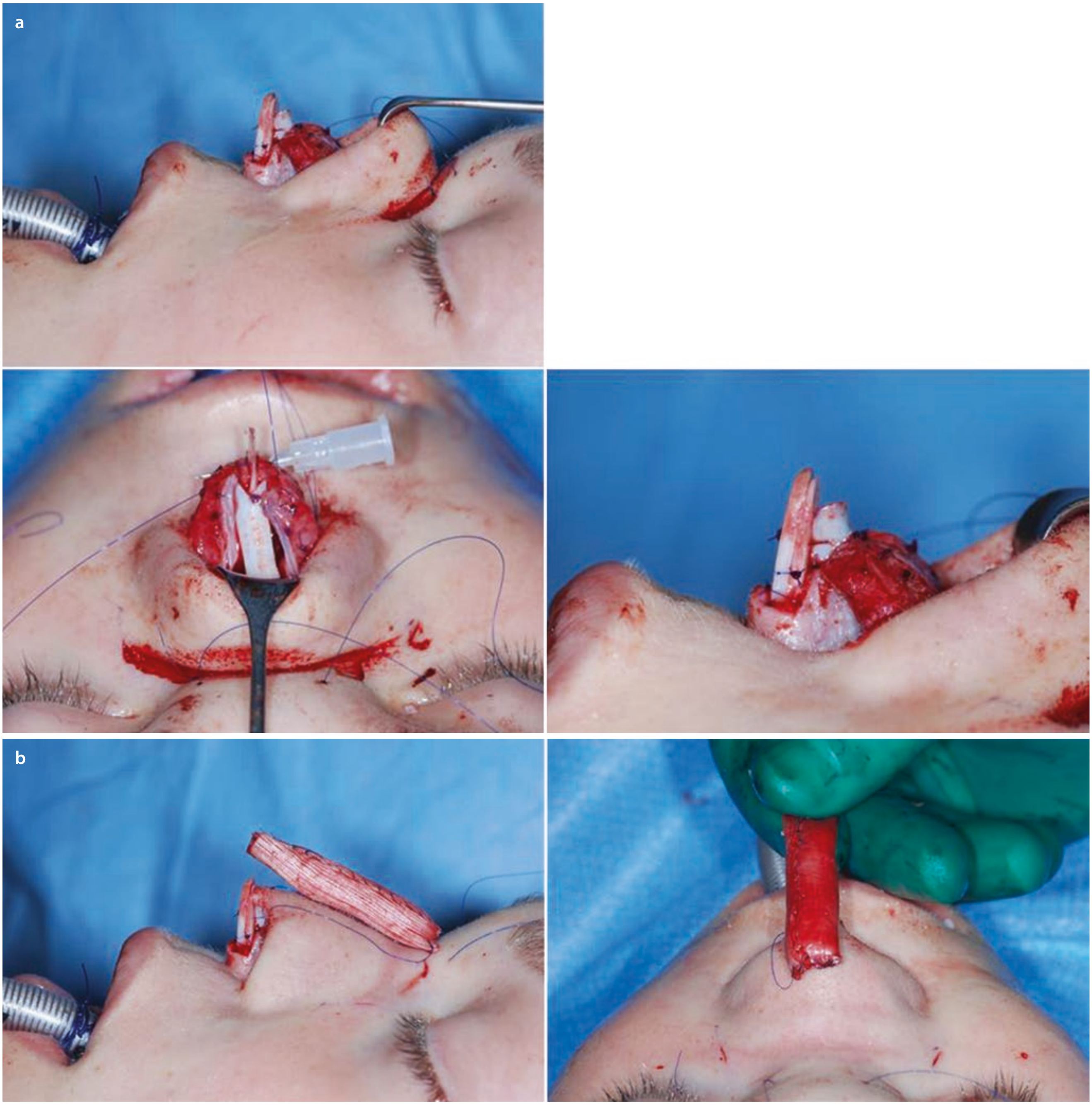


Fig. 7.27 (**a**–**b**) Dorsal augmentation in a congenital saddle nose and simultaneous correction of a bulbous tip. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 7.27 (continued)

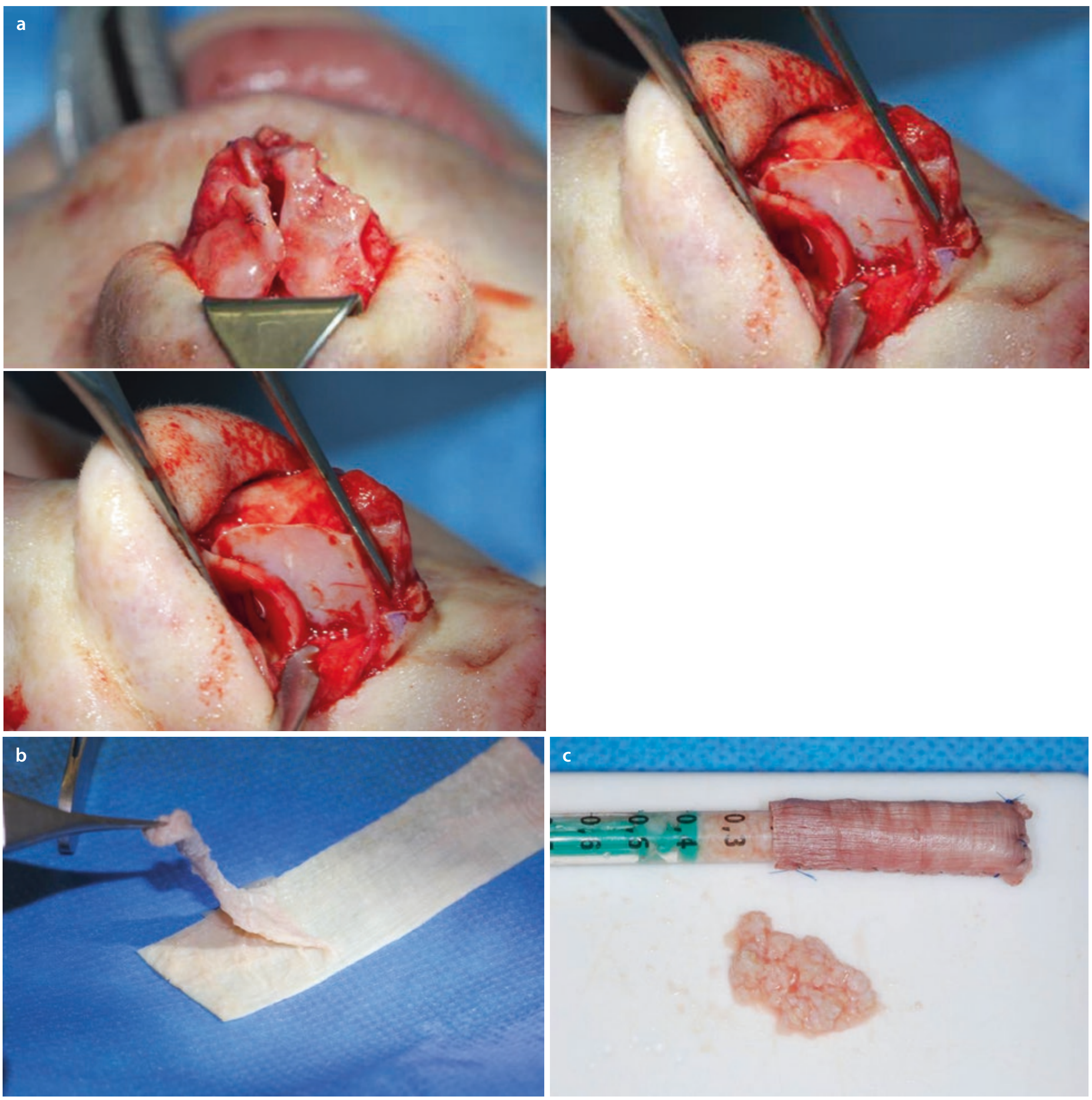
■ **Fig. 7.27** (continued)

7.2.15 Case 15: Augmentation of a Severe Idiopathic Saddle Nose and Simultaneous Tip Correction

A 22-year-old female presented idiopathic severe saddle nose with very wide nasal pyramid. The nose was very short, the tip was bulbous and overprojected, so that in the profile a skilooped nose resulted. Intraoperatively, we found badly deformed LLC with a lot of irregularities (◘ Fig. 7.28).

Using an open approach technique, we removed a large intercrural fat pad. We harvested a large piece of straight septal cartilage, fixing it side to side as septal extension graft. So we could lengthen the nose. The circumference of the LLC was too large, creating also the bulbosity of the tip. This cartilage excess was corrected by a medial sliding technique (medial overlay technique) because the side effect of this maneuver is a down rotation, which leads to a further lengthening. The third technique to lengthen the nose was fixation of a strong shield graft. Before that maneuver, the cephalic portion was fold under to strengthen the lateral crus. This enabled us to contour the tip with spanning sutures. The residual rib cartilage was diced very fine and used together with allogenic fascia lata for fabrication of a DC-F.

It was overfilled and only the cranial end was closed. After fixing it in position with two guiding sutures, the nasal skin was sutured back, and by manual massaging an ideal contour got achieved.



◘ **Fig. 7.28** (**a**–**c**) Augmentation of a severe saddle nose with DC-F from allogenic fascia lata, which first had be cleaned from adherent fibrous tissue. Simultaneous correction of a bulbous tip. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 7.28 (continued)

7

Fig. 7.28 (continued)

Suggested Reading

Aiach G. Atlas of rhinoplasty: open and endonasal approaches. 2nd ed. St. Louis: Quality Medical Publishing; 2003.

Secondary Augmentation of the Dorsum

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_8

8.1 Surgical Principles in Secondary Saddle-Nose Deformity

The principles of secondary dorsal augmentation are largely the same as those used in primary rhinoplasty. However, owing to the previous surgical disruption of nasal soft tissues, scar contracture and/or fibrosis may complicate or limit secondary dorsal augmentation. Frequently, wide undermining of the soft-tissue envelope is necessary to enable adequate dorsal augmentation. In severe cases preoperative conditioning of the fibrotic skin envelope with stretching exercises and/or repeated massage is necessary to gradually loosen the tethered and noncompliant soft-tissue envelope. Unfortunately, the nose is poorly suited to the use of conventional tissue expanders, and while self- or autoinflating expanders may offer effective alternatives, we have no experience with these devices.

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If there is minor but full-length saddle deformity, we augment the defect with allogenic fascia lata grafts (Figs. 8.1 and 8.2). When necessary, allogenic fascia lata can be applied up to four layers thick. If the saddling is limited to a small area, we prefer using free diced cartilage (FDC) minced to a paste-like consistency to precisely fill the indentation (Fig. 8.3). Before the advent of FDC, a single layer of allogenic fascia lata was used to cover and smooth the coarsely diced cartilage (Fig. 8.4).

Revision of a previous dorsal augmentation with solid rib cartilage is most often prompted by warping of the original augmentation graft material (Fig. 8.5a). There are two possible options for correcting this problem. The first is removal of the original graft, followed by reshaping and reinsertion. However, because the risk of deformation increases with decreased graft thickness, this approach is not always successful. Alternatively, the solid rib graft can be removed and used as donor material for a DC-F graft (Fig. 8.5b–d). This approach completely eliminates the risk of warping because the graft is no longer a solid implant material. Instead, the graft becomes a malleable augmentation material that can be digitally manipulated in situ to achieve the desired dorsal contour. And by leaving the caudal end open, diced cartilage can be expressed from the open end and removed with suction when the graft is too large. However, it is best to close the transcolumellar skin incision before making final determinations regarding graft size. The marginal incision can then be used for access to remove additional graft material when necessary. Once the desired shape is established, it is reinforced with Proxi-Strips (Ethicon, Inc., Somerville, New Jersey), a flexible adhesive tape that stretches in two directions to better maintain the desired contour. Regardless of the augmentation graft tissue of origin (e.g., rib or conchal cartilage), we use the DC-F conversion technique for all dorsal implants in which shape deformation has occurred.

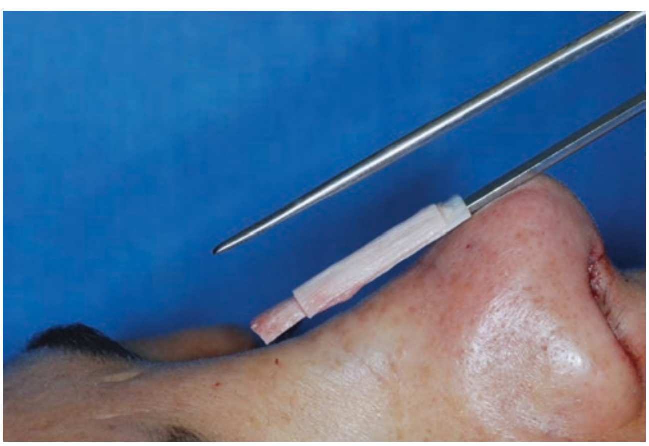

Fig. 8.1 Multilayered fascia graft

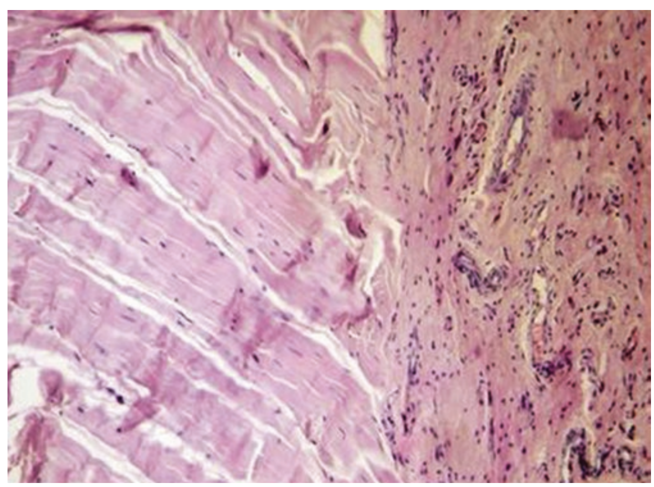

Fig. 8.2 Specimen of Tutoplast fascia graft

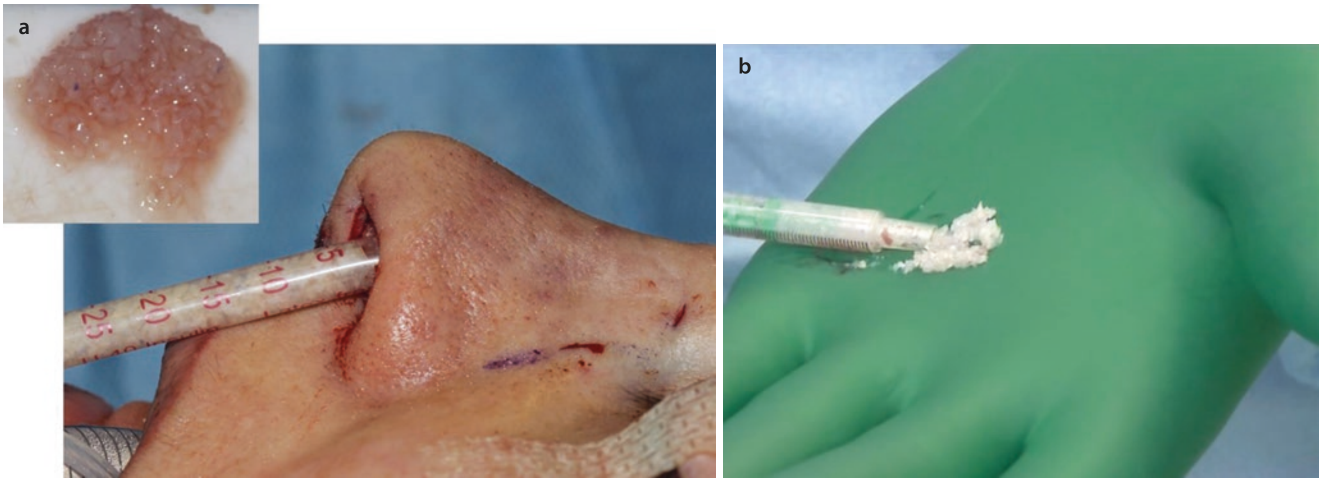

Fig. 8.3 (**a**, **b**) Free diced cartilage of pastelike consistency

Fig. 8.4 Free diced cartilage covered with allogenic fascia graft (Tutoplast)

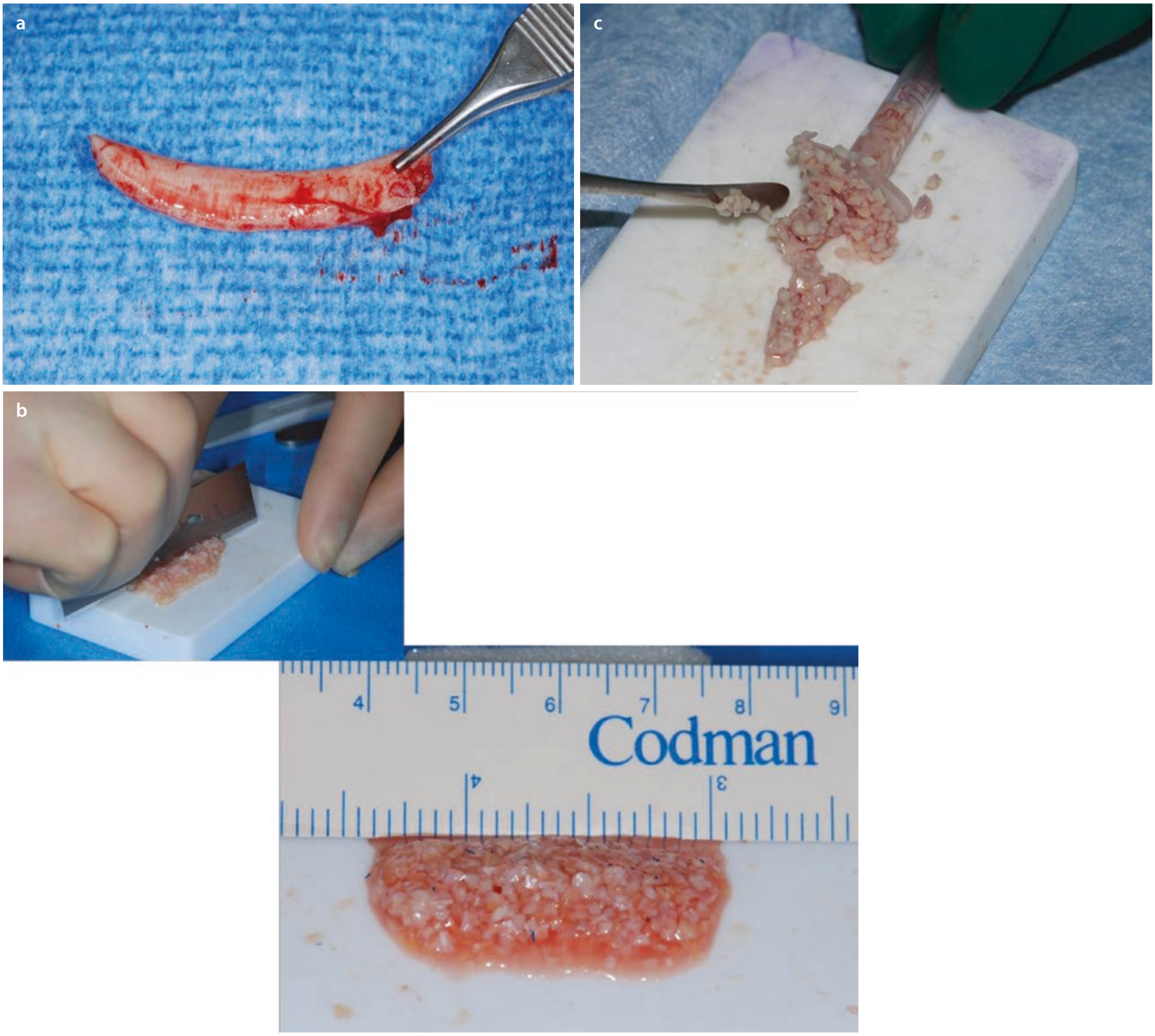

Fig. 8.5 (**a**–**d**) Reconstruction of a DC-F graft from warped rib cartilage and allogenic fascia lata

Fig. 8.5 (continued)

8.2 Case Studies

8.2.1 Case 1: Overresected Dorsum Augmented with Multilayered Allogenic Fascia Lata

A 25-year-old female presented with an overresected dorsum seeking revision rhinoplasty. Using the closed approach, six layers of allogenic fascia lata were applied to the overresected dorsum (Fig. 8.6).

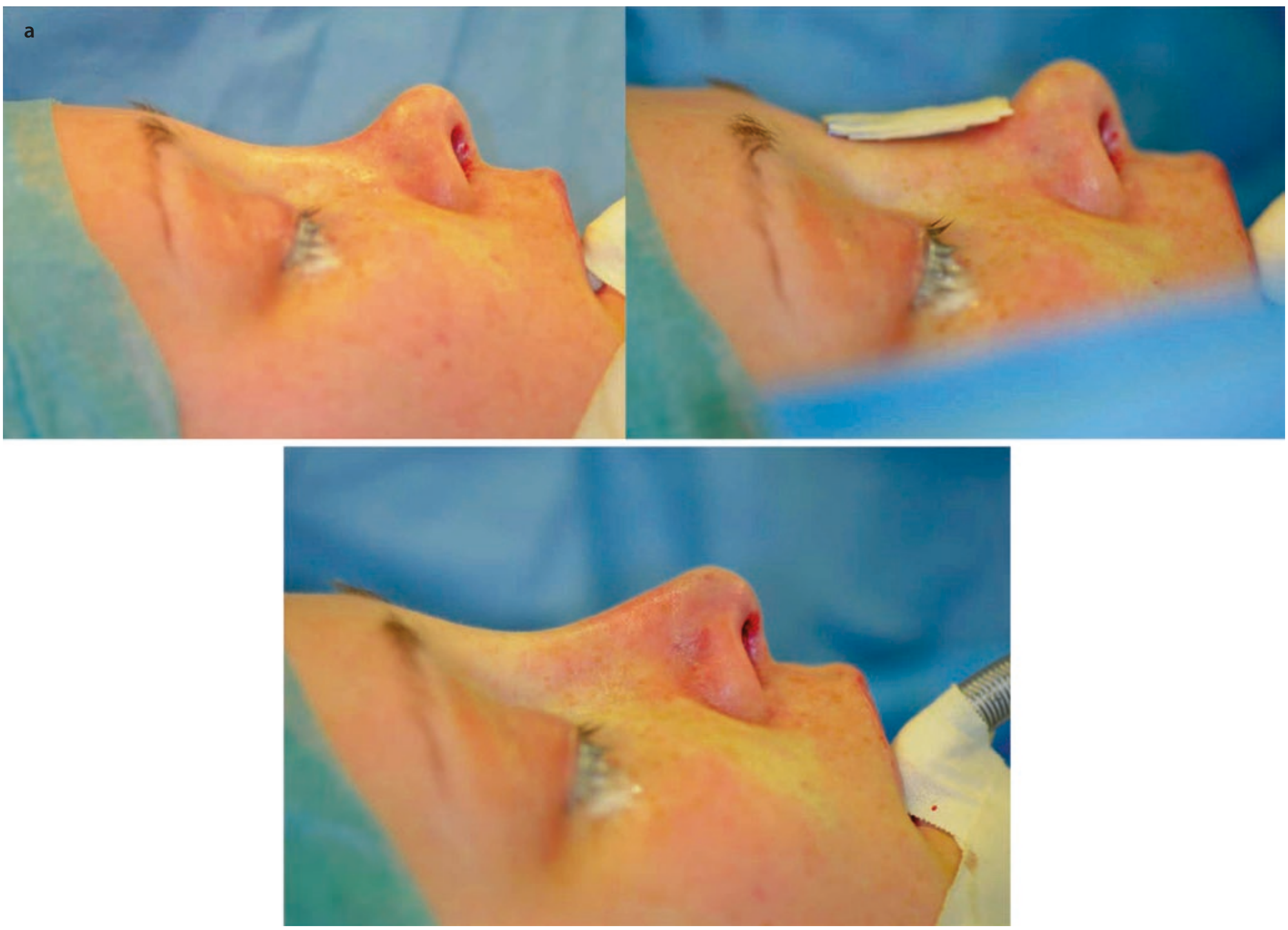

Fig. 8.6 Augmentation with allogenic fascia lata (Tutoplast[R]). (**a**) Intraop procedure and result. (**b–d**) Front view, profile view, base view pre-op/post-op

■ **Fig. 8.6** (continued)

Fig. 8.6 (continued)

8.2.2 Case 2: Augmentation with Free Diced Cartilage

A 36-year-old female presented after previous reduction rhinoplasty with irregularities of the nasal dorsum, including a slight dorsal depression and a small residual hump. A ptotic tip was also observed. Using the open rhinoplasty approach, dorsal exploration revealed three layers of allogenic fascia lata, which accounted for the small dorsal hump. Consequently, the outer layer of fascia lata was removed, creating a small dorsal depression. Conchal cartilage from the right ear was then harvested and diced to a very fine consistency and loaded into a tuberculin syringe. The ptotic tip was then rotated using a tip suspension suture with an anterior sling, and after partially closing the skin flap, finely diced ear cartilage was injected into the dorsal depression via the marginal incision. Using digital massage, smoothing of the dorsum established a satisfactory dorsal contour, and after closure of the marginal incision, an elastic paper tape (3 M) dressing was applied to maintain the desired dorsal contour during initial healing (Fig. 8.7).

Fig. 8.7 (**a**) Dorsal augmentation with pastelike free diced cartilage. (**b**–**d**) Front view, profile view, basal view pre-op/post-op

Fig. 8.7 (continued)

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8.2.3 Case 3: Augmentation with Free Diced Cartilage

A 36-year-old female presented with saddling of the cartilaginous dorsum after two previous rhinoplasties. Examination also revealed a C-shaped nasal deviation with an oblique columella and asymmetrical nostrils. In addition to the saddle indentation, profile examination revealed an overprojected bony vault. Using the open rhinoplasty approach, surgical exploration revealed a previously placed right spreader graft that was not strong enough to keep the dorsal septum from bending. Consequently it was replaced by an extended spreader graft fashioned from cartilage harvested from the ninth rib. The 8.0-cm long rib specimen was split into several 2-mm-thick strips, and additional graft material was used to replace a warped and weak columellar strut graft. The newly inserted strut graft was sutured to the extended spreader graft for stabilization. After lowering the overprojected bony dorsum with a powered cylindrical burr, the nasal pyramid was straightened with (internal) parasagittal medial osteotomies followed by percutaneous low-to-low lateral and transverse osteotomies. The remaining rib cartilage was finely diced and injected beneath the nasal skin flap with a tuberculin syringe (after closure of the columellar incision) for final contouring of the nose (Fig. 8.8).

Fig. 8.8 (**a**) Augmentation with free diced cartilage. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 8.8 (continued)

8.2.4 Case 4: Augmentation with Conchal Cartilage and Simultaneous Reconstruction of the Lateral Crura

A 35-year-old female presented for revision rhinoplasty after two previous nasal surgeries. Examination revealed an abnormally low nasal "starting point" resulting from a severely overresected bony dorsum, an inverted-V deformity, leftward deviation of the dorsal septum, and tip asymmetry. Intraoperatively, the left lateral crus was found to be malformed, and the right alar dome was missing. Treatment involved placement of bilateral (conchal) spreader grafts to correct middle vault pinching and to correct the dorsal septal alignment. A columellar strut graft fashioned from septal cartilage was placed for tip support, and batten grafts fashioned from septal cartilage were used to reconstruct the lateral crura. The bony dorsum was augmented using a crosshatched conchal cartilage graft (with the perichondrium still intact) covered with two layers of allogenic fascia lata (◘ Fig. 8.9).

Fig. 8.9 (**a**) Augmentation with conchal cartilage and simultaneous reconstruction of the lateral crura. (**b**–**d**) Front view, profile view, basal view pre-op/post-op

Fig. 8.9 (continued)

8.2.5 Case 5: Augmentation with Conchal Cartilage

A 24-year-old male presented for revision rhinoplasty after four previous nasal surgeries. Examination revealed an overresected nasal dorsum. Treatment involved dorsal augmentation with a multilayered conchal cartilage graft in which multiple smaller fragments were sutured to a flat, full-length segment to produce a custom-tailored onlay graft (Fig. 8.10).

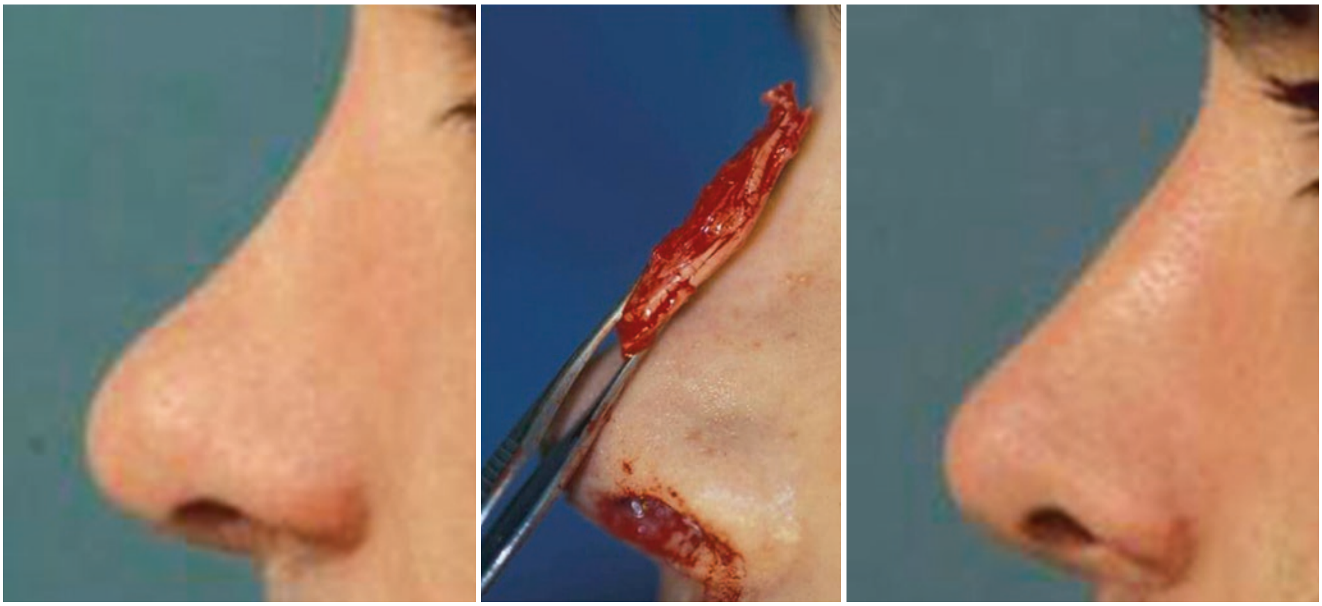

Fig. 8.10 Augmentation with conchal cartilage

8.2.6 Case 6: Augmentation with Conchal Cartilage

An 18-year follow-up after saddle-nose correction by reconstruction of the anterior septum with double-layered conchal graft was seen. A 35-year-old male presented with broad saddle nose and drooped bulky tip after multiple rhinoplasties. Because of the missing anterior septum, the nasolabial angle was acute.

In a closed approach technique, the surgical exploration revealed an overresection of the anterior septum. The wide nasal pyramid was narrowed by low-to-low lateral osteotomies from a sublabial approach and by transverse osteotomies through the eyebrow. To reconstruct the anterior septum and to rebuild the dorsum, both conchae were harvested from posteriorly. A double-layered sandwich graft was folded and used as a columellar strut. It was fixed to the anterior nasal spine (ANS) through a drill hole. Also the concha from the other side was transformed in a double-layered graft and used for dorsal augmentation. Residual parts of the ear cartilage were diced for camouflaging dorsal irregularities. The patient came for a follow-up visit after 18 years because of a skin tumor. Good function and form of the nose have been stable over time (Fig. 8.11).

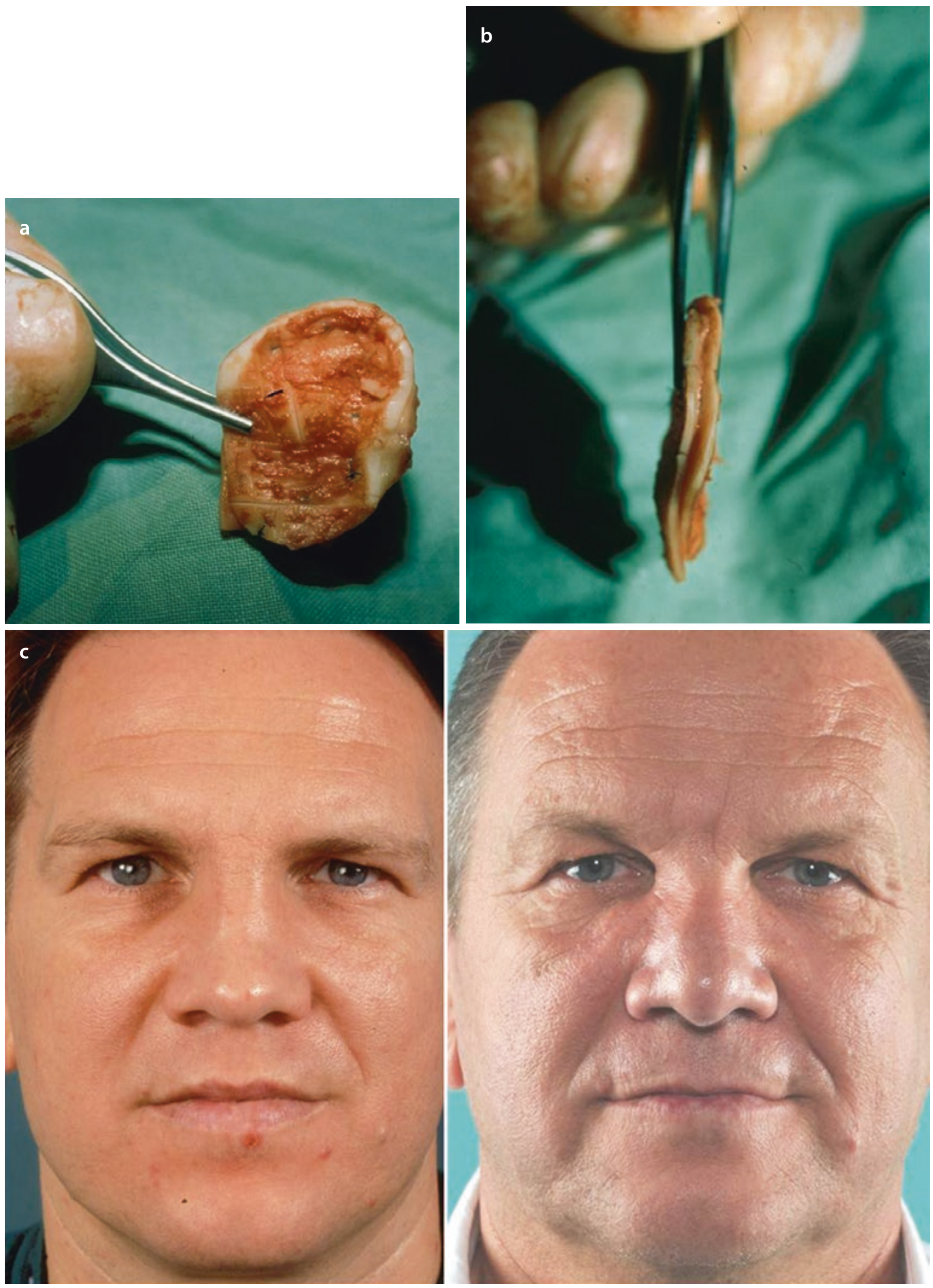

Fig. 8.11 **(a–b)** Double layered conchal graft. (**c**–**d**) Front view, profile view pre-op/post-op

■ **Fig. 8.11** (continued)

8.2.7 Case 7: Augmentation with Conchal Cartilage

A 40-year-old female presented for reconstruction of a saddle-nose deformity resulting from previous septoplasty. Examination revealed resection of the anterior septum and severe collapse of the weakened dorsal L-strut. The unaltered bony dorsum gave the false impression of a large rhinion hump—the so-called pseudo-hump deformity. Reconstruction was performed with conchal cartilage harvested from both ears. A portion of the donor cartilage was used to create a double-layered columellar strut graft to reconstruct the missing caudal septum, while the remaining cartilage was used to create a full-length (crosshatched) dorsal onlay graft. After reducing a slight bony hump with the rasp, five layers of allogenic fascia lata were used to cover the full-length conchal graft (Fig. 8.12).

Fig. 8.12 (a–c) Augmentation with conchal cartilage. Front view, profile view, base view pre-op/post-op

Fig. 8.12 (continued)

8.2.8 Case 8: Augmentation of DC-F Graft from Concha, Complex Tip Reconstruction

A 41-year-old female presented for revision rhinoplasty after two failed rhinoplasties abroad. Examination revealed an overprojected nasal tip and an overresected nasal dorsum. Retraction of the central columella and overprojection of the supratip were also observed. Intraoperatively, the right lateral crus was found to be partially absent, and the medial crura were malpositioned and partially resected. Treatment included deprojection of the tip with the lateral crural sliding technique (lateral crural overlap technique) on the left and placement of a (septal) batten graft to replace the missing right lateral crus. A conchal shield graft was also placed. The dorsum was augmented with a DC-F graft fashioned from conchal cartilage and allogenic fascia lata (Fig. 8.13).

Fig. 8.13 (a–d) Augmentation with DC-F graft from concha. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 8.13 (continued)

Fig. 8.13 (continued)

Fig. 8.13 (continued)

8.2.9 Case 9: Augmentation of DC-F Graft from Concha and Simultaneous Deprojection of the Tip

A 33-year-old female presented for revision surgery after rhinoplasty elsewhere. Examination revealed an overresected dorsum partially concealed by a malpositioned rib cartilage graft. The nasal pyramid was overly wide, and the nose seemed too long. Saddling of the middle vault, overprojection of the asymmetrical tip, and an overly acute nasolabial angle were also observed.

Treatment of the overprojected and underrotated tip was accomplished with a lateral crural overlap of 5 mm, coupled with columellar shortening of 2 mm. After removing the dorsal rib graft, the bony dorsum was smoothed, and the dorsum was augmented with a DC-F graft fashioned from conchal cartilage, recycled rib cartilage, and allogenic fascia lata (Fig. 8.14).

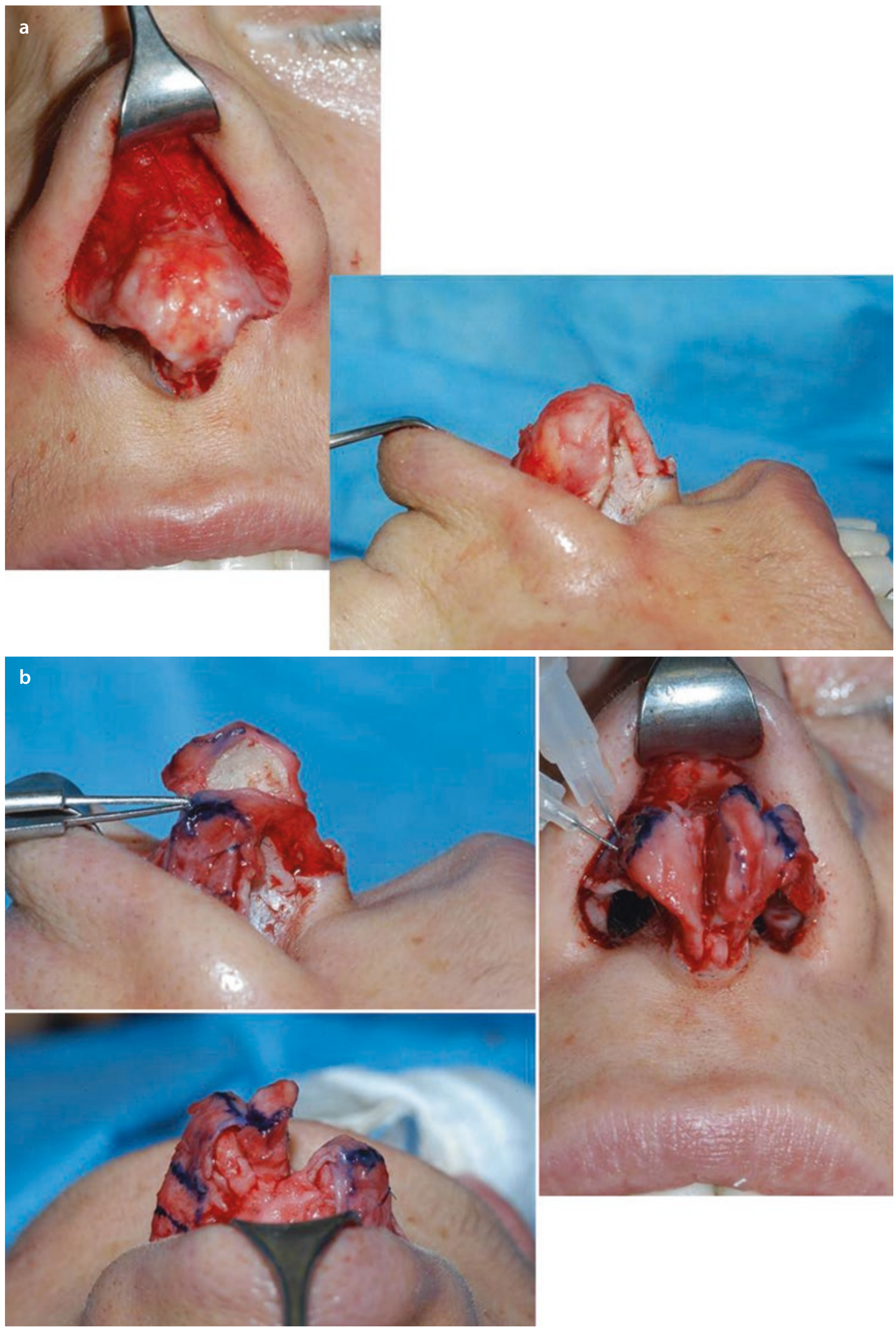

Fig. 8.14 **(a–g)** Dorsal augmentation with DC-F graft and simultaneous deprojection of the tip. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 8.14 (continued)

Fig. 8.14 (continued)

8.2.10 Case 10: Augmentation with DC-F from Rib Cartilage and Lengthening with Septal Extension Graft

A 31-year-old female presented with a ski-loop nose after overresection of the dorsum during previous surgery. The nasolabial angle was 125°. The bony pyramid was deviated to the left. Both alae showed deep impression, and the left one had additional notching. Using an open approach technique, surgical exploration revealed that both the dorsum and the anterior septum had been overresected. There was a huge open roof on both sides. A big septal transplant consisting of cartilage and thin bone was harvested and used as a septal extension graft. The bone was perforated with multiple holes and used as a splint to fix the septal extension graft to the residual parts of the anterior septum.

After straightening the nasal pyramid by percutaneously low-to-low lateral and transverse osteotomies (parasagittal medial osteotomies were not necessary because of the huge open roofs), the upper border of the upper lateral cartilage (ULC) was sutured to the dorsal septum as spreader flaps, accepting an increase of the saddling.

The ninth rib was harvested and cut into small strips. From these, two lateral crural struts grafts were fabricated to support the weak lateral crura. Then the lateral parts of the lower lateral cartilages (LLC) were transposed to correct the retraction.

The rest of the cartilage was diced finely and put into a tube of deep temporalis fasciae, sutured over a tuberculin syringe. Only the cranial end was closed, and then the DC-F was placed with two guiding sutures. After suturing back the nasal skin, the final shape was molded, the excess of cartilage was sucked out, and the transition areas from the graft to the dorsum were smoothed with free diced cartilage (Fig. 8.15).

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■ **Fig. 8.15** (**a**–**c**) Augmentation with DC-F from rib cartilage and lengthening with septal extension graft. Enforcing the lateral crura with under batten grafts from rib cartilage (lateral crural strut grafts). (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 8.15 (continued)

Fig. 8.15 (continued)

8.2.11 Case 11: Replacing a MedporeR Implant with a DC-F Graft

A 29-year-old female with an overly short nose presented for evaluation 5 years after reduction rhinoplasty performed elsewhere. Examination revealed acute erythema of the dorsum. A review of the operative report revealed that inadvertent overresection of the dorsum was treated primarily with MedporeR implant placement. A threatened extrusion was also observed at the glabella with thinning and erythema of the overlying skin.

To avoid extrusion, we elected to treat the patient emergently and we removed the MedporeR implant through an open rhinoplasty approach. Although there were no signs of an acute purulent infection, a chronic foreign body-type reaction with diffuse granulation tissue was observed. Removal of the implant also revealed a very irregular dorsum and exploration of the septum revealed prior removal of the central section. The tip framework was also severely damaged.

In light of the severe skeletal damage, we opted for an immediate reconstruction. Autologous rib cartilage was harvested and cut into 1.5 mm thick strips. The strips were then used as extended spreader grafts and fixed to the previously placed columellar strut graft. The strut graft had been cranially overrotated from scar contracture and was therefore counter-rotated using the extended spreader grafts. The medial crural remnants were then sutured to the repositioned columellar strut graft for support. Lateral crural batten grafts fashioned from rib cartilage were also used to replace missing segments of the lateral crura, and the tip was further contoured with placement of a shield graft.

Dorsal reconstruction was achieved with a DC-F graft. However, owing to the preexisting inflammation, the fascial sleeve was fashioned from vascularized autologous temporalis fascia rather than from allogenic fascia lata. Using the explanted MedporeR implant as a template, the DC-F sleeve was fabricated from temporalis fascia and filled with finely diced residual rib cartilage. The DC-F graft was positioned using percutaneous guiding sutures placed at both medial eyebrows and secured with interrupted sutures to the underlying ULCs. Final refinement of the dorsum was achieved with the application of free diced cartilage (Fig. 8.16).

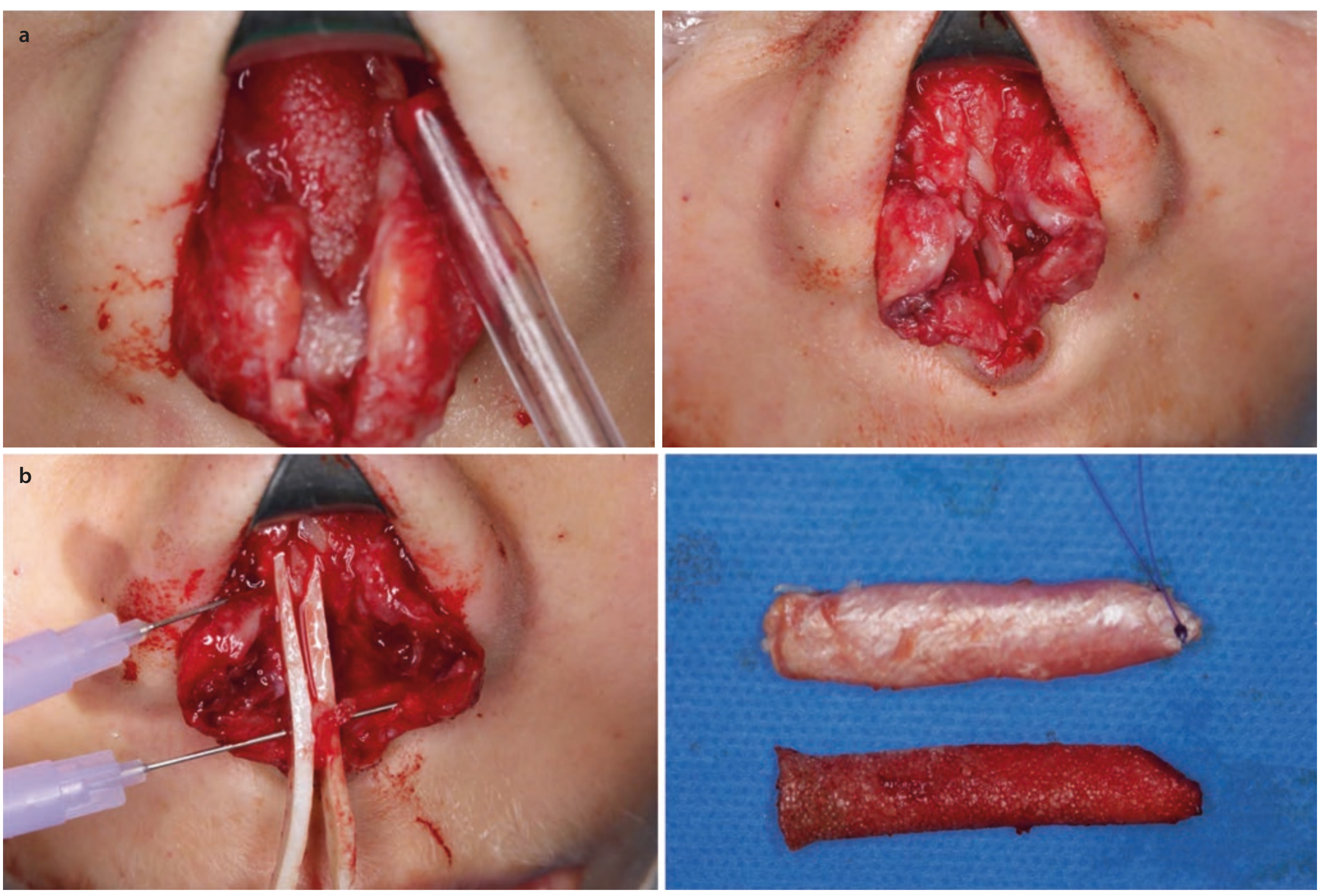


Fig. 8.16 (**a**) Destroyed tip framework, MedporeR implant in situ (*leftside*). (**b**) Extended spreader grafts from rib cartilage, DC-F graft using MedporeR implant as a template. (**c**) Alloplastic dorsal implant threatening extrusion with acute erythema and thinning of the overlying glabellar skin. (**d**–**f**) Front, profile, and base views before and 8 months postoperative

Fig. 8.16 (continued)

Fig. 8.16 (continued)

8.2.12 Case 12: Augmentation with DC-F from Rib Cartilage

A 31-year-old female presented after two previous surgeries with an overresected dorsum and a broad deviated nose. The columella was asymmetrical and oblique, so that the nostrils were asymmetrical as well. The ANS was dislocated to the right. Endoscopic view showed a septal perforation of 23 mm in diameter that extended up the roof of the nose.

An open approach was performed, but the transection of the columella was not done via the old scar, which had been placed at the base but at the most narrow part of the columella. Surgical exploration revealed destruction of the LLC and camouflaging by bended rib grafts, which were not contoured. Only a small part of the anterior and dorsal septum was left. The caudal septum was strengthened by a sandwich graft from the concha, which was shaped asymmetrically at its base to balance the dislocated ANS. The medial crura were missing. The rib grafts were removed but could not be used for reconstruction of the LLC. Therefore, the ninth rib was harvested and cut into 1.5-mm-thick strips. These were fixed to the columellar strut from conchal cartilage, thinned in the dome area for better bending and easier shaping by sutures, and then fixed to the lateral crura.

The nasal pyramid was narrowed and straightened by parasagittal median osteotomies and percutaneously low-to-low lateral and transverse osteotomies. The dorsum was reconstructed by a DC-F from the fine diced residual rib cartilage and allogenic fascia (Fig. 8.17).

■ **Fig. 8.17** (**a**–**b**) Augmentation with DC-F from rib cartilage. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 8.17 (continued)

Fig. 8.17 (continued)

8.2.13 Case 13: Augmentation with DC-F from Rib Cartilage

A 24-year-old male presented with a very wide and overresected dorsum after two previous rhinoplasties. The tip was round and bulky, and the distance between the tip defining points was widened. The supratip area showed a fullness.

After using the open approach, the intraoperative exploring showed multiple grafts on top of the domes, which were removed. The residual septum was deviated to the left and blocked the airway. The deformed parts were resected, and the septum was shortened at its base und fixed to the ANS after perforating it. From the resected cartilage, two extended spreader grafts were harvested and sutured in position to stabilize the framework. The wide deviated nasal pyramid was straightened and narrowed by percutaneous low-to-low lateral and transverse osteotomies.

From the resected septal part, a strong columellar strut could be cut and brought into position. By inverted suspension sutures, the whole tip-columella complex was shifted downward. The previously cut medial crura were fixed to the strut.

For reconstruction of the dorsum, we resected the 10th and 11th ribs, diced this cartilage, and built a DC-F from allogenic fascia lata. In the end a double-layered onlay graft from allogenic fascia was put on the tip to obtain a good contour (Fig. 8.18).

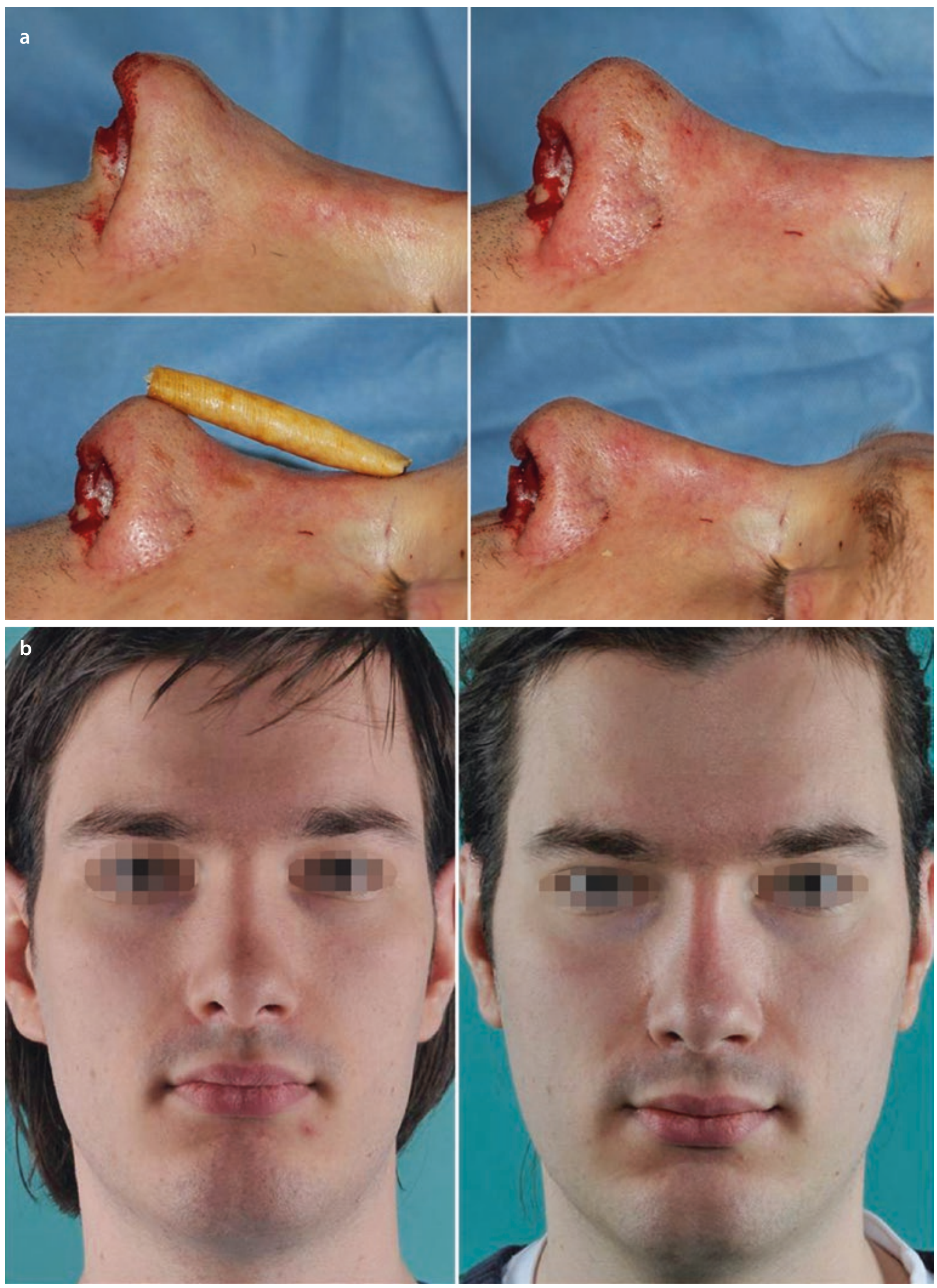


Fig. 8.18 (**a**) Augmentation with DC-F from rib cartilage. (**b**–**d**) Front view, profile view, base view pre-op/post-op

■ **Fig. 8.18** (continued)

8.2.14 Case 14: Dorsal Reconstruction with DC-F from Rib Cartilage

Technique: Removal of infected Mersilene mesh used for dorsal augmentation and secondary dorsal reconstruction using an autologous DC-F graft.

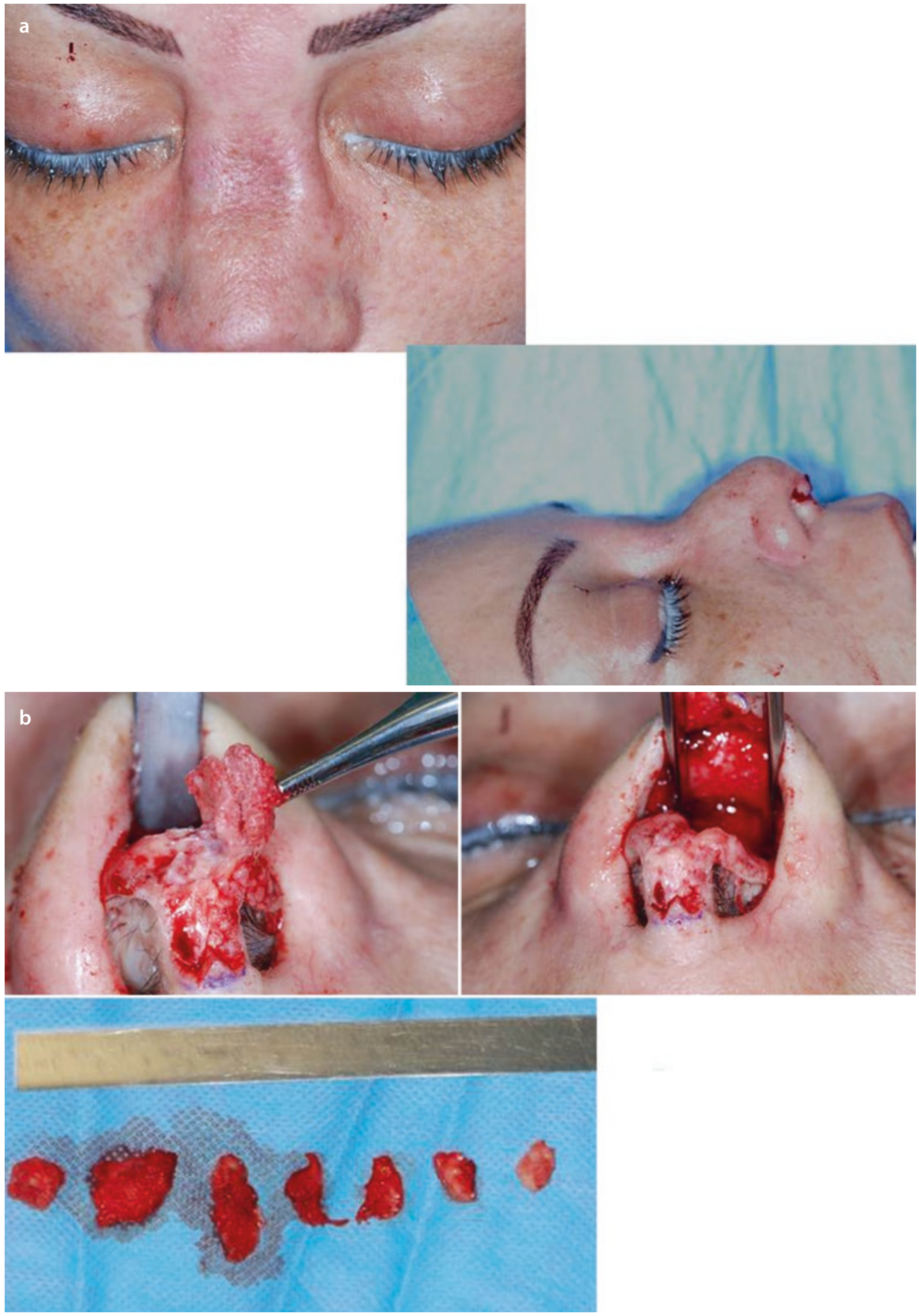
After six previous nasal surgeries, a 50-year-old female presented with purulent infection of the nasal dorsum. All the prior surgeries had been done abroad in different countries. Ten years earlier, Mersilene mesh was used for augmentation of the nasal dorsum. Nine years later, a different surgeon who did not know that Mersilene mesh had been implanted was consulted to perform a revision surgery. Following the revision surgery, the Mersilene mesh became infected, but the second surgeon declined to remove the infected implant because he did not feel responsible for the problem. The surgeon who had originally implanted the Mersilene mesh also declined to treat the patient because the infection had started only after additional surgery by another doctor.

During surgical exploration, it became clear that the entire nasal framework had been augmented with Mersilene mesh. All of the mesh was subsequently removed, resulting in a flat nose with inadequate projection of both the nasal tip and nasal dorsum. Bacterial cultures of the explanted Mersilene revealed a multiresistant organism (*Escherichia coli* with extended spectrum beta-lactamases [ESBL]). Antimicrobial coverage was selected according to the prevailing antibiogram, and the patient was treated with intravenous piperacillin and tazobactam combined with local wound care.

After 3 months (and confirmation by three consecutive negative nasal swabs), the infection had resolved, and reconstructive surgery was undertaken. The tenth rib was harvested from the right chest wall and the right conchal bowl was also harvested. Additionally, a 5- × 3-cm piece of deep temporalis fascia was harvested from beneath the right temporal scalp. The temporalis fascia was used to create a "sleeve" of fascia to encase finely diced cartilage to construct a DC-F augmentation graft. After dissecting the membranous septum with the open rhinoplasty approach, the previously placed columellar strut graft was removed and replaced with a double-layered sandwich graft fashioned from conchal cartilage. The conchal graft was implanted into the columella using a guiding suture through the philtrum, and the former strut graft was recycled to create a nonintegrated shield graft to stretch the scarred and thickened nasal skin.

To narrow the overly wide nasal pyramid, percutaneous low-to-low lateral and transverse osteotomies were first performed. Then the overfilled DC-F graft was sutured shut at the cephalic end but left open distally. Two guiding sutures were placed at the cephalic end and used to guide the DC-F into position over the nasal dorsum. After partial skin flap closure, the final graft shape was created by applying external digital pressure and suctioning the excess diced cartilage from beneath the skin flap until the desired contour was achieved (▪ Fig. 8.19).

Fig. 8.19 **(a–d)** Dorsal reconstruction with DC-F from rib cartilage after removing of infected Mersilene mesh. **(e–g)** Front view, profile view, base view pre-op/post-op



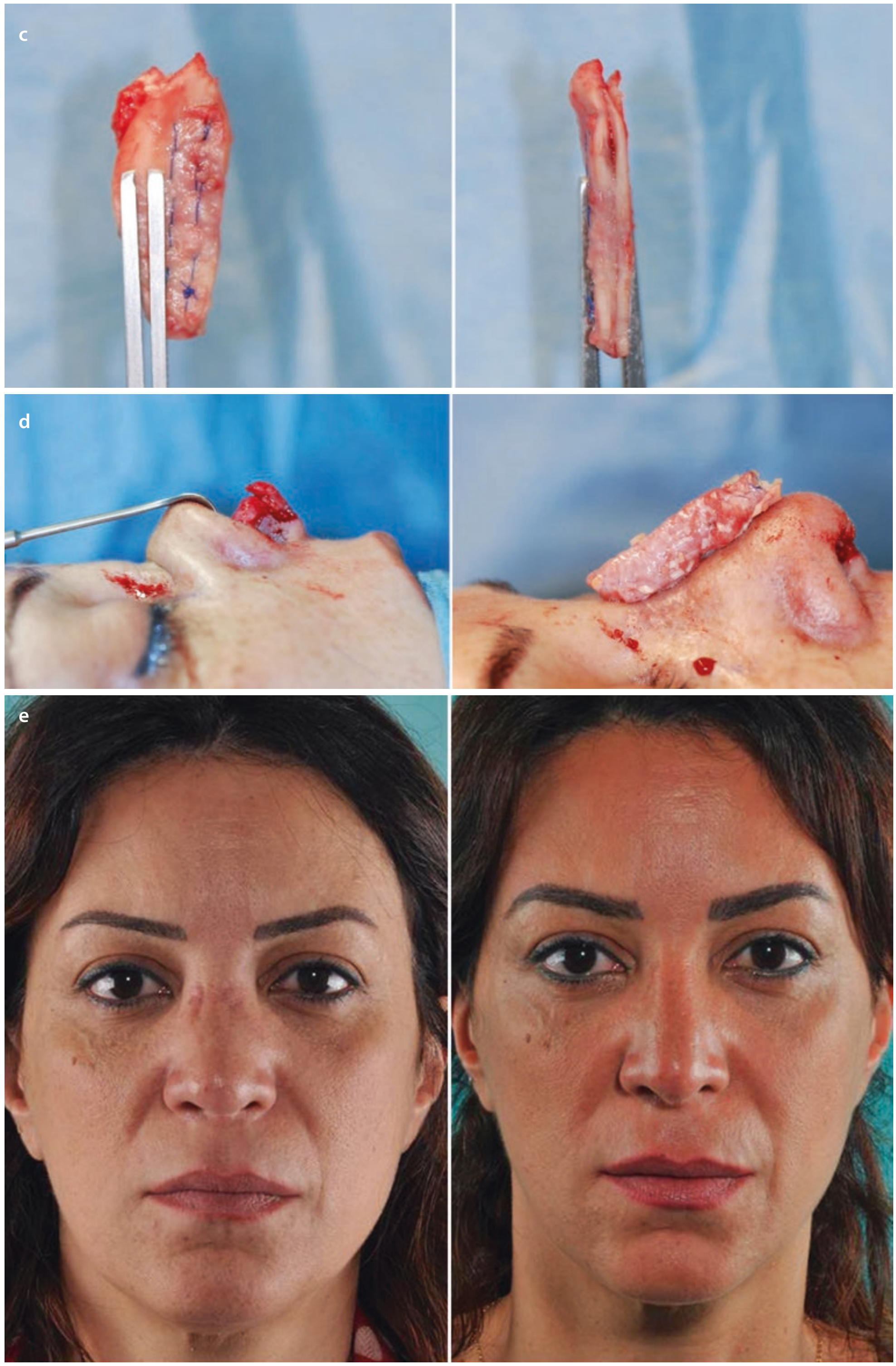


Fig. 8.19 (continued)

Fig. 8.19 (continued)

8.2.15 Case 15: Dorsal Reconstruction with Solid Rib Graft Covered with DC-F

An 18-year-old male presented with a severe saddle-nose deformity and a large septal perforation measuring 20 × 30 mm located close to the nasal roof. According to the previous operative report, a two-flap technique was used in a failed attempt to close a central septal perforation. Mucosa was harvested from beneath the upper lateral cartilages bilaterally, and in addition to recurrence and enlargement of the original septal perforation, the denuded cartilage resulted in saddle collapse of the nasal dorsum. Moreover, there was inadequate residual space within the dorsal soft tissues to permit augmentation of the saddle deformity. Hence, closure of the septal perforation was first undertaken.

Perforation repair was achieved by elevating mucosa off the upper lateral cartilages and advancing mucosal flaps inferiorly to partially eliminate the perforation. This, in turn, created a pocket to accommodate placement of a dorsal augmentation graft. Autologous deep temporalis fascia was first used to line the mucosal pocket, which was used to secure a solid rib cartilage graft. The solid rib construct was then covered with a DC-F graft fashioned from diced rib cartilage and additional deep temporalis fascia. One-year follow-up revealed good dorsal contour and persistent closure of the septal perforation (Fig. 8.20).

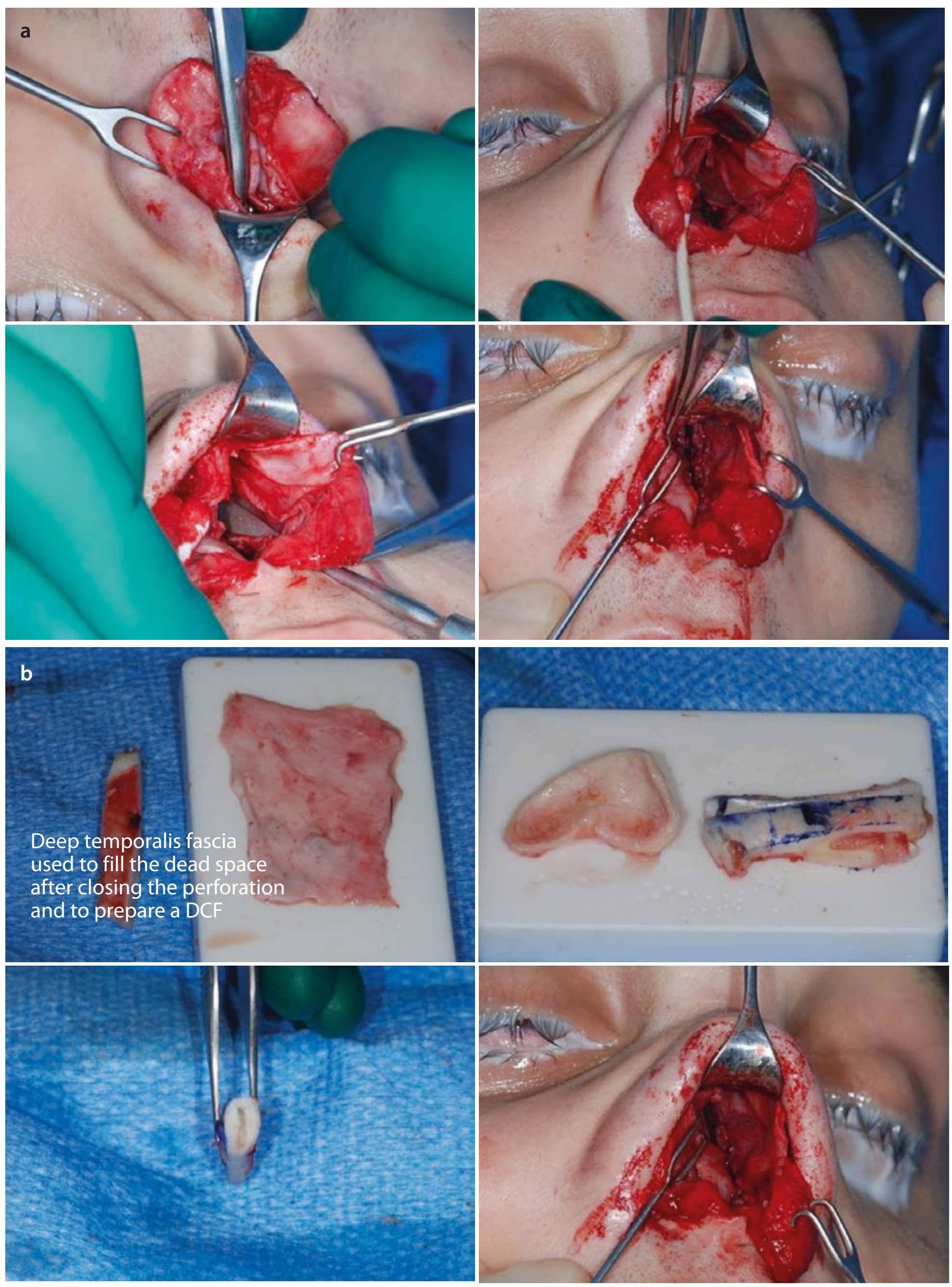
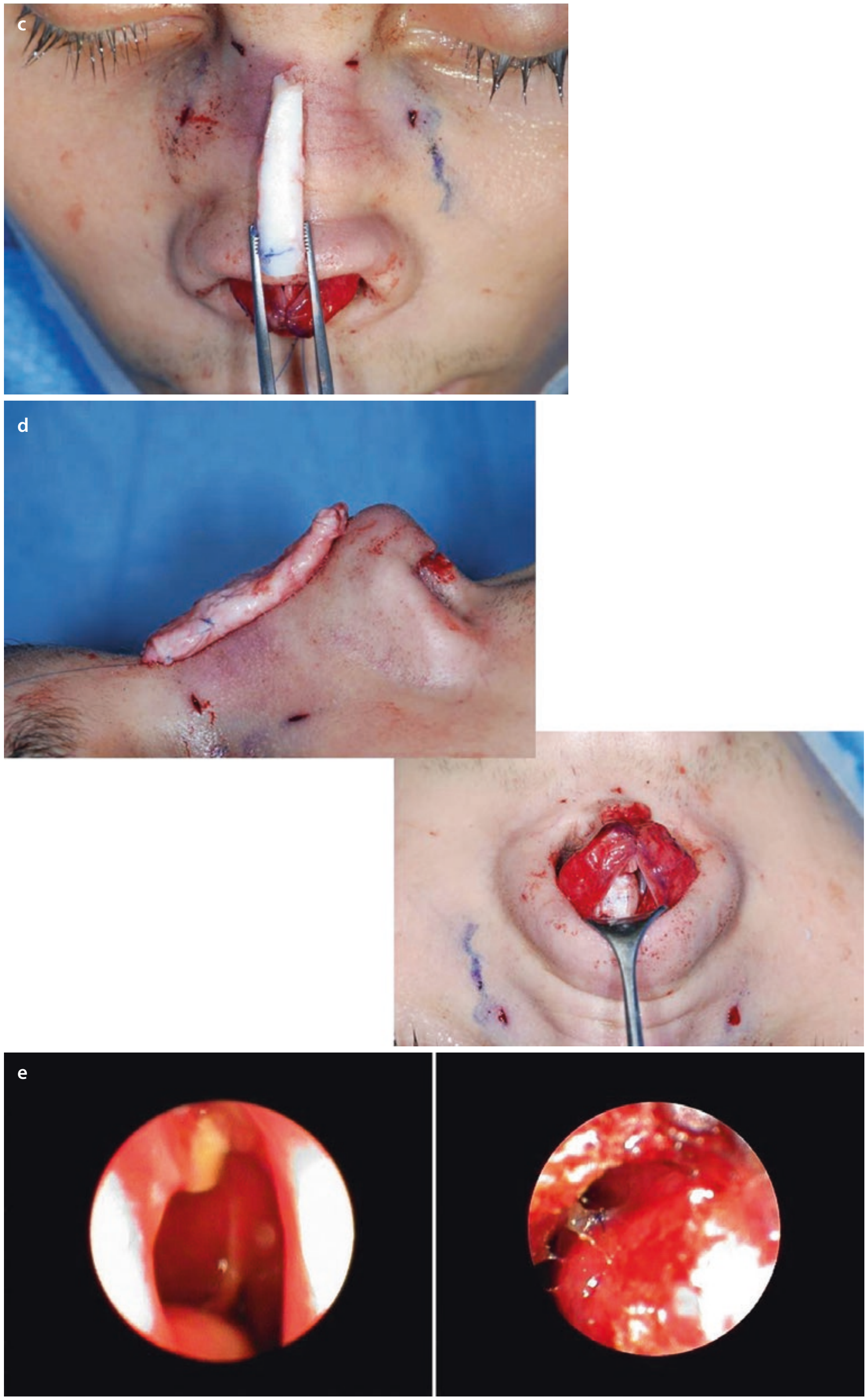


Fig. 8.20 **(a–e)** Dorsal reconstruction with solid rib graft covered with DC-F after closing the septal perforation close to the roof. **(f–h)** Front view, profile view, base view pre-op/post-op

Fig. 8.20 (continued)



Septal perforation

Pre op

Post op

Fig. 8.20 (continued)

■ Fig. 8.20 (continued)

8.2.16 Case 16: Augmentation with Diced Cartilage from the Previous Rib Cartilage Graft

A 55-year-old male presented after five previous unsuccessful rhinoplasties. The most recent failed surgery attempted to correct severe saddling with a solid rib graft but was complicated by severe warping and graft distortion. Examination also revealed a scarred and irregular nasal skin envelope. Surgical exploration showed absent lateral crura and partial absence of the intermediate crura. Explantation of the existing rib graft produced a severely deformed and unusable specimen, necessitating harvest of a new rib cartilage graft. Using fresh rib cartilage, batten grafts were created to reconstruct the overresected nasal tip tripod, and the remaining cartilage was diced and inserted into a sleeve of autologous temporalis fascia. Dorsal augmentation with a large DC-F graft served to restore dorsal contour and to minimize irregularities of the nasal skin envelope. Three-year postoperative follow-up revealed satisfactory nasal alignment and a good dorsal profile (Fig. 8.21).

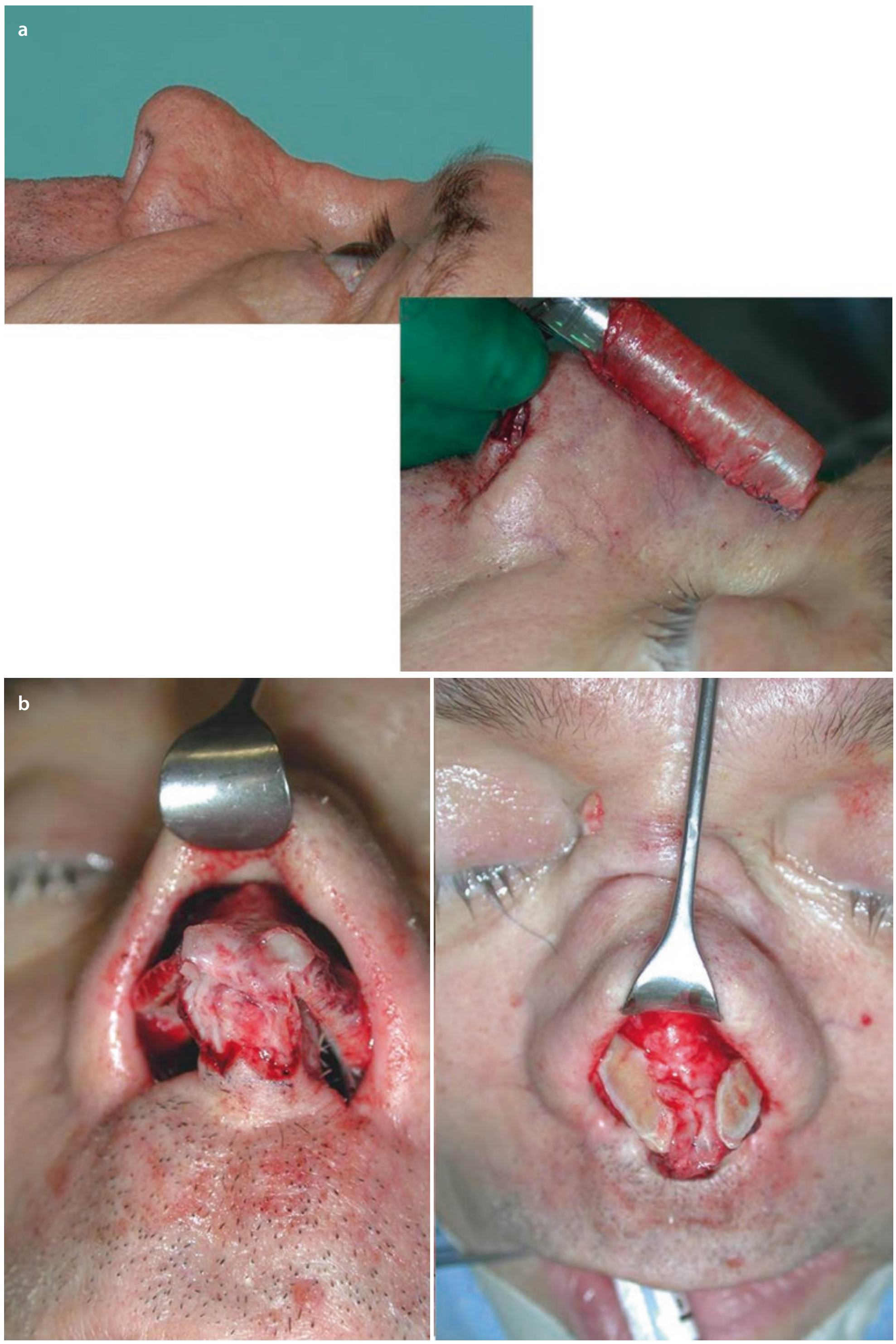


Fig. 8.21 **(a–b)** Augmentation with diced cartilage from the previous rib cartilage graft. Batten grafts for reconstruction of the overresected LLCs. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 8.21 (continued)

■ **Fig. 8.21** (continued)

8.2.17 Case 17: Augmentation with Diced Cartilage from a Previous Rib Cartilage Graft

A 58-year-old male was seen after unsuccessful saddle-nose correction using a solid rib cartilage graft. Examination revealed a scoliotic nose from a severely warped rib cartilage graft and a twisted, slightly overprojected nasal tip with grossly asymmetrical nostrils.

Reconstruction was begun by removing the warped L-shaped rib cartilage graft. A double-layered conchal sandwich graft was then used as a columellar strut. The misshapen lower lateral cartilages were suspended from this strong central pillar, and a lateral crural overlap technique was used on the left side, so simultaneously decrease of tip projection and reshaping was achieved. On the right side an upside-down-technique with an additional batten graft was necessary to reconstruct a symetric framework. The dorsum was then augmented using a DC-F graft created from recycled rib cartilage wrapped in autologous temporalis fascia. A straight and well-contoured nose was evident on 1-year follow-up (Fig. 8.22).

Fig. 8.22 (**a–f**) Augmentation with diced cartilage from the previous rib cartilage graft. (**g**–**h**) Front view, profile view pre-op/post-op. (**i–j**) Tip correction with lateral crural overlap on the left side and upside-down technique in combination with onlay batten graft on the right one. Base view pre-op/post-op

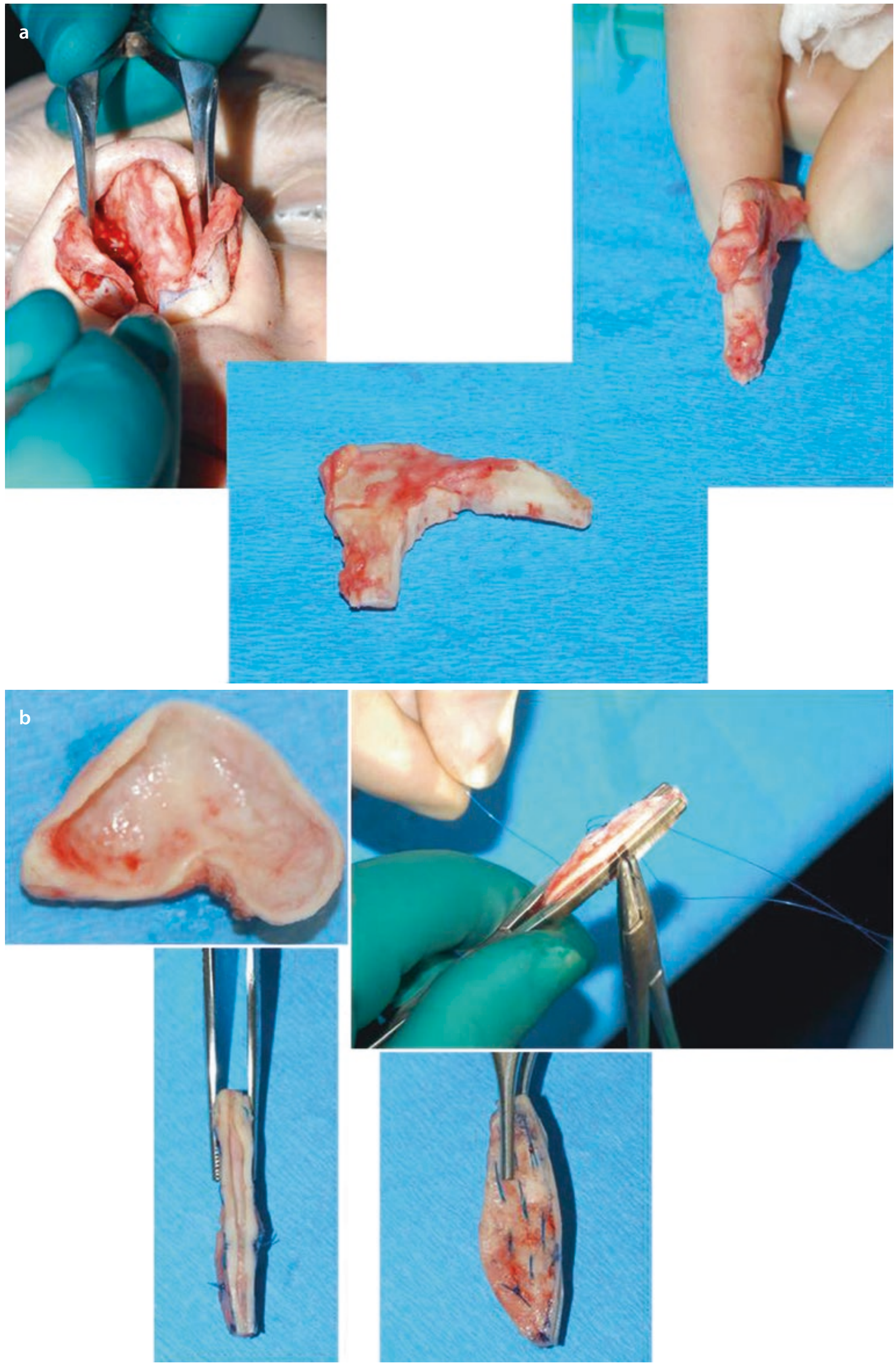
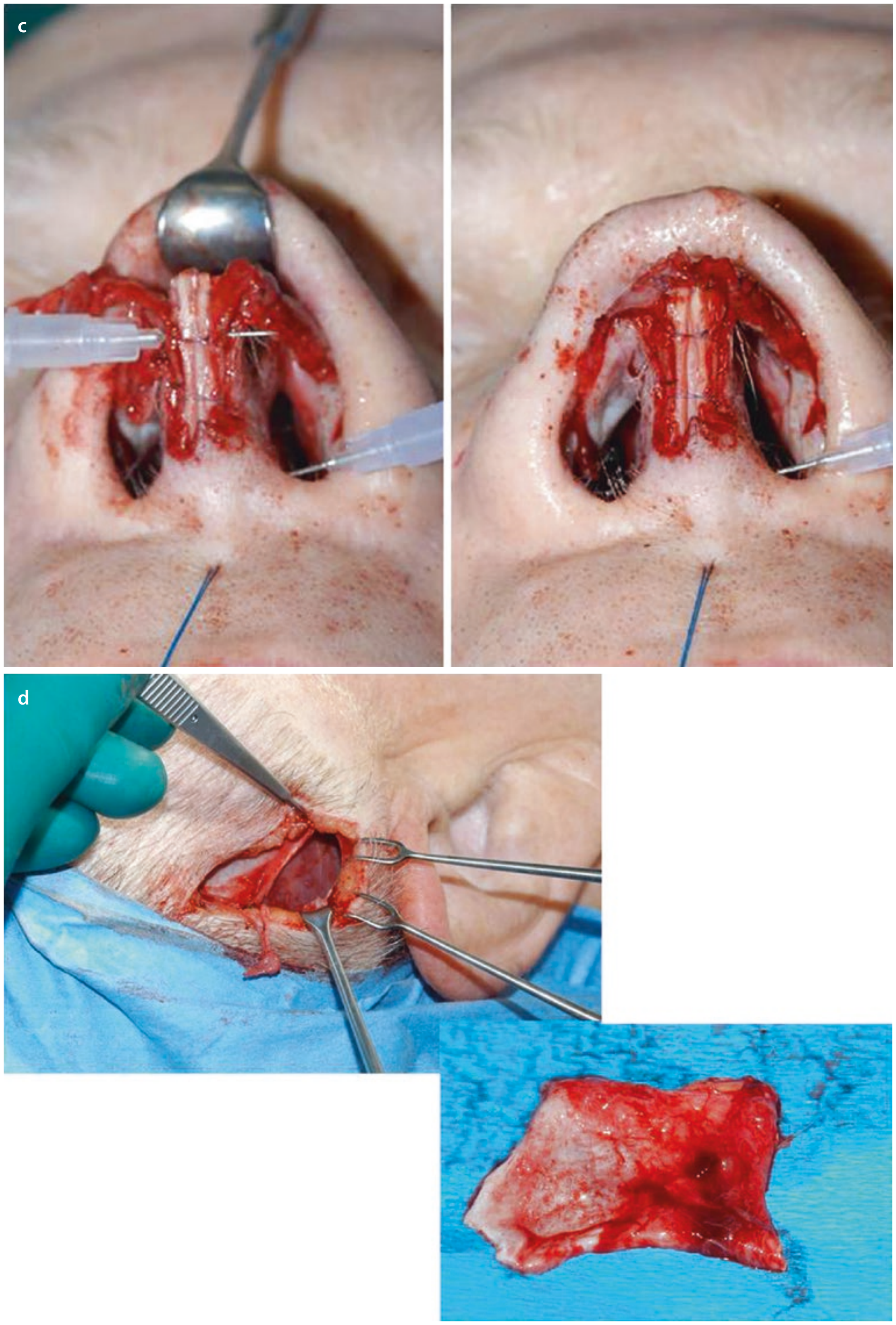


Fig. 8.22 (continued)



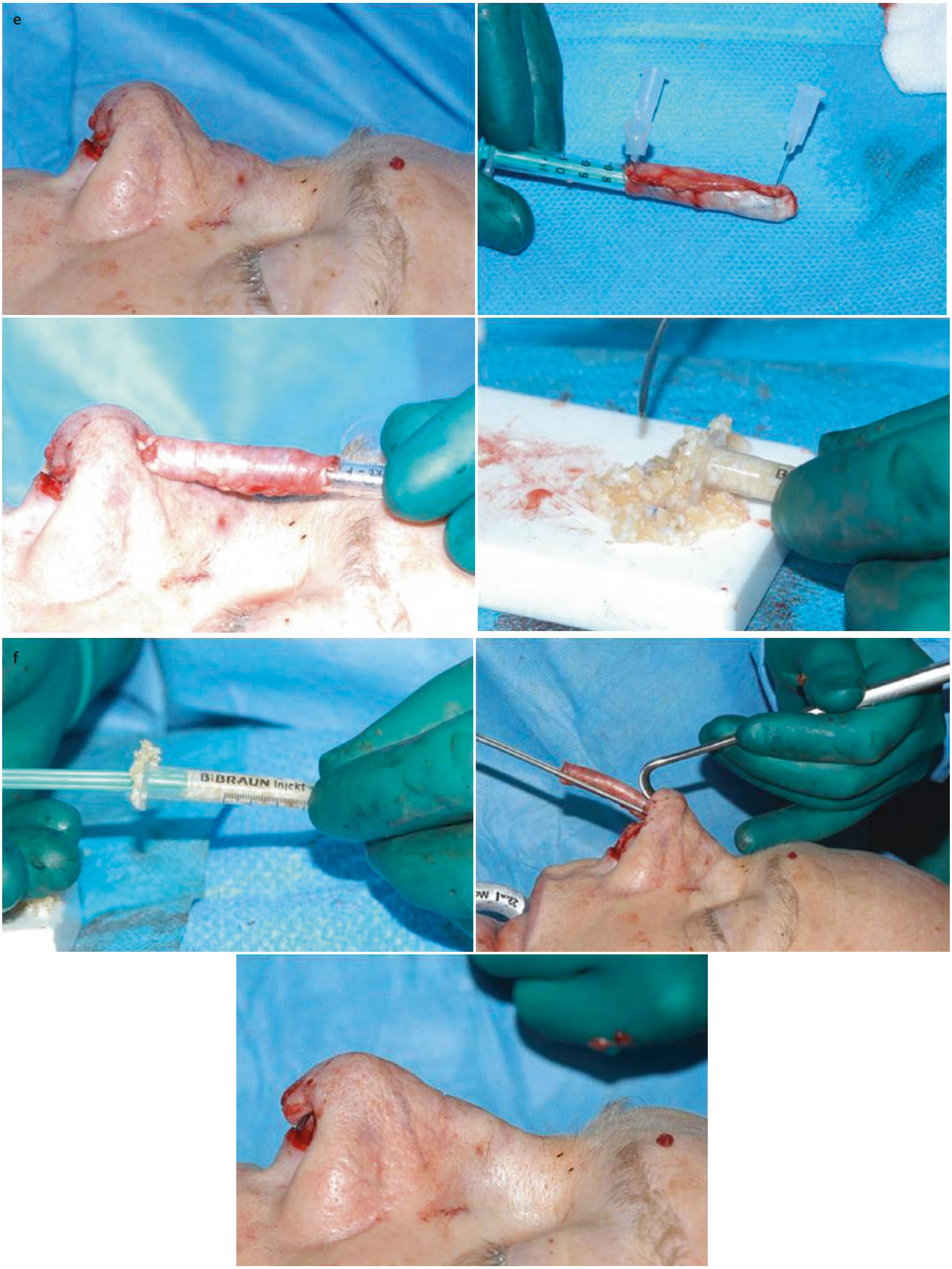


Fig. 8.22 (continued)

■ **Fig. 8.22** (continued)

Fig. 8.22 (continued)

8.2.18 Case 18: Augmentation with Diced Cartilage from the Previous Rib Cartilage Graft

A 47-year-old male presented after multiple failed revision rhinoplasties, including rib graft implantation. The cranial end of the graft had warped and almost perforated the skin. Surgical exploration was conducted using the external rhinoplasty approach. After excision of extensive subcutaneous scar tissue, concave deformities of both lateral crura were exposed. The explanted rib cartilage also revealed numerous foci of resorption. Tip support was reconstituted with a double-layered conchal sandwich graft followed by reshaping the lateral crura with suture techniques. The dorsum was then reconstructed using a DC-F graft created from recycled rib cartilage. Multiple osteotomies, including parasagittal medial, transverse, and low-to-low lateral osteotomies were used to straighten the crooked bony pyramid (◘ Fig. 8.23).

◘ **Fig. 8.23** (**a**–**d**) Augmentation with diced cartilage from the previous rib, reconstruction of a straight columella with double-layerd conchal graft. (**b**–**d**) Front view,profile view,base view pre-op/post-op

■ **Fig. 8.23** (continued)

8.2.19 Case 19: Total Septal Reconstruction with Concha Combined with DC-F Graft from Rib Cartilage

An 18-year-old male presented with postsurgical columellar retraction and a saddle-nose deformity following nasal septoplasty. Examination also revealed a wide nose with a bony rhinion hump. Surgical exploration revealed complete absence of the anterior septum without evidence of septal abscess or inflammation. Surgical overresection was thought to be the most likely cause of the dorsal and columellar deformities. Reconstruction was performed using only conchal cartilage harvested from both ears, since the patient refused rib graft harvest. A double-layered conchal sandwich graft was first used to create a neoseptum and support the middle vault and columella. The remaining cartilage was diced and used as a DC-F graft for dorsal augmentation.

Although significant improvement was achieved, the patient returned 2 years postoperatively seeking further dorsal augmentation with rib cartilage. Consequently, a second DC-F graft was created from diced rib cartilage and autologous temporalis fascia. The new DC-F graft was then placed on top of the previous graft, and improved profile aesthetics resulted (Fig. 8.24).

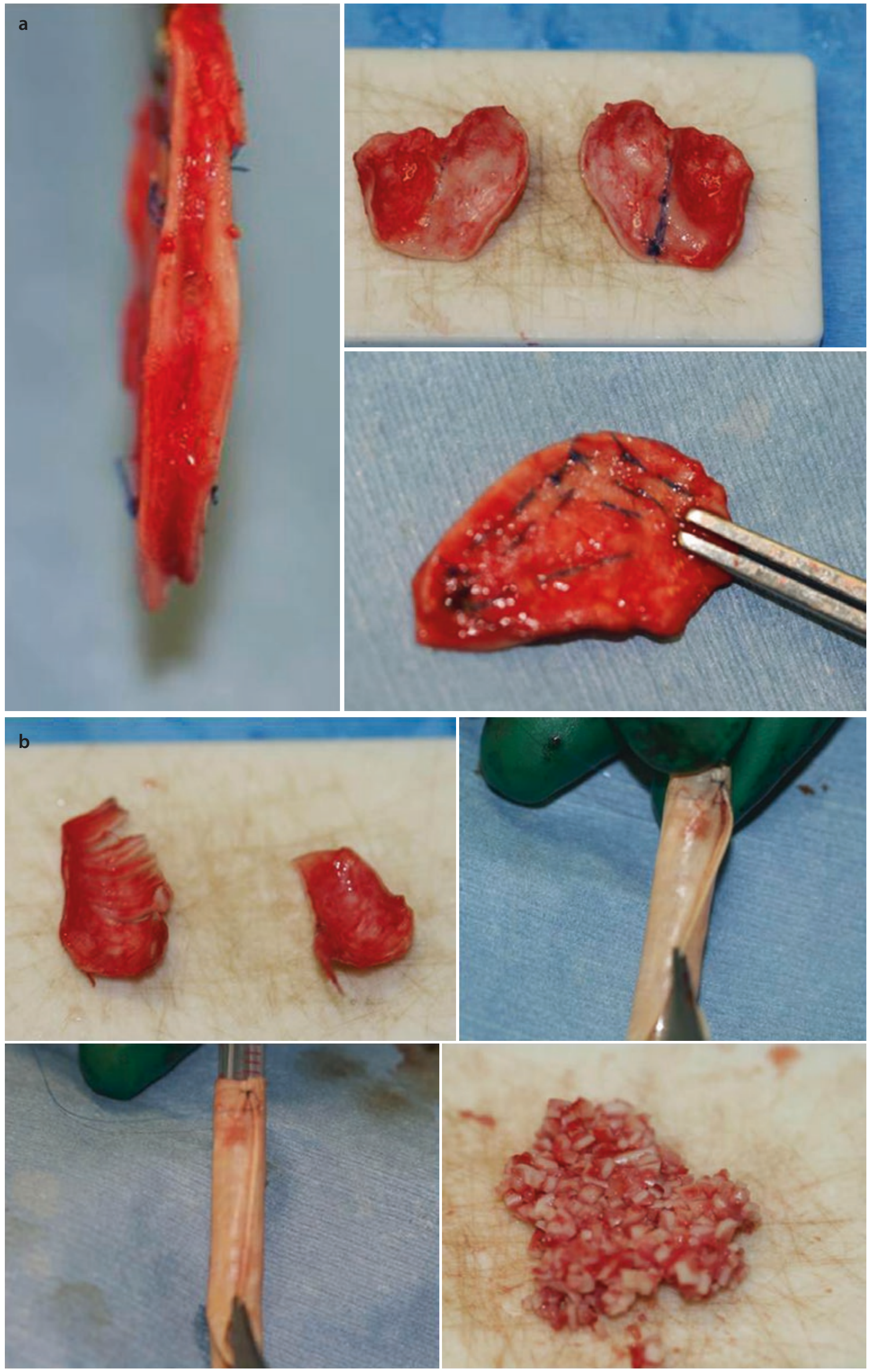


Fig. 8.24 **(a–c)** Total septal reconstruction with concha combined with DC-F graft from rib cartilage. (**d**–**f**) Front view, profile view, base view pre-op/post-op. and after revision. (**g**) Ear configuration after removal of the whole concha

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Fig. 8.24 (continued)

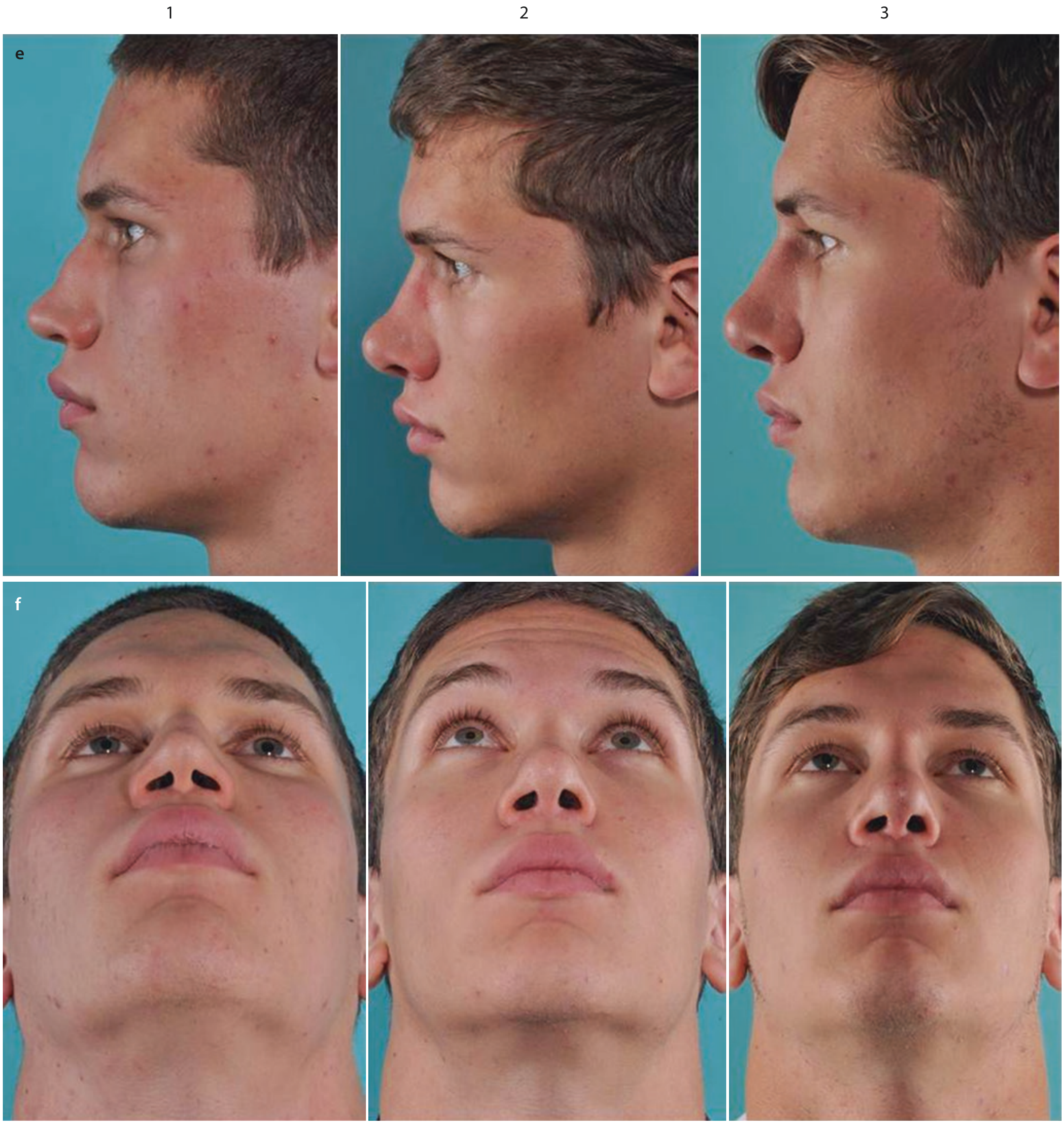

Fig. 8.24 (continued)

Fig. 8.24 (continued)

8.2.20 Case 20: Removal of Silicone Implants and Replacement of DC-F Graft

A 35-year-old female presented with a large silicone nasal implant and impending extrusion at the nasal tip. Immediate removal with simultaneous reconstruction with autologous tissue was recommended and performed.

After lifting the nasal skin flap, the implant was identified and removed, and the capsule was then incised and enlarged. Tip support was reconstituted using a double-layered conchal sandwich graft as a columellar strut. Deformed lower lateral cartilages were then suspended from the strut graft after performing a lateral crural "steal" procedure to increase tip projection. Further projection and tip refinement were achieved with placement of shield and cap grafts. The remaining conchal cartilage was then diced and wrapped in autologous temporalis fascia to create a DC-F graft for dorsal augmentation. The patient refused harvest of rib cartilage for dorsal augmentation (Fig. 8.25).

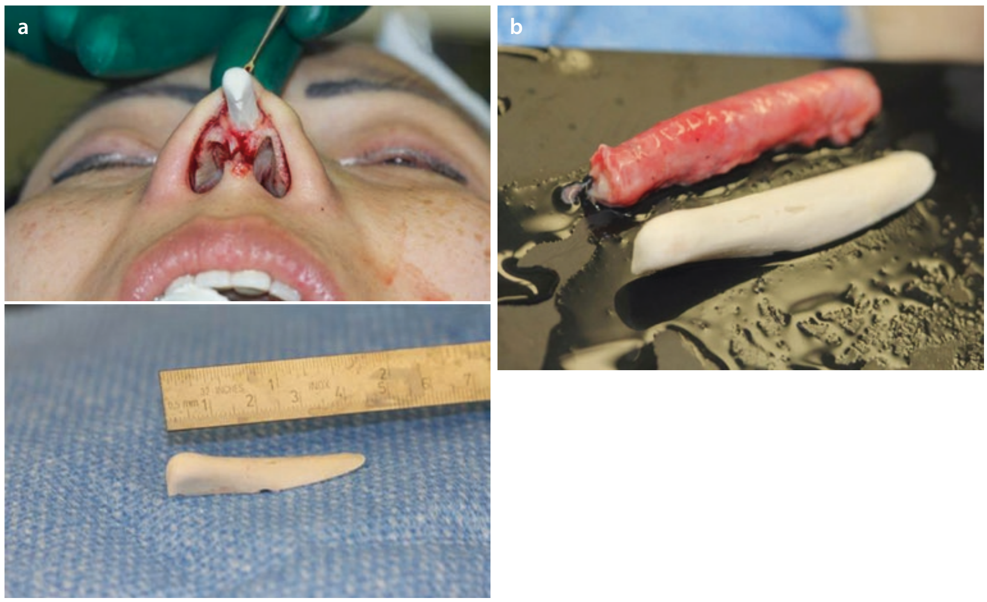

Fig. 8.25 **(a–b)** Removal of silicone implants and replacement with DC-F graft. **(c–e)** Front view, profile view, base view pre-op/post-op

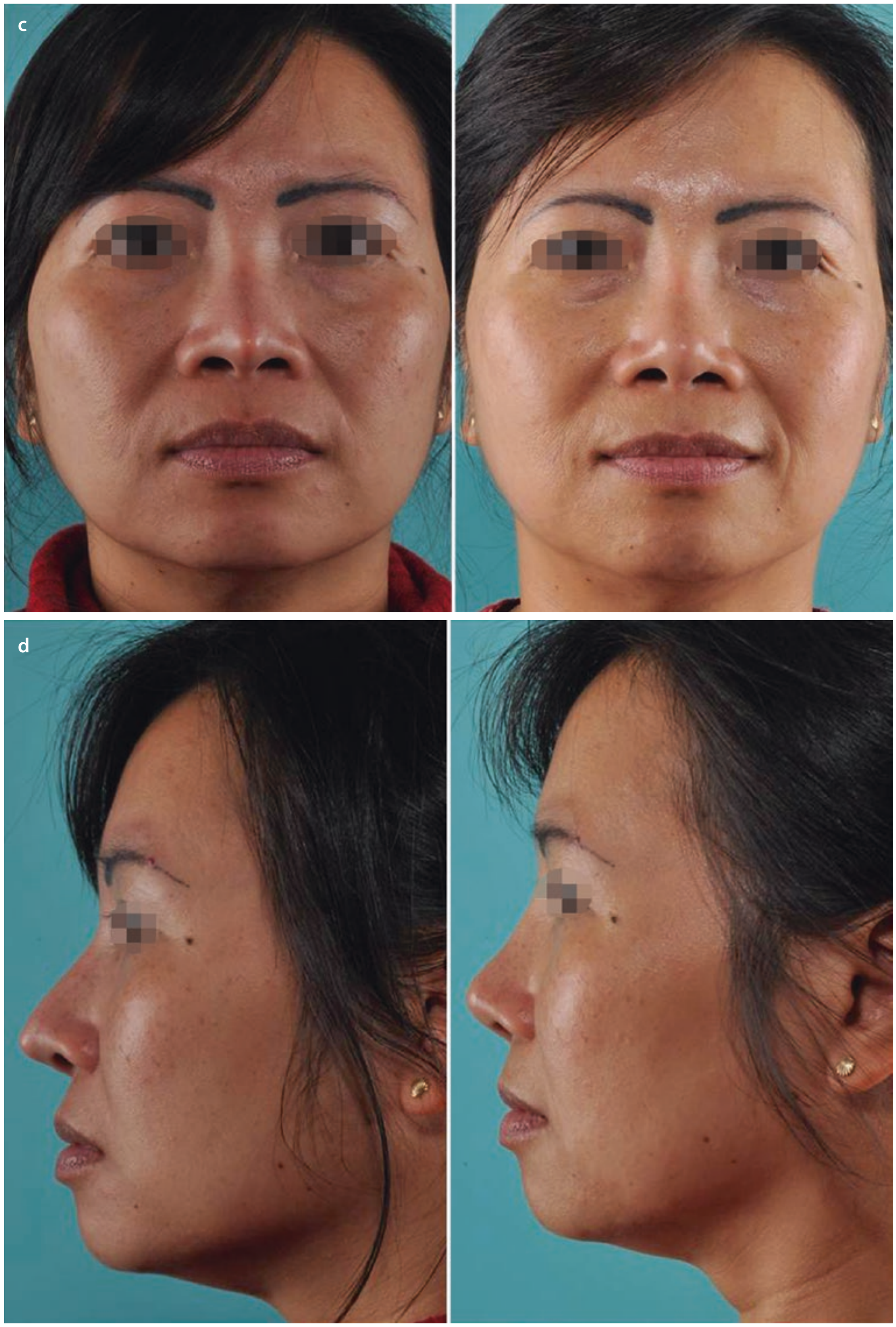

Fig. 8.25 (continued)

Fig. 8.25 (continued)

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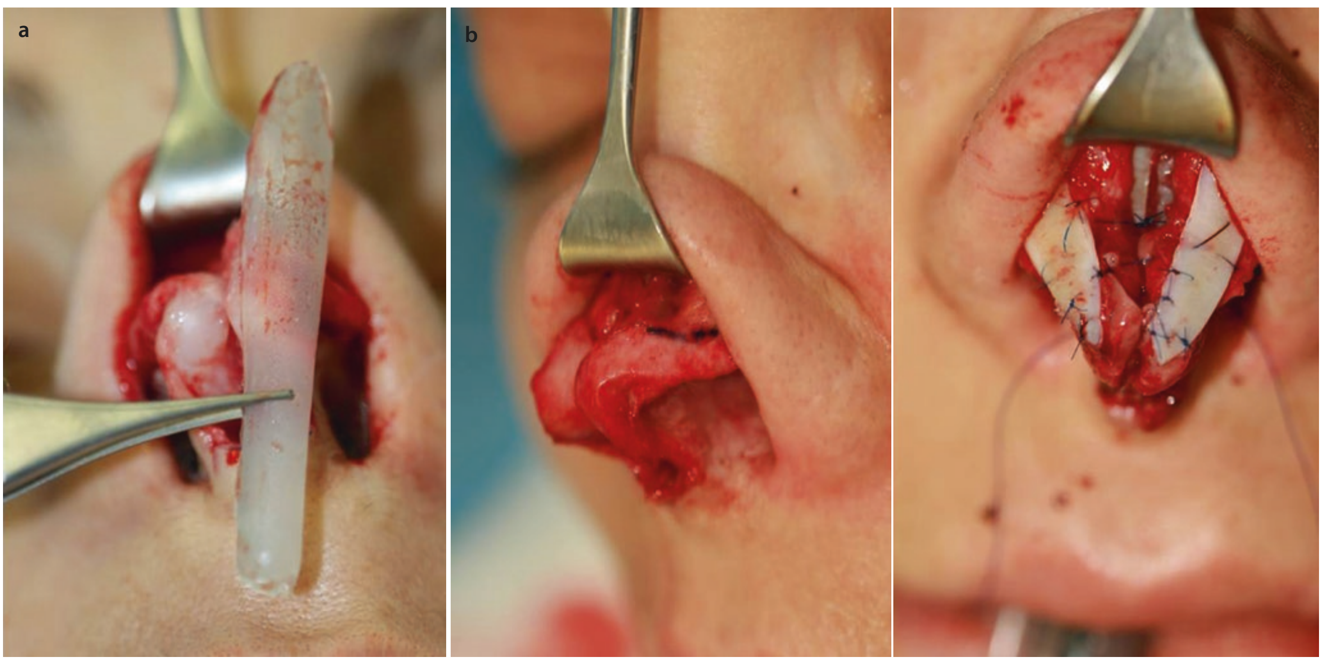
8.2.21 Case 21: Removal of Silicone Implants and Replacement of DC-F Graft

A 35-year-old female presented seeking revision rhinoplasty after six previous rhinoplasties elsewhere. Examination revealed a malpositioned dorsal silicone implant placed during the most recent surgery. A bulky and wide supratip and a retracted left soft triangle were also observed. Because of severe septal deviation, airway obstruction was also present bilaterally.

Surgical exploration revealed a postsurgical deformity of both lower lateral cartilages resulting from previous overresection. Insufficient treatment of the intermediate crura was also seen. Despite multiple prior surgeries and a history of nasal dysfunction, no attempt had been made to correct the severe septal deformity.

We began reconstruction by resecting the deformed central septum, shortening the caudal L-strut, and suturing the caudal septum to the anterior nasal spine using a transverse drill hole. In order to increase nasal length, the right conchal cartilage was harvested to create a double-layered sandwich graft, which was inserted between the medial crura. Deformity of the intermediate crura was eliminated using a lateral crural overlap technique. This enabled the deformed segments to be sutured to the lateral crura. Batten grafts were then used to further strengthen and straighten the surgically overresected lateral crura. Additional cartilage was harvested from the tenth rib. Rib cartilage was used to fabricate the two batten grafts as well as two alar rim grafts, two spreader grafts, and enough residual cartilage to create a large DC-F graft from autologous deep temporalis fascia for dorsal augmentation (◘ Fig. 8.26).



◘ **Fig. 8.26** (**a**–**c**) Removal of silicone implants and replacement with DC-F graft, reconstruction of the overresesected lateral crura. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 8.26 (continued)

Fig. 8.26 (continued)

8.2.22 Case 22: Removal of Synthetic Implant and Replacement of DC-F Graft

A 38-year-old female presented with a severe polly-beak deformity after previous rhinoplasty 20 years earlier. Using the open approach, surgical exploration revealed augmentation of the overresected dorsum with an unidentifiable synthetic implant. The tip was badly scarred, and thick nonresorbable suture material had been used for tip contouring. The right LLC was malpositioned, and the cephalic border was overresected. After removing the dorsal implant, the dorsum was underprojected with numerous contour irregularities. The caudal septum was weak and deformed but also overprojected. After lowering the anterior septal angle, the caudal septum was sutured to the ANS via osseous drill holes. The right concha cavum and cymba were then harvested, and the cymba was used to create a double-layered sandwich graft that was sutured while stabilizing the cartilage segments with an Aiach-Gubisch clamp (Medicon, Inc., Setauket, New York). The conchal cavum was used to augment the caudal septum, and the sandwich graft was then placed in front of the caudal septum; the medial crura were sutured to the graft. The malpositioned right LLC was transposed caudally and fixed in a symmetrical position. The LLCs were then contoured with spanning sutures combined with a tip suspension suture and posterior sling. After narrowing the nasal pyramid with parasagittal medial osteotomies created with the Lindemann burr and percutaneous low-to-low lateral and transverse osteotomies, the dorsum was reconstructed with a DC-F graft fashioned from allogenic fascia lata and finely diced rib cartilage (Fig. 8.27).

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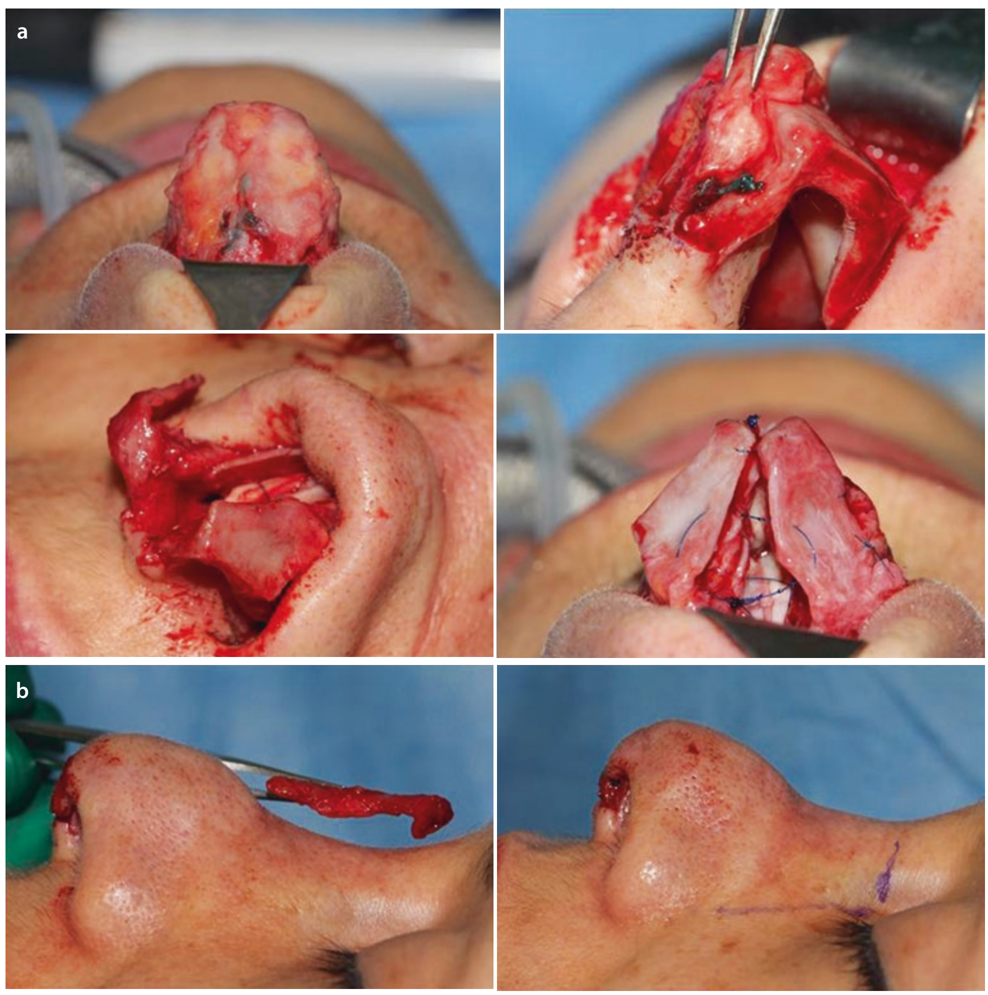


Fig. 8.27 (**a**–**e**) Reconstruction of the anterior septum with double layered conchal graft, dorsal reconstruction with DC-F graft and tip configuration with suture techniques. (**f**–**h**) Front view, profile view, base view pre-op/post-op

▪ **Fig. 8.27** (continued)

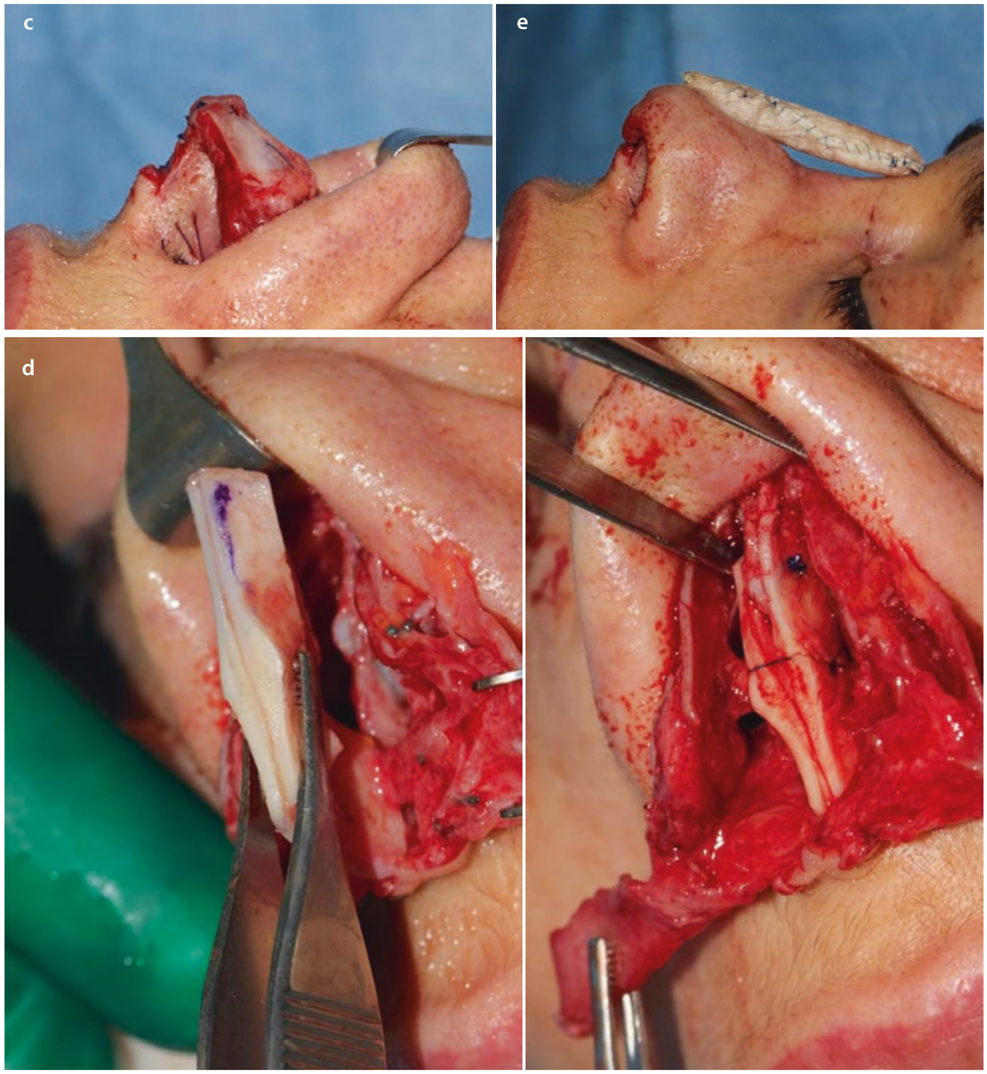


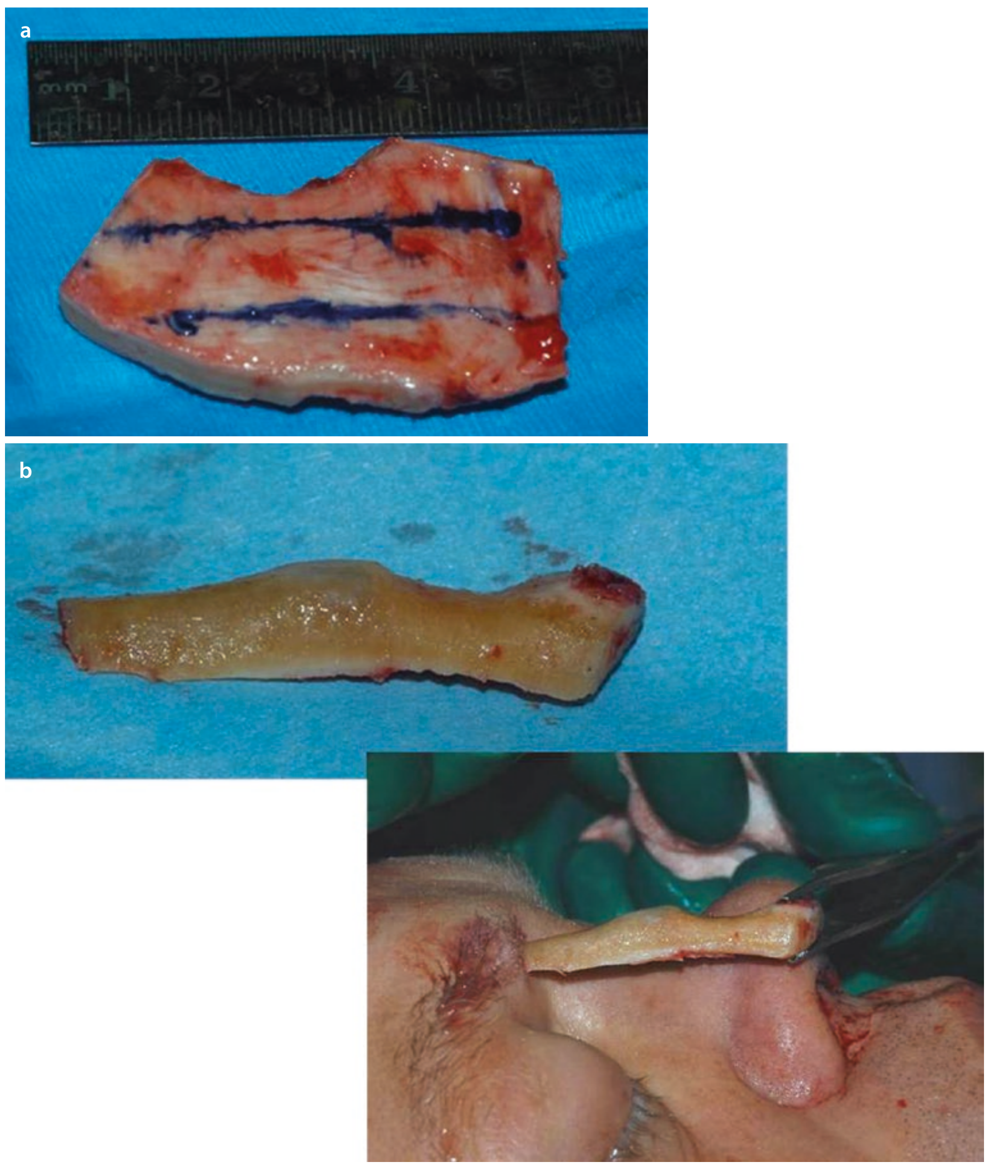
Fig. 8.27 (continued)

Fig. 8.27 (continued)

8.2.23 Case 23: Enlarging the Shrunken Skin Envelope by Continuous Manual Stretching as Prerequisite for a Successful Augmentation with Solid Rib Graft

A 51-year-old male presented with an overly short saddle nose resulting from childhood trauma and septal abscess formation. The patient had also undergone several unsuccessful attempts at surgical restoration.

Previous surgery failed because of an overly tight skin envelope that prevented successful skeletal expansion. Our past experience with tissue expanders has been disappointing; therefore, we sought another means of enlarging the soft-tissue envelope. One option was a paramedian forehead flap, but the deficit was not large enough to justify such an aggressive procedure. Consequently, we instructed the patient to begin cutaneous stretching exercises for at least 30 min each day, tensioning the dorsal skin and columella in a caudal direction. After 6 months of therapy, soft-tissue elasticity had improved dramatically, allowing for placement of a two-piece L-shaped (solid) rib graft. To achieve a straight nasal profile, the dorsal rib graft had to be contoured to account for various irregularities in skin thickness. One-year follow-up revealed good nasal length and improved dorsal projection (◘ Fig. 8.28).



◘ **Fig. 8.28** (a–e) Reconstruction with solid rib graft. One-year follow-up revealed good nasal length and improved dorsal projection

Fig. 8.28 (continued)

Fig. 8.28 (continued)

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Suggested Reading

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Nasal Pyramid

Contents

Osteotomies in Primary Rhinoplasty

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_9

9.1 Surgical Principles

Surgical alteration of the bony pyramid is often anxiety-provoking for the prospective rhinoplasty patient. Just talking about "breaking" the bone in the middle of the face creates fear and apprehension. However, contemporary techniques, combined with sophisticated cutting instruments, intraoperative ice-water cooling, and postoperative mechanical cooling devices to minimize swelling and bruising, have greatly improved surgery of the bony vault. Yet despite technical advances, the most important factor is still a well-conceived and individualized treatment plan executed with meticulous precision and extreme care.

Our treatment philosophy seeks to create bone fragments that are as large as possible and to mobilize them completely so that it becomes much easier to mold a new bony pyramid. Typically this is done using parasagittal medial osteotomies, percutaneous transverse osteotomies, and percutaneous low-to-low lateral osteotomies (Fig. 9.1). By using a 2- or 3-mm osteotomies and the percutaneous technique for the transverse and lateral osteotomies, the blunt force energy is applied at right angles to the bone for more precise bone cut placement, and by using a mallet made from Teflon, the blunt force energy is dissipated like a shock absorber for less tissue trauma. Using this approach, we feel that we can avoid many of the complications resulting from unwanted bony comminution or misplaced bone cuts. We also use a single-access incision for each percutaneous osteotomy (Fig. 9.2). For the lateral osteotomy, the skin incision is placed at the junction of the caudal and medial thirds, and for the transverse osteotomy, the incision is placed at the junction of the central and middle thirds (Fig. 9.3). After inserting the osteotome, we also score the periosteum along the fracture line to displace blood vessels and minimize bleeding and to get a glas cutter effect (Fig. 9.4). Finally, in our practice we have not observed medial displacement of the inferior turbinate head with the low-to-low lateral osteotomy, and therefore we are not using a high-to-low-to-low technique for preserving Webster's triangle.

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Fig. 9.1 Options for osteotomy configurations. Straight osteotomy lines produced by parasagittal medial, transverse, and percutaneous low-to-low lateral osteotomies. Curved osteotomy lines produced by conventional high-to-low-to-high lateral and medial oblique osteotomies

Fig. 9.2 Stab incision for percutaneous transverse osteotomy

Fig. 9.3 Percutaneous transverse and low-to-low lateral osteotomy. Lindemann fraise for parasagittal medial osteotomies. Making the percutaneous stab incision for the transverse and lateral osteotomies

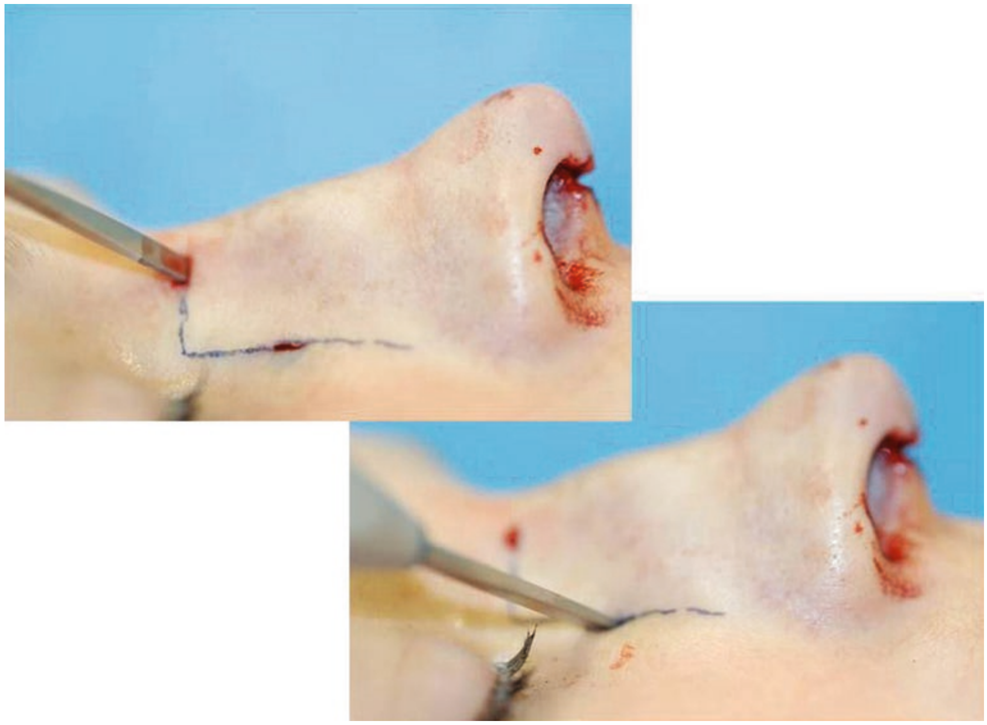

Fig. 9.4 Pushing away the vessels by scratching on the bone. Placement of the percutaneous access incisions

When performing the parasagittal medial osteotomy (which is always performed first), we are occasionally confronted with the challenge of achieving straight and symmetrical osteotomy lines when the bony vault is asymmetrical (Fig. 9.5). When a large hump is first removed, a large open roof is produced, and medial osteotomies are unnecessary. But in cases with a small dorsal hump and thick dorsal bone, or in those without a dorsal hump, creation of symmetrical medial osteotomies is best achieved using the Lindemann fraise (Fig. 9.6). Using a power-driven Lindemann fraise, the parasagittal cuts are performed from the inside out and extend cephalically near the intercanthal line. In addition to parallel and straight bone cuts, the Lindemann osteotomies also remove the excess bone (Fig. 9.5) that prevents adequate narrowing of the bony vault. Low-to-low lateral osteotomies are performed next, and the procedure is then completed with transverse osteotomies to fully mobilize the bone fragments. Only in few cases do we perform an oblique osteotomy, which can also be performed with a Lindemann fraise (Fig. 9.7). Ice-water irrigation is then used to prevent bleeding and reduce swelling.

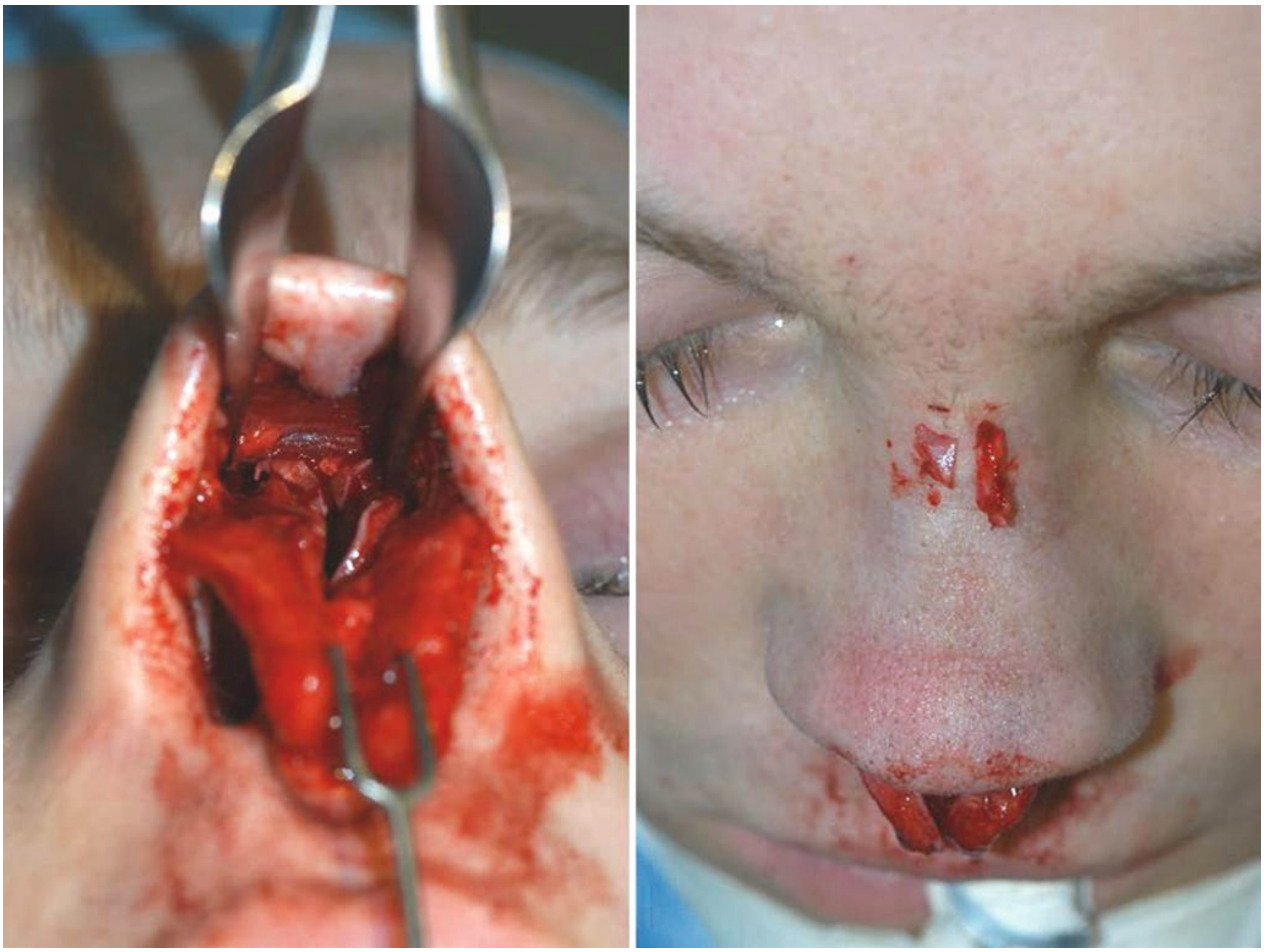

Fig. 9.5 Intraoperative photograph showing enlarged open roof and excised unequal bone fragments after parasagittal medial osteotomy with a 5-mm chisel

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Fig. 9.6 Paramedian osteotomy with a Lindemann fraise

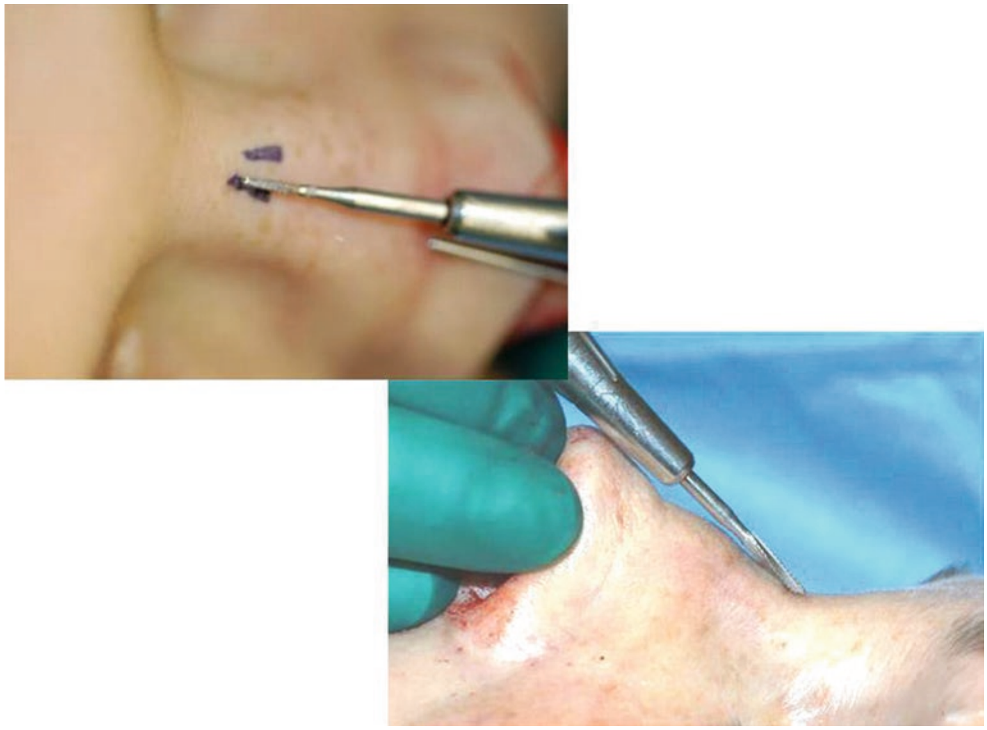

Fig. 9.7 Oblique osteotomy with a Lindemann fraise

We apply ice water for some minutes, which helps to reduce bleeding and swelling. These techniques help to mobilize the nasal pyramid best, and from our point of view, this is the prerequisite for straightening or narrowing any disfiguration of the nasal pyramid.

Complete mobilization of the bony vault is a prerequisite for straightening and/or narrowing a misshapen bony nasal pyramid. However, aggressive skeletal mobilization also necessitates prolonged external splinting for a favorable surgical outcome. For most noses, 2 weeks of postoperative splinting is adequate, but for a very wide bony vault, we prefer 3 weeks of immobilization using a plaster of Paris splint extending onto the forehead and reinforced by a circular bandage to minimize movement from the mimetic musculature. Removal of the splint after 2 weeks in these cases may result in recurrence of a wide nose (Fig. 9.8).

Fig. 9.8 Plaster of Paris splint extending onto the forehead and reinforced by a circular bandage

9.2 Case Studies: Primary Nasal Pyramid Correction

9.2.1 Case 1: Wide Nasal Bridge

A 20-year-old female presented with a low and very wide nasal dorsum and a wide and bulky nasal tip. Endonasal examination also revealed a severe deformity of the anterior septum.

An extracorporeal septoplasty was needed to thin the widened bony septum and to reconstruct the anterior segment. After thinning the bony septum, a large piece of quadrangular cartilage was added to serve as a new caudal septum, and spreader grafts were added for support. The bony vault was then narrowed using parasagittal medial osteotomies created with the Lindemann fraise, including removal of a strip of bone followed by percutaneous low-to-low lateral and transverse osteotomies. Using the low-to-low lateral osteotomy also helped to increase dorsal height.

The wide nasal tip was contoured by resecting the cephalic margin of the overly stiff lower later cartilages (LLCs) and by using both transdomal and spanning sutures. The septi depressor muscle was partially resected, allowing the columellar pedestal to be narrowed with transfixion sutures. Further contouring was achieved with alar rim graft placement and with morselized cartilage grafts to augment both soft-tissue facets. A tip suspension suture was also used to maintain tip position (◘ Fig. 9.9).

Fig. 9.9 (**a**–**d**) Correction of wide nasal bridge including. (**a**) Extracorporeal septal reconstruction. (**b**–**d**) Frontal view, profile view, base view pre-op/post-op

Fig. 9.9 (continued)

9.2.2 Case 2: Wide Nasal Bridge

A 19-year-old female presented with an ultrawide and slightly overprojected nasal dorsum, a low radix, a wide columellar pedestal, and a wide and bulky nasal tip.

Intraoperatively, a large fat pad between the medial crura was resected. The ULCs were divided from the septum, and the cartilaginous hump was then resected. The bony hump was lowered with a carbide rasp, and parasagittal medial osteotomies were created with an ultrawide Lindemann fraise to create a very wide osteotomy line. Percutaneous low-to-low and transverse osteotomies were then used to narrow the bony nasal vault. The overprojecting ULCs were then used to create spreader flaps.

The septi depressor muscle was partially resected, and the resected cartilaginous hump was used as a columellar strut graft. Tip contouring was accomplished by resecting the cephalic margin of both LLCs and by using transdomal, spanning, and suspension sutures. The resected cephalic margins were then used as alar rim grafts. Because tip projection increased with the aforementioned changes, a push-down technique was used to offset the increase in projection. The nasion was then augmented with three layers of allogenic fascia lata, while the dorsum was augmented with only a single layer. An external nasal cast was placed for 3 weeks (▫ Fig. 9.10).

Fig. 9.10 (**a**–**d**) Wide nasal bridge. (**a**) Removing intercrural fat pad. (**b**–**d**) Frontal view, profile view, base view pre-op/post-op

Fig. 9.10 (continued)

9.2.3 Case 3: Wide Nasal Bridge Complicated by Fracture of the Septal Frame

A 25-year-old female presented with an extremely wide and overprojected dorsum and a wide and underprojected nasal tip. Thin overlying skin also revealed lots of skeletal irregularities, and the endonasal examination revealed a deformed anterior septum.

Using the external rhinoplasty approach to expose the anterior nasal septum, an attempt to straighten the deviated anterior septum in situ by scoring the deviated cartilage, and splinting with ethmoid bone was complicated by bony fracture separation of the septal partition during ethmoid bone harvest. Consequently, since the septal partition was inadvertently mobilized like an extracorporeal septoplasty, it was removed, splinted with thinned septal cartilage, and reinserted. Percutaneous transverse and lateral osteotomies were then performed to narrow the extremely wide bony vault. However, in order to achieve adequate narrowing, parasagittal medial osteotomies were first created using a large Lindemann burr to generate an unusually wide bony open roof. Following fixation of the neoseptum, the upper lateral cartilages (ULCs) were invaginated to form spreader flaps for additional stability, and a columellar strut was added for tip support. Tip narrowing was then accomplished using both transdomal and spanning sutures. The dorsum was then camouflaged with finely diced cartilage and a single layer of cadaveric fascia lata. In order to achieve consistent positioning of the nasal bones during healing, a plaster of Paris cast was maintained for three consecutive weeks (◘ Fig. 9.11).

Fig. 9.11 (a–c) Wide nasal bridge. Frontal view, profile view, base view pre-op/post-op

9.2.4 Case 4: Wide Nasal Bridge with Functional Problems

A 26-year-old female presented with a very wide nasal bridge that prevented a comfortable fit for her eyeglasses. Examination of the profile revealed an overprojected tip and cartilaginous dorsum.

Using the external rhinoplasty approach, a lateral crural overlay technique of 5 mm (lateral sliding technique) was used for tip deprojection. After dissecting mucosa from beneath the ULC/septal junction and dividing the ULCs from the septum, parasagittal medial osteotomies were created using a large Lindemann burr in order to create a wide open roof for aggressive bone narrowing and to align the osteotomy cuts in a precise and symmetrical fashion. Percutaneous low-to-low (continuous) lateral and transverse osteotomies were then performed to narrow the bony nasal pyramid. Overprojected ULCs resulted from the cartilaginous hump and the aggressive bony narrowing. The overprojected ULCs were invaginated and used as spreader flaps to stabilize the middle vault. The low bony dorsum was then augmented with morselized septal cartilage covered with three layers of allogenic fascia lata (Fig. 9.12).

■ **Fig. 9.12** (**a**–**d**) Wide nasal bridge. (**a**) Tip deprojection with lateral sliding (lateral crural overlap) technique. (**b**–**d**) Frontal view, profile view, base view pre-op/post-op

Fig. 9.12 (continued)

9.2.5 Case 5: Narrow Nasal Bridge

A 24-year-old female presented for treatment of a dorsal hump. From the frontal view, the dorsum was very narrow, and compared with the dorsal width, the tip appeared too wide.

Using the external approach, a fold-under flap technique was used to strengthen both lateral crura. Spanning sutures were then used to refine the newly strengthened LLCs. After separating the ULCs from the dorsal septum, the cartilaginous hump was resected, and the bony hump was lowered using the rasp. Spreader flaps that extended into the keystone area were then created from the overprojected ULCs after they were released from beneath the nasal bones. This served to adequately widen the overly narrow dorsum. Low-to-high lateral osteotomies were then used to narrow the base of the bony vault. The columellar pedestal was narrowed by subtotal resection of the septi depressor muscle followed by transfixion suture placement (Fig. 9.13).

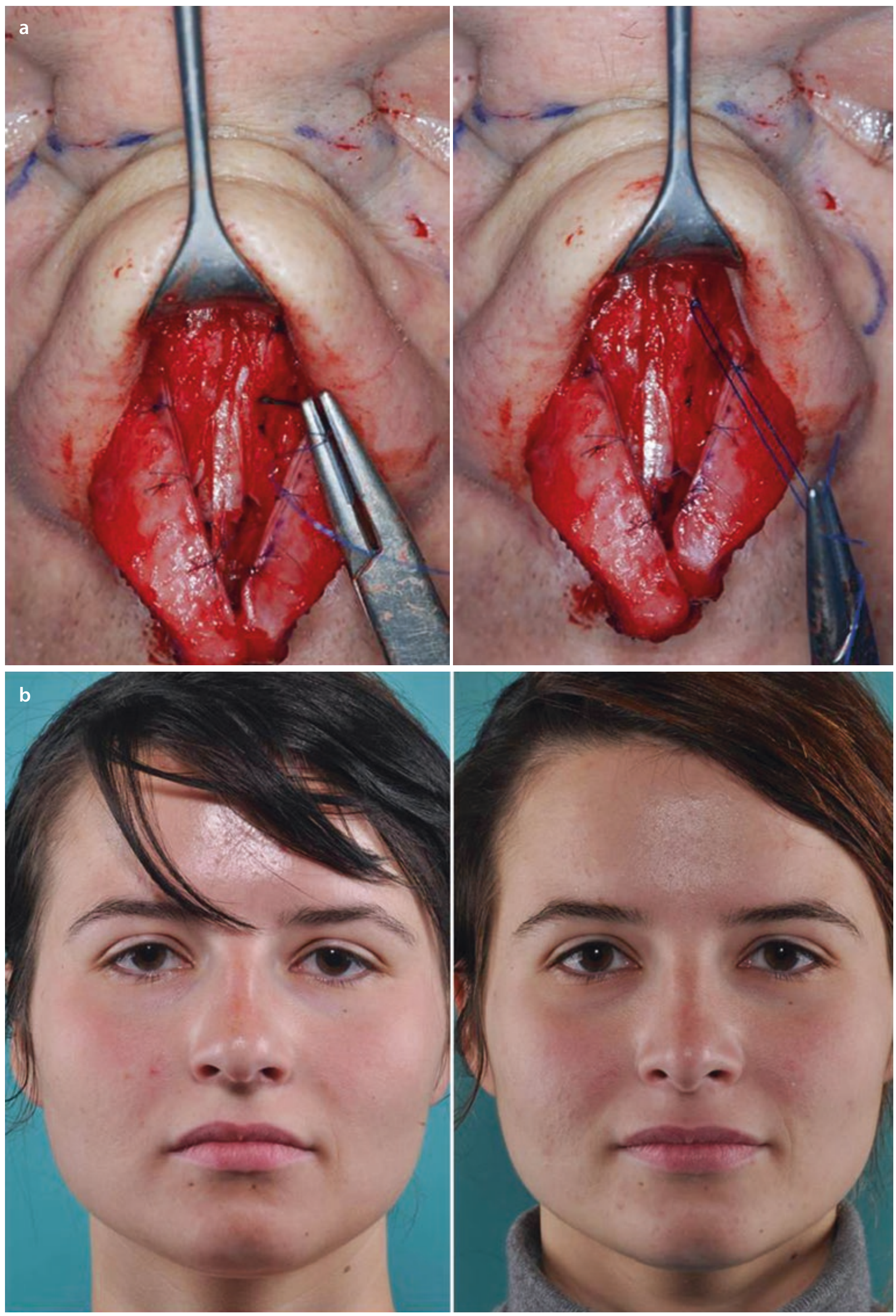

Fig. 9.13 (**a**–**d**) Widen a narrow dorsum using spreader flaps. (**a**) Fixation of the invaginated ULC to the dorsal septum (spreader flaps), fold-under flaps for stabilisation of the LLCs. (**b**–**d**) Frontal view, profile view, base view pre-op/post-op

Fig. 9.13 (continued)

9.2.6 Case 6: Narrow Nasal Bridge with Overprojected Dorsum

A 26-year-old female presented with a narrow dorsum and a prominent dorsal hump. Additionally, a depressed left nasal bone led to asymmetry of the brow-tip aesthetic lines.

After component resection of the cartilaginous and bony humps, spreader flaps were used to widen the internal nasal valves. However, following osteotomies, support to the keystone area was inadequate, and extended spreader grafts were used to support the bony vault. To smooth the nasal dorsum, the previously elevated periosteal flap was folded upon itself and sutured in the midline. The depressor septi muscle was partially resected, and after rotating the nasal tip, the medial crura were sutured to the caudal septum using the tongue-in-groove technique. A spacer graft was placed in the nasal tip to prevent excessive tip narrowing (■ Fig. 9.14).

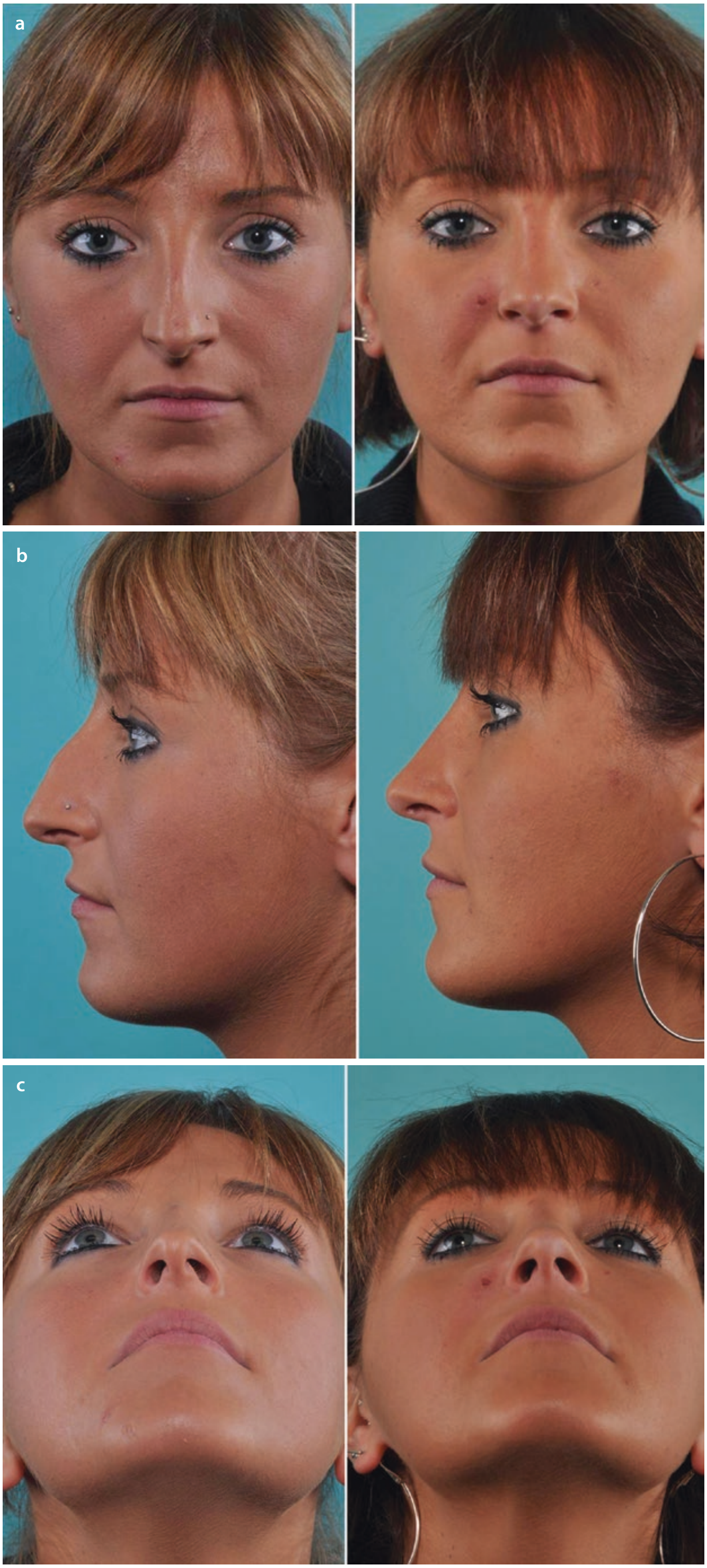

Fig. 9.14 (**a–c**) Correction of deviated and narrow nasal bridge. Frontal view, profile view, base view pre-op/post-op

9.2.7 Case 7: Deviated Wide Nasal Bridge

A 17-year-old male presented with an S-shaped deviation of the dorsum and an overly wide nasal pyramid. Severe deformity of the nasal septum necessitated an extracorporeal septoplasty to adequately straighten the nose. Spreader grafts were attached to the neoseptum before reimplantation. The tip was contoured using transdomal and spanning sutures, followed by tip rotation with a tongue-in-groove technique combined with a posterior sling suspension suture. Following parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies, the bony vault was repositioned and stabilized in a straight and narrow configuration (▪ Fig. 9.15).

Fig. 9.15 Correction of deviated wide nasal dorsum with extracorporeal septl reconstruction. (**a**) Explanted deformed septum causing the deviated nasal bridge. (**b**–**d**) Frontal view, profile view, base view pre-op/ post-op

Fig. 9.15 (continued)

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9.2.8 Case 8: Deviated Nasal Bridge

A 52-year-old male presented with a severe S-shaped deviation of the nose and an overprojected dorsum. From the basal view, the tip was asymmetrical, and the anterior border of the septum was shifted to the right side.

Using the open approach via an inverted-V transcolumellar incision, the ULCs were separated (extramucosally) from the septum, and parasagittal medial osteotomies were created with a Lindemann burr to release the perpendicular plate superiorly. Then both the upper and lower mucosal tunnels were dissected, revealing a severe septal deformity that necessitated extracorporeal septal reconstruction. After fracturing the perpendicular plate posteriorly and unhinging the septum from the maxillary crest inferiorly, the septal partition was removed en bloc. Only the bony cartilaginous junction was long enough to recreate a straight dorsum, and consequently the septum was rotated 90°, and the cartilage was scored and splinted using thinned perpendicular ethmoid bone. The septal spur was then harvested and used to fabricate spreader grafts, which were sewn to the new dorsal border. Before reimplanting the newly straightened neoseptum, the deformed bony pyramid was mobilized using percutaneous low-to-low lateral and transverse osteotomies. The reimplanted neoseptum was then sutured to the nasal bones, the ULCs, and the anterior nasal spine after creation of osseous drill holes.

After trimming the cephalic portion of the LLCs and inserting a columellar strut created from septal cartilage, the tip was further contoured using spanning sutures combined with a tip suspension suture with a posterior sling. Rim grafts were then placed bilaterally, and for dorsal camouflage, three layers of allogenic fascia lata were added to the nasal dorsum (◘ Fig. 9.16).

Fig. 9.16 (**a**–**c**) Correction of deviated nasal bridge. Frontal view, profile view, base view pre-op/post-op

9.2.9 Case 9: Asymmetrical Nasal Bridge with Severe Septal Deviation

An 18-year-old female presented with bilateral nasal obstruction after severe childhood nasal trauma. Examination revealed rightward deviation of the nose, a dorsal hump, and previous fracture dislocation of the septum.

Using the external approach, the entire septum was dissected and removed en bloc. A straight cartilage segment of sufficient size was available to reconstruct the entire caudal L-strut but not the entire dorsal L-strut. Consequently, the dorsal L-strut was reconstructed by morselizing two deformed pieces of cartilage and suturing them together. The dorsal construct was then sutured to a double-layered piece of flat cartilage. Bilateral spreader grafts were fashioned from the cartilaginous spur and sutured to the neoseptum. Before replacement of the neoseptum, parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies were used to mobilize the bony pyramid. The neoseptum was then reimplanted in a more anterior position with suture fixation to the ULCs and to the anterior nasal spine via a drill hole. The medial crura were then sutured to the anterior margin of the caudal septum. The tip was contoured with transdomal sutures and a double-layered tip graft. Small cartilage chips were used to smooth the nasal dorsum (▣ Fig. 9.17).

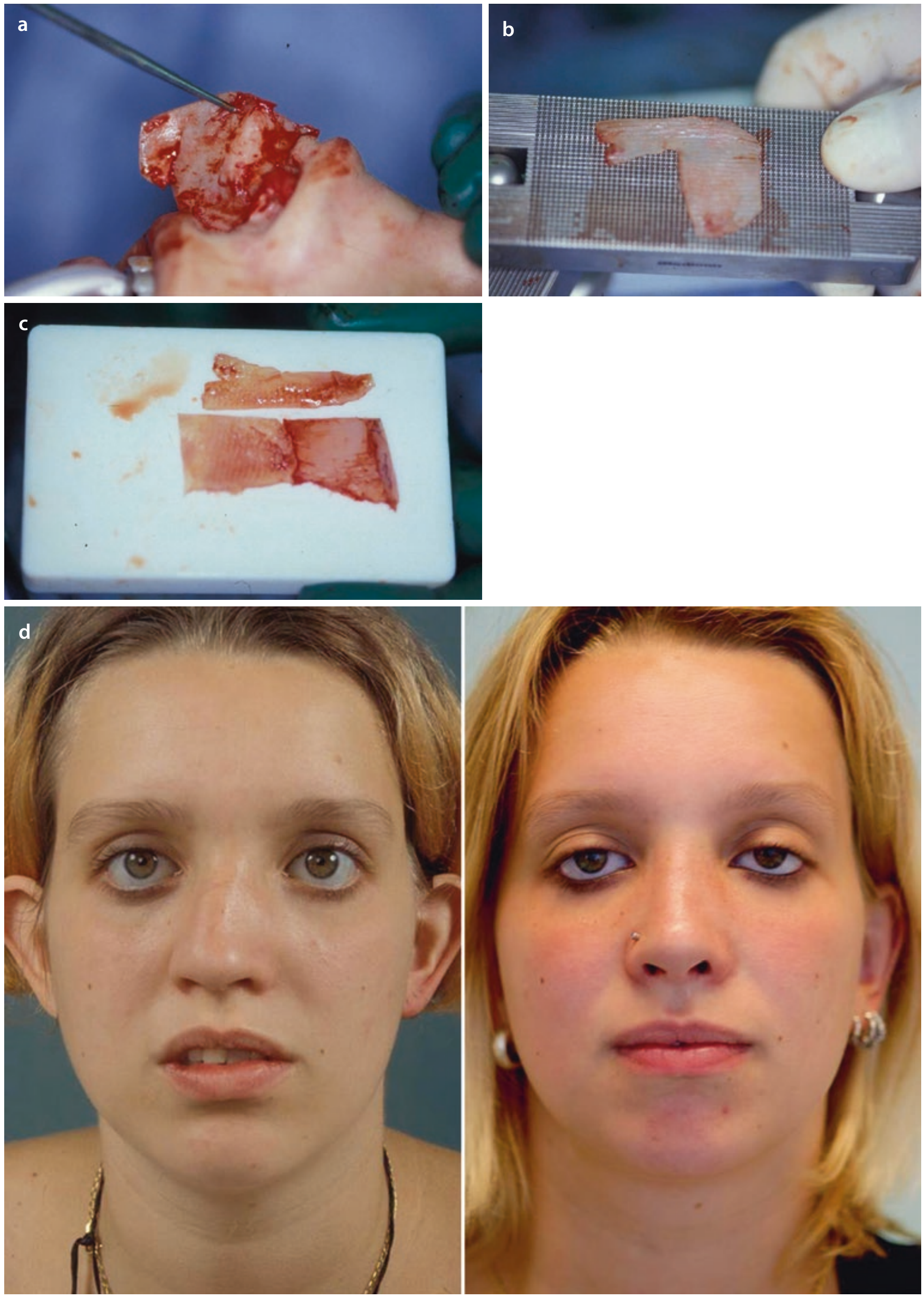

Fig. 9.17 (**a**–**f**) Asymmetrical deviated nasal bridge. (**a**–**c**) Extracorporeal septal reconstruction. (**d**–**f**) Frontal view, profile view, base view pre-op/post-op

■ **Fig. 9.17** (continued)

9.2.10 Case 10: Inverted-V Deformity

A 30-year-old patient was seen after severe nasal trauma with inverted-V deformity on the right side. After opening up the nose, we found that this deformity had been created by a disruption and disconnection of the upper lateral cartilage from the bony pyramid.

Next to osteotomies for narrowing and symmetrical positioning of the nasal bones, unilateral spreader grafts on the right side were placed to correct the inverted-V deformity. To camouflage any irregularities of the dorsum, a graft from the septum was placed as a dorsal onlay graft (▪ Fig. 9.18).

Fig. 9.18 Correction of (**a**–**c**) Inverted-V deformity. Frontal view, profile view, base view pre-op/post-op

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Osteotomies in Secondary Rhinoplasty

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_10

10.1 Surgical Principles of Osteotomies in Secondary Rhinoplasty

The principles of nasal pyramid correction in secondary rhinoplasties are identical to the ones in primary rhinoplasties.

The most common reasons for revisions are remaining deviations or asymmetries of the bony pyramid caused by the primary rhinoplasty. These often result from incomplete osteotomies or inadequate postoperative fixations. We think that the postoperative fixation by any kind of cast for only 1 week is often not sufficient.

Therefore, we always change the patient's cast after 1 week, and often there is the opportunity to correct minor deviations during this time. A cast is applied for a second week, and in patients with a very wide nasal pyramid, we continue to do this for a third week to keep the bony pyramid narrow.

In terms of incomplete osteotomies, the revision has to perform what did not work during the primary procedure. With the technique of external osteotomies, this works nicely.

Another common failure patients complain about is visible stair-step deformities at the lateral nasal wall. These mostly result from a displacement of the osteotomies. If these are performed just at the junction from the nasal bone to the maxilla, the bone transection will always be too high. This happens more often when using the low-to-high lateral osteotomy than in a low-to-low technique; we prefer the latter.

The neglect of the use of spreader flaps or spreader grafts can be responsible for an unpleasant outcome of the primary procedure. Therefore, it is essential to use one of these two techniques in all rhinoplasties in which the dorsum has been lowered. This also helps to prevent the occurrence of inverted-V deformities.

10.2 Case Studies: Secondary Nasal Pyramid Correction

10.2.1 Case 1: Wide Nasal Bridge

A 25-year- old patient presented after three previous rhinoplasties with a wide nasal pyramid and irregularities of the dorsum after grafting with conchal cartilage.

After opening the nose, the anterior septum was found to be overresected. Therefore, a large columellar strut, taken from the septum, was put in a pocket in front of the anterior septal border, and the medial crura were affixed to it. After smoothing the dorsum, paramedian osteotomies were performed with a Lindemann fraise, and then low-to-low lateral and transverse osteotomies were performed transcutaneously. As a result of this mobilization, a satisfactory narrowing of the pyramid was possible. The dorsum was covered with two layers of allogenic fascia (Tutogen). The tip was narrowed by transdomal sutures, and a cap graft from fascia was put on the tip. By using fascia any visibility of the graft was avoided (Fig. 10.1).

Fig. 10.1 (**a–c**) Correction of wide nasal bridge. Frontal view, profile view, base view pre-op/post-op

10.2.2 Case 2: Wide Nasal Bridge

A 29-year-old patient was seen after two previous rhinoplasties. In addition to a loss of support from overresection of the septum and incomplete lowering of the dorsum, the nasal pyramid was also overly wide. The reason for the deformity of the nasal pyramid was the extremely thick bone, which required four chisels to cut the strong hump. Initially a parasagittal medial osteotomy with a Lindemann fraise was performed after lowering the dorsum, followed by low-to-low lateral and transverse osteotomies transcutaneously to mobilize the pyramid and narrow it. A cast was put on for 3 weeks to guarantee the narrowing of the bones. The missing support was achieved by a strong sandwich graft from the concha. The tip was narrowed by transdomal sutures and contoured by spanning sutures (Fig. 10.2).

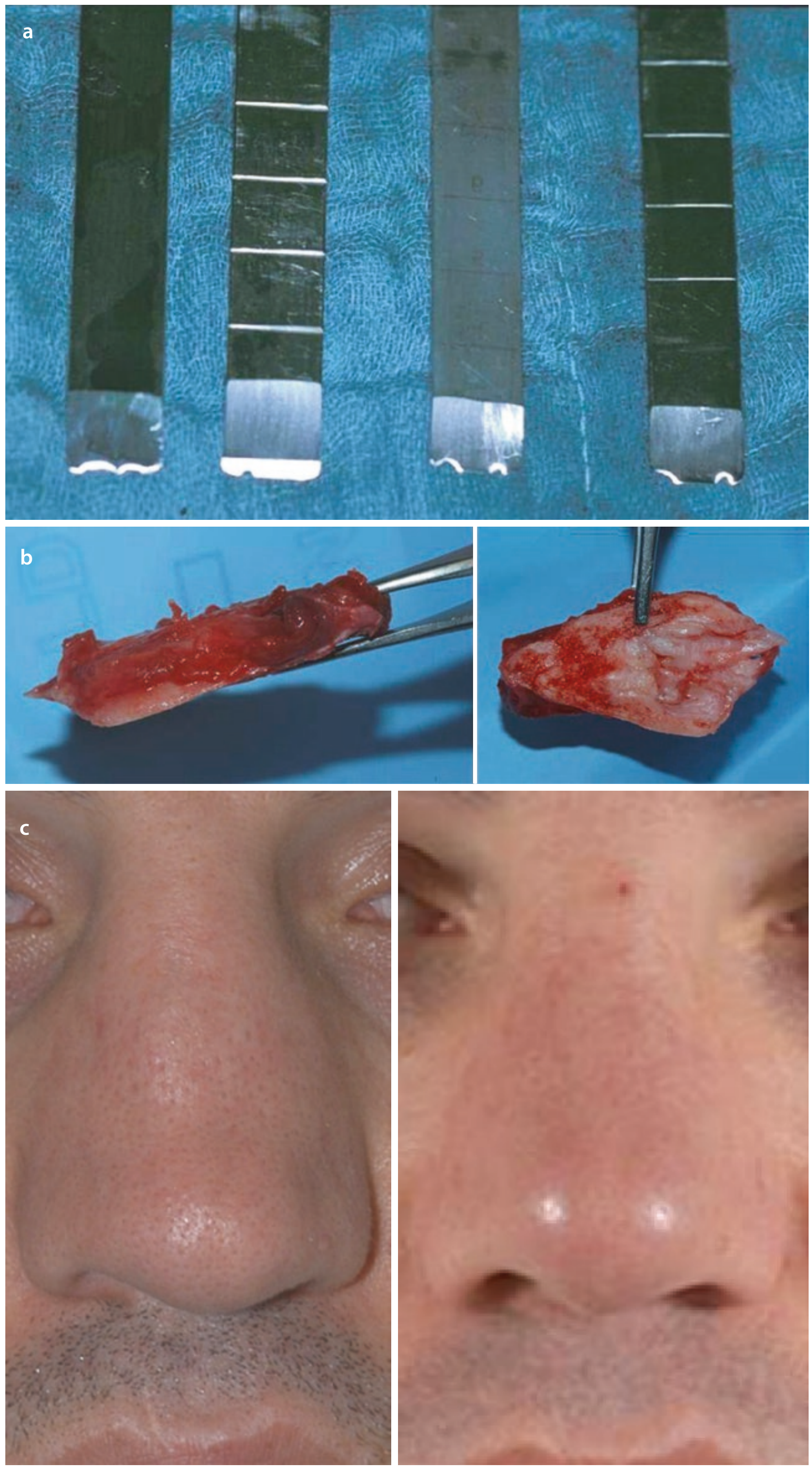
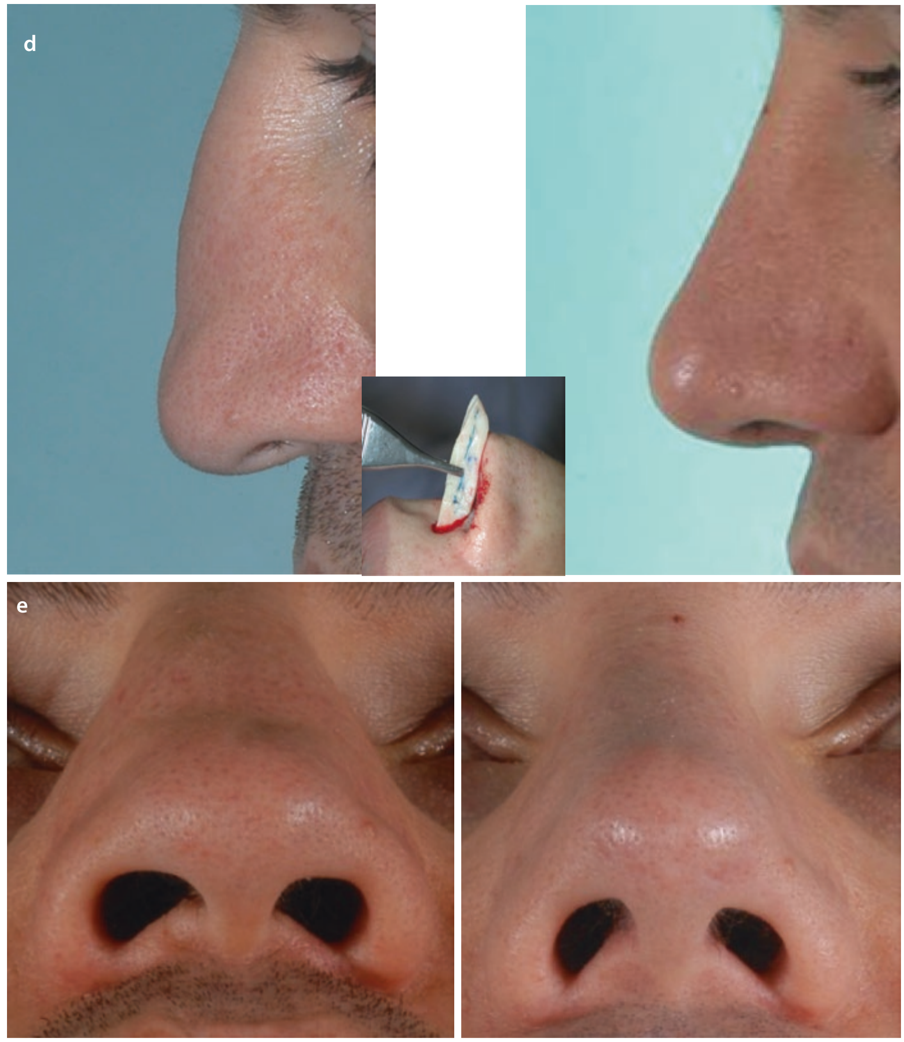


Fig. 10.2 (**a**–**e**) Wide nasal bridge. (**a**) Chisels destroyed by strong bony hump. (**b**) Strong bony hump. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig.10.2** (continued)



10.2.3 Case 3: Asymmetrical Wide Nasal Bridge

A 51-year-old patient presented after two rhinoplasties, which were followed by nasal trauma. His complaints centered on the deviated nose, an open roof, and a wide tip with asymmetrical nostrils. The facial skeleton was asymmetrical.

The pyramid was straightened and narrowed after parasagittal medial osteotomy and low-to-low lateral osteotomy combined with a transverse osteotomy performed transcutaneously. The dorsum was camouflaged by two layers of alloplastic fascia. Narrowing the tip by transdomal sutures was not effective because of the thick cartilage. Therefore, both domes were divided and then sutured together. A shield graft from the tragus was applied. The residual parts of the tragus were used to graft the supratip area (Fig. 10.3).

Fig. 10.3 (**a**–**e**) Correction of asymmetrical wide nasal bridge. (**a**) Removal of bony spiculae with a chisel. (**b**) Removal of bony spiculae wth a side-cutting burr. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig.10.3 (continued)

10.2.4 Case 4: Deviated Nasal Pyramid Combined with Inverted-V Deformity

A 20-year-old patient presented after previous rhinoplasty with a severely deviated septum resulting in a severely deviated nose. The anterior septal border subluxated to the right and blocked the right nostril. The reason for the poor result from the previous operation was the fact that the anterior border was deformed and totally unstable.

Therefore, we performed an extracorporeal septal reconstruction, resected the deformed anterior part, and recreated a neoseptum with a straight anterior border and a straight dorsum, strengthened and supported by two spreader grafts. This spreader grafts also helped to overcome the inverted-V deformity. After paramedian, low-to-low lateral, and transverse osteotomies, the nasal pyramid could be narrowed and straightened, but the prerequisite for a straight nose was the straight neoseptum, which we had replanted after radical mobilization of the nasal pyramid and fixed to the upper lateral cartilages and the nasal bones after drilling holes there. The neoseptum was also fixed through a drill hole to the anterior nasal spine. The spine was very wide but dislocated to the right; we partially resected it so that the residual spine stood in the midline. The tip was contoured by transdomal and spanning sutures, and the position was secured by a tip suspension suture with a posterior sling.

After 1 year postsurgery, excess of the vestibular skin that was not totally smoothed out could still be seen on the right side, leaving a little irregularity. This was created by the extreme subluxation of the septum. The patient did not want further revision because the result was perfect for her (◘ Fig. 10.4).

Fig. 10.4 (**a**–**d**) Correction of deviated nasal pyramid combined with inverted-V deformity. (**a**) Extracorporeal septal reconstruction. (**b**–**d**) Front view, profile view, base view pre-op/post-op

■ **Fig.10.4** (continued)

10.2.5 Case 5: Deviated Nasal Pyramid

A 28-year-old female was seen after three previous rhinoplasties. She complained about a deviation of the bony pyramid and asymmetry of the columella base as well as a subluxation of the anterior septum to the left, with a consecutive asymmetry of the external nasal valve. She could not breathe properly, and the Cottle test result was positive. After insertion of a glass spreader and opening of the inner valve, her breathing became normal.

From the outer aspect, there was also a malformation of the right lower lateral cartilage.

Using an open approach with an inverted-V transection, the anterior nasal spine was found to be slightly dislocated, but the damage was so small that there was no reason to fracture it and to bring it in the midline. To fix the anterior border of the septum properly in the midline, we applied a four-hole microplate, which was fixed with two microscrews; after trimming, we fixed the anterior border to it. Thus, the septum was in the midline. We put in a columellar strut and fixed the medial crura to it. The narrowed inner valve was widened by putting in spreader grafts on both sides. The deviated bony pyramid was straightened by paramedian, external low-to-low lateral, and transverse osteotomies. To overcome the severe concavity of the lower lateral crus on the right side, we used a fold-under flap technique. On the left side, there was only a minor concavity that could be corrected with horizontal mattress sutures. For stabilization, we placed a batten graft under the left lateral crus. To give the ala a better contour, we put in a rim graft and covered the whole dorsum with two layers of alloplastic fascia (◘ Fig. 10.5).

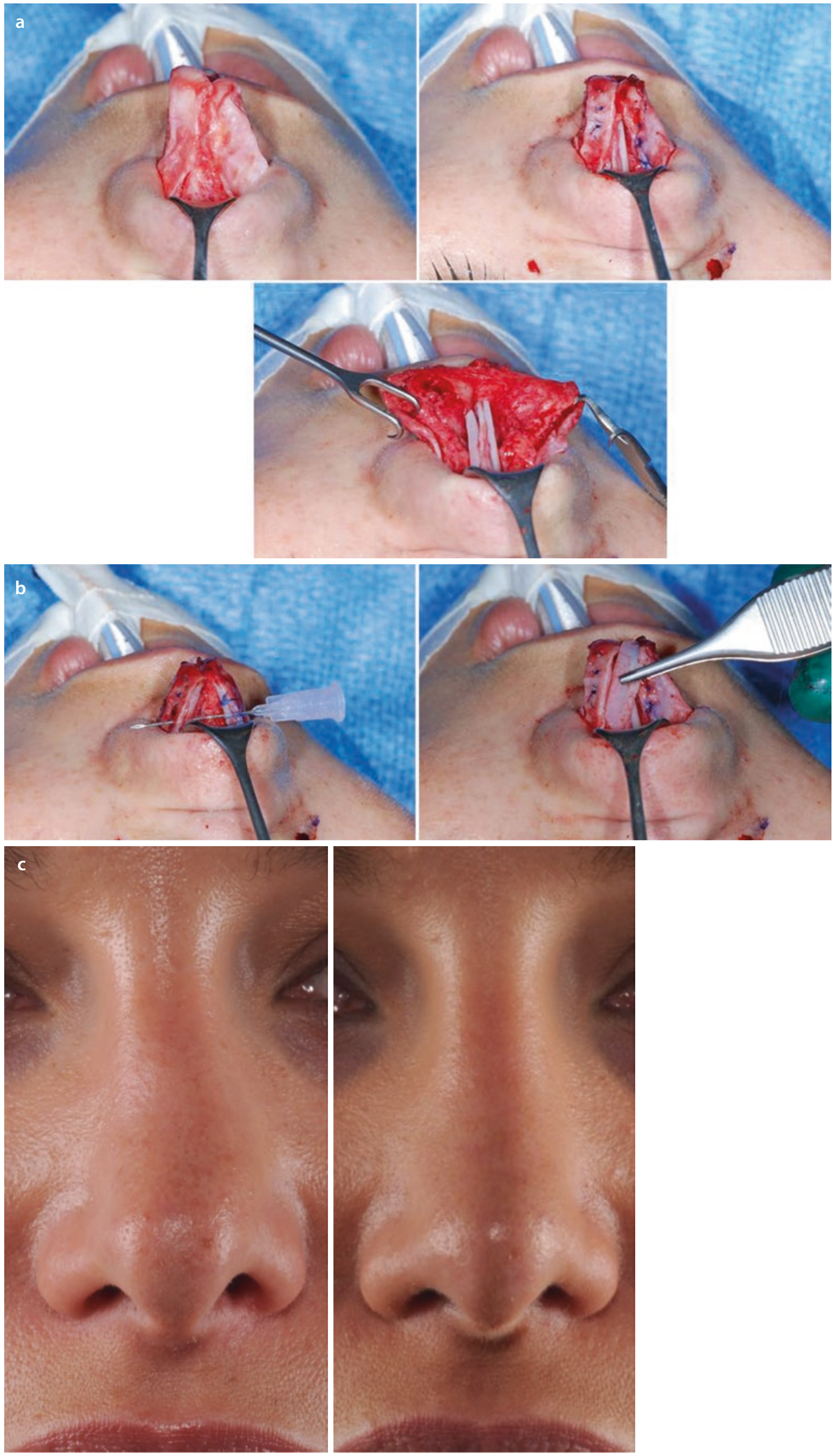
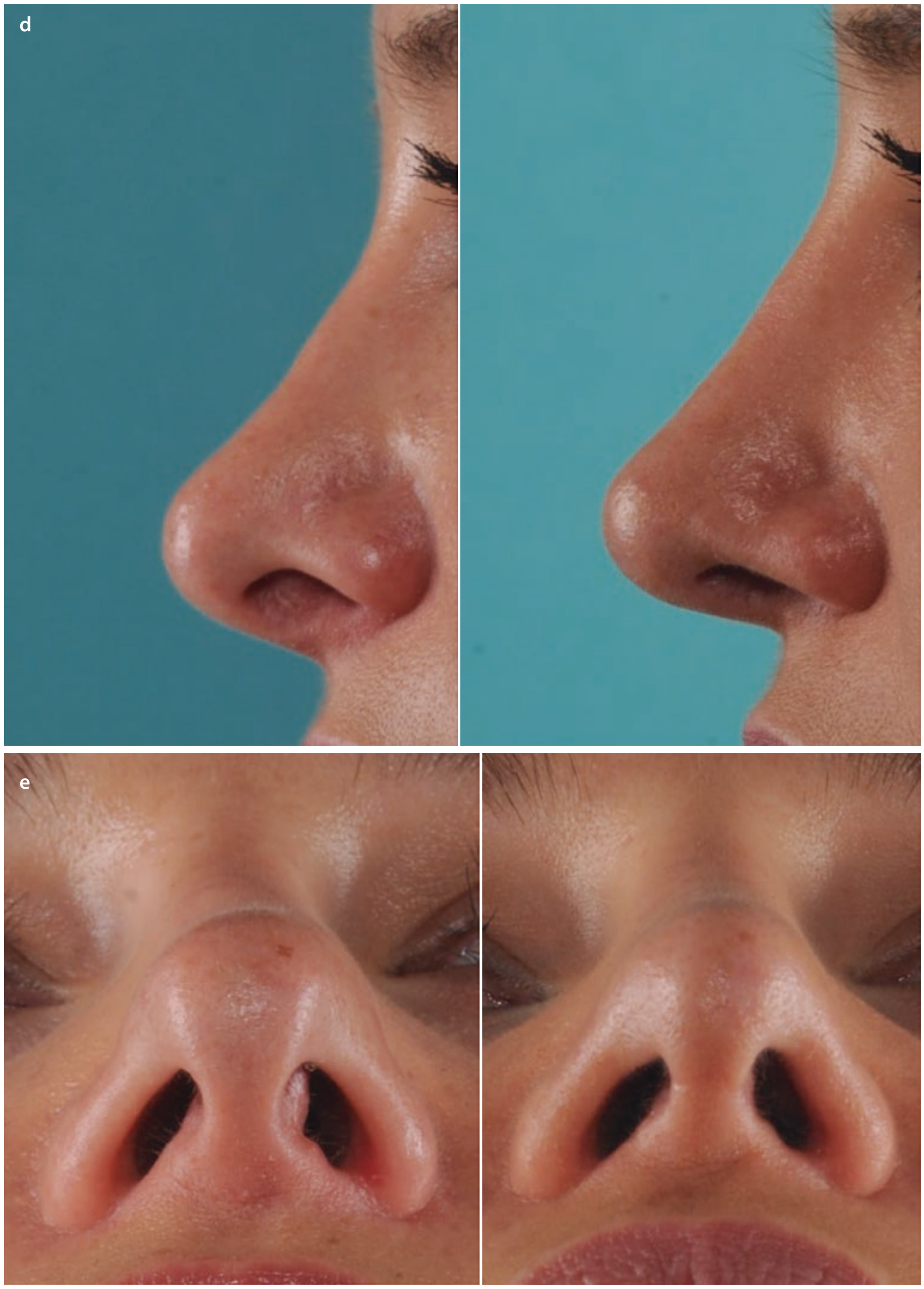


Fig. 10.5 (**a**–**e**) Correction of deviated nasal pyramid and concave LLCs. (**a**–**b**) Fold-under flap on the right side, horizontal mattress suture and batten graft on the left side, spreader grafts on both sides of the septum. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig.10.5** (continued)



10.2.6 Case 6: Wide Bony Pyramid

A 23-year-old male presented for revision surgery after a severe nasal trauma in childhood. The patient complained that he was unable to comfortably wear his eyeglasses as a result of his nasal bridge deformity. Examination revealed a very large nasal pyramid with an overprojected dorsum and a retracted columella. Endonasal inspection revealed a severe residual septal deformity.

Using the open rhinoplasty approach, the upper lateral cartilages (ULCs) were first divided from the dorsal septum. However, elevation of the septal flaps was challenging because of heavy scarring and partial reduplication of the residual septal bone and cartilage fragments. Lowering the dorsum with a chisel was avoided because the nasal bones were exceptionally brittle and easily disrupted. Therefore, we used a powered cylindrical drill to remove the bony hump and to successfully create a smooth bony contour. Parasagittal medial osteotomies were then created with a Lindemann burr, and the perpendicular plate was fractured posteriorly using a 5-mm chisel and firm (transverse) digital pressure applied along the desired fracture line. The residual parts of the septum were then removed and fixed to a PDS foil scaffold. The neoseptum was reimplanted after mobilizing and narrowing the nasal bones with transcutaneous low-to-low lateral and transverse osteotomies. The neoseptum was sutured to the ULCs and to the nasal bones and the anterior nasal spine (ANS) after the creation of osseous drill holes. The ANS was also modified with the Lindemann burr to create a sagittally oriented groove for better stabilization of the caudal neoseptum. For reconstruction of the retracted columella and correction of the overly acute nasolabial angle, a double-layered conchal sandwich graft was also fixed to the caudal neoseptum. The very wide and bulky tip was narrowed using transdomal sutures combined with spanning sutures and a tip suspension suture with a posterior sling. The reconstruction was concluded with placement of four layers of allogenic fascia lata (Tutoplast) as a full-length dorsal onlay graft (Fig. 10.6).

Fig. 10.6 (**a**–**e**) Correction of wide bony pyramid. (**a**) Extracorporeal septal reconstruction: explanted septum with PDS-foils for reconstruction of the internal nasal valve. (**b**) Sandwich graft from the concha used as septal extension graft. (**c**–**e**) Front view, profile view, base view pre-op/post-op

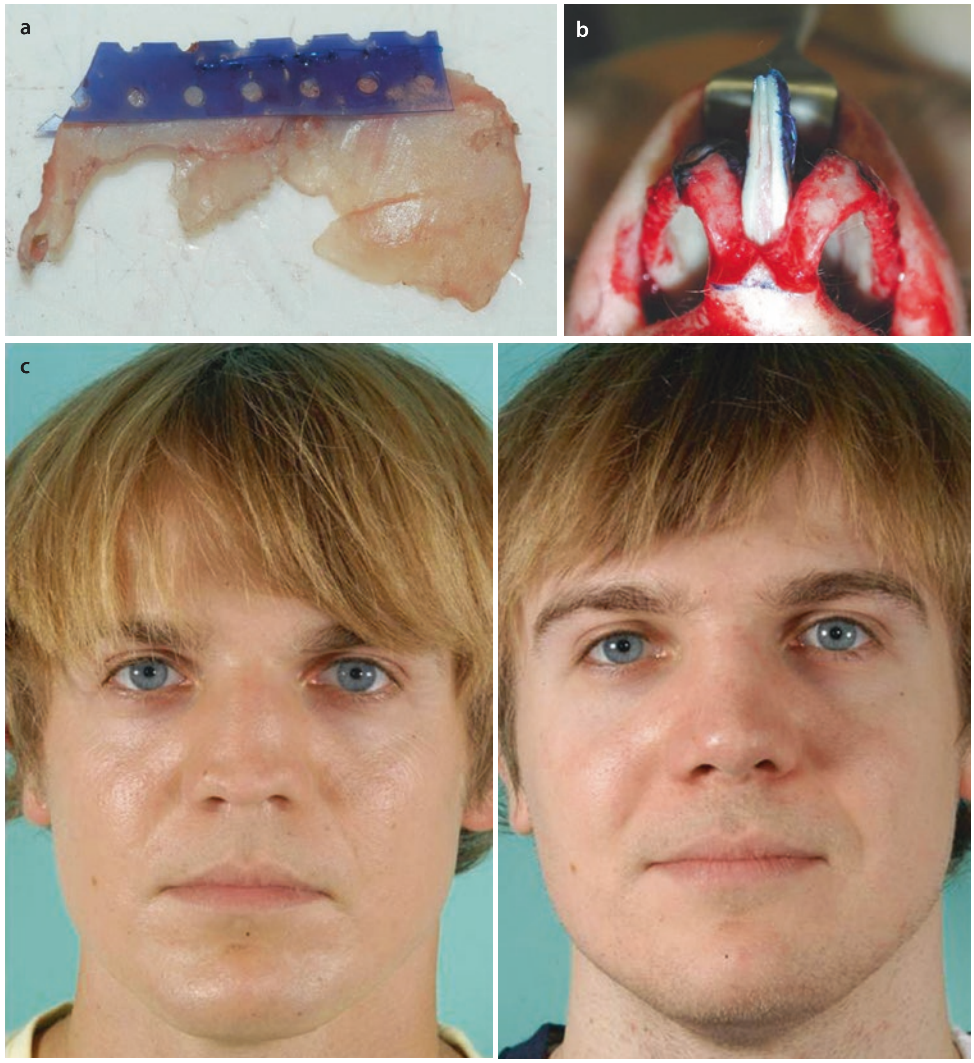
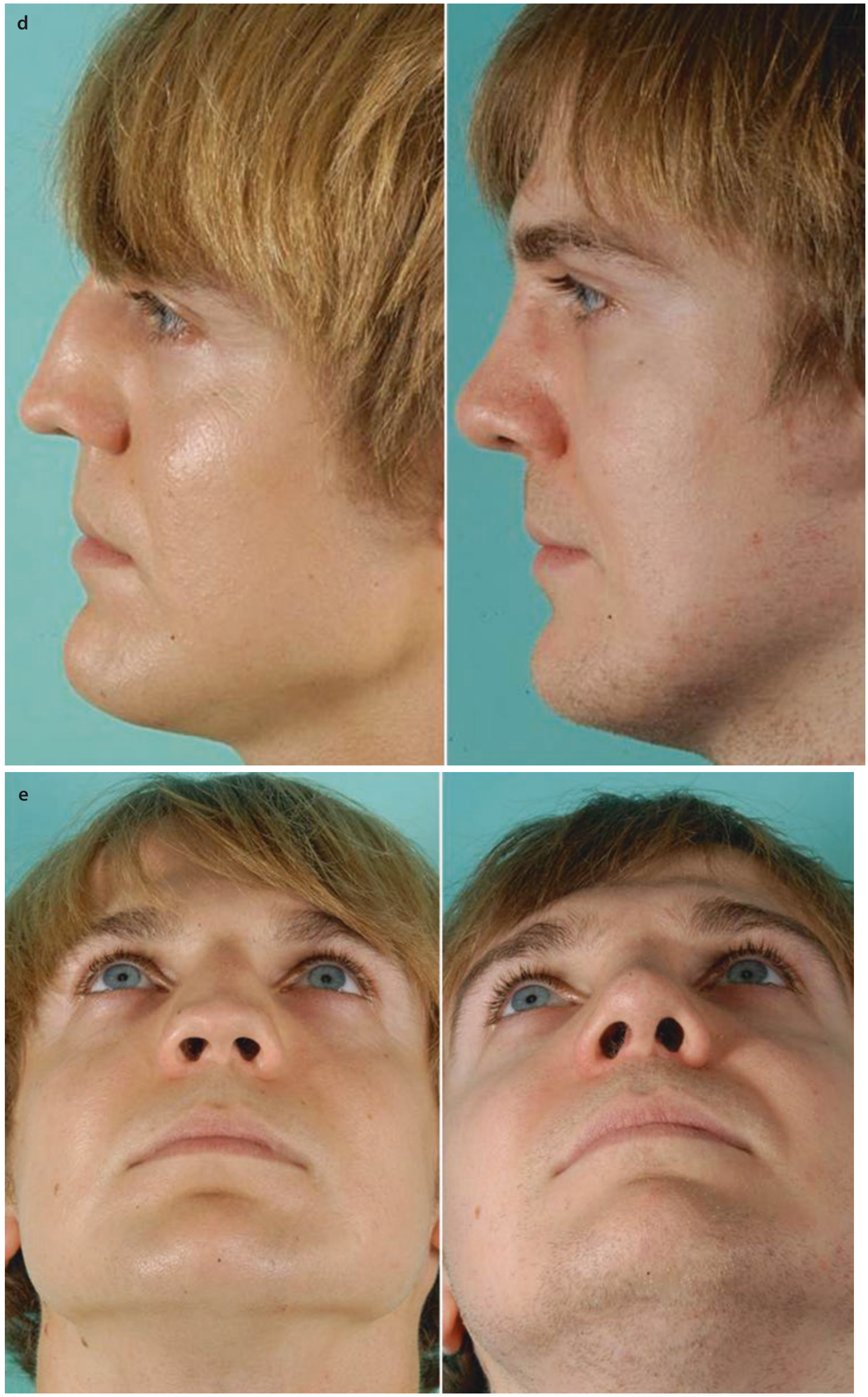


Fig. 10.6 (continued)



10.2.7 Case 7: Crooked Nose with Asymmetrical and Deviated Nasal Pyramid

A 38-year-old male presented after three previous nasal surgeries with an overly wide and deviated nasal pyramid and an inverted-V deformity. The profile revealed an overprojected tip, saddling of the cartilaginous dorsum, and a bony dorsal hump. The base view revealed a very unnatural pointed tip with asymmetrical nostrils.

Using the open rhinoplasty approach, dissection of the tip revealed a severe asymmetry of the lower lateral cartilage (LLC). Despite the use of an open approach with previous surgery, this deformity had been unrecognized and/or untreated. Next, the septum was dissected, and the residual components were removed. After thinning the bony septal components with a powered cylindrical drill bit, a straight neoseptum was created by splinting the cartilaginous segments using the thinned ethmoid plate as a splinting graft. The bony dorsum was then smoothed using the powered cylindrical drill bit to create a smooth and even contour dorsal profile. After parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies, the wide and deviated nasal pyramid was successfully straightened and narrowed. The neoseptum was then reimplanted in a more anterior position so that the medial crura could be fixed to the anterior border of the septum using the tongue-in-groove technique. The neoseptum itself was fixed to the ULCs and to the nasal bones and ANS after creating osseous drill holes with the Lindemann burr. For sculpting the tip and correcting the tip asymmetry, a unilateral lateral crural overlay technique (lateral sliding technique) was performed on the right side. Transdomal sutures and spanning sutures were then applied to narrow the tip cartilages. After redraping the skin flap, the middle vault saddle deformity was corrected by reimplanting pieces of allogenic fascia that were removed during dissection of the dorsum (▪ Fig. 10.7).

Fig. 10.7 (**a**–**e**) Correction of a crooked nose with asymmetrical and deviated nasal pyramid. (**a**) Severe asymetry of the LLCs. (**b**) Symetrical contour of the LLCs by suture techniques. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 10.7 (continued)

10.2.8 Case 8: Narrow Nasal Pyramid with Inverted-V Deformity

A 39-year-old female presented after previous rhinoplasty with an unsatisfactory functional and cosmetic outcome. An overly narrow dorsum with collapsed internal nasal valves resulted in bilateral nasal airway obstruction. A C-shaped dorsal curvature and an overresected dorsum with an inverted-V deformity also led to a cosmetic deformity of the nasal bridge. Additionally, an overrotated, deviated, and boxy nasal tip with retracted soft-tissue facets and an oblique columella was observed.

Using the open rhinoplasty approach, exploration confirmed the clinical findings: the dorsum was extremely narrow with collapse of both internal nasal valves, and both LLCs exhibited buckling at the transition of the medial and intermediate crura. After separating the ULCs from the dorsal septum, parasagittal medial osteotomies were created using a powered Lindemann fraise. The bony pyramid was then mobilized using percutaneous low-to-low lateral and transverse osteotomies. Rib cartilage was then harvested and 2.0-mm wide cartilage strips were fabricated for use as extended spreader grafts. Extended spreader grafts served to simultaneously straighten the dorsum, widen the internal valves, and eliminate the inverted-V deformity. The overprojected and overrotated tip was then deprojected and counterrotated using the medial crural overlay technique. This also permitted simultaneous correction of the buckled medial crura. The overresected lateral crura were then strengthened using lateral crural strut grafts fashioned from rib cartilage, and transdomal sutures were used to contour the nasal tip. Because of thin overlying skin, the tip framework was also covered with a shield graft fashioned from allogenic fascia lata. The columellar incision was then closed with 6-0 permanent sutures, whereas all other sutures were performed with resorbable suture material. The residual rib cartilage was diced to a very fine consistency and used as free diced cartilage (FDC) to augment and smooth the dorsum and soft-tissue triangles (◘ Fig. 10.8).

Fig. 10.8 (**a**–**c**) Correction of a narrow nasal pyramid with inverted-V deformity. Front view, profile view, base view pre-op/post-op

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Tip

Contents

Tip Refinement in Primary Rhinoplasty

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_11

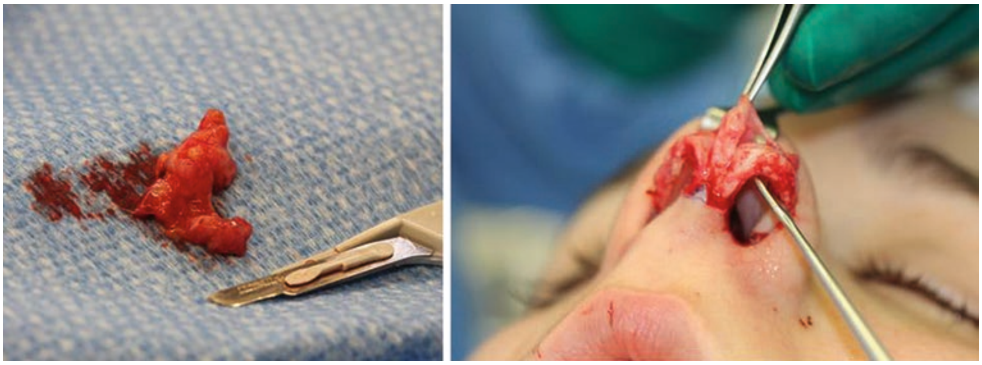
11.1 Surgical Principles

Alterations of nasal tip contour are perhaps the most challenging aspect of cosmetic rhinoplasty. And because tip contour must harmonize with the surrounding facial features in a natural but pleasing manner, some degree of surgical tip refinement is a goal of nearly every cosmetic rhinoplasty. However, in addition to constituting a major determinant of facial beauty, the tip is also an integral component of the human nasal airway. Hence, surgical alterations to the nasal tip framework must be circumspect in order to prevent impairment of nasal airway function. Naturally weak tip cartilages are at increased risk of collapse with surgical manipulation, and cartilage size may not always correspond to cartilage strength.

In addition to surgical technique, various architectural and biomechanical properties govern the outcome of tip rhinoplasty. Rollin K. Daniel differentiates between the three intrinsic factors of volume, definition, and width and the three extrinsic factors of position, rotation, and projection—all critical determinants of tip aesthetics. Yet, from an analytical and utilitarian standpoint, the characteristics of contour, rotation, and projection are perhaps the most useful.

Although surgical changes in contour, rotation, and projection of the nasal tip framework are prerequisites for a satisfactory cosmetic transformation, architectural changes can be profoundly altered by the characteristics of the overlying skin/soft-tissue envelope. Noses with ultrathick tip skin have greater bulk, weight, and volume (◘ Fig. 11.1), which can obscure skeletal definition, promote unwanted tip ptosis, and resist tip narrowing. On the other hand, mild to moderate deformities of the underlying tip framework can be diminished or even totally concealed by thick nasal skin. Conversely, ultrathin nasal skin offers better surface definition, less bulk, and greater ease of tip narrowing, but thin skin provides little or no camouflage of underlying skeletal imperfections, and shrink-wrap contracture is typically more severe in thin-skinned noses. And although surgical changes to the skeletal framework are still paramount, the prudent surgeon will recognize the limitations of unfavorable skin types and counsel patients accordingly.

In addition to the impact of the overlying skin/soft-tissue envelope on tip aesthetics, changes in the surrounding nasal anatomy may also have an impact on nasal tip aesthetics. Since the nose represents a complex three-dimensional structure, surgical changes in one area may have a secondary anatomic and/or visual impact on another. For example, reducing dorsal height gives the illusion of nasal lengthening, and a slight increase in tip rotation may be needed to offset this phenomenon. Conversely, augmentation of a low radix may create the illusion of a counterrotated tip owing to cephalic repositioning of the nasal starting point. Since the final cosmetic outcome is determined by the impact of direct skeletal alterations coupled with influences of both the skin envelope and illusory changes, the combined impact of these factors must be carefully considered during preoperative planning and analysis.



◘ **Fig. 11.1** Debulking of the tip

11.1.1 Nasal Tip Contour

Nasal tip contour depends mainly on the three intrinsic factors of volume, definition, and width. The surgical options available to change tip contour include excisional techniques, suture techniques, or combined techniques. Because excisional techniques are irreversible and destructive, they have become increasingly less popular. Alternatively, suture techniques that are potentially reversible and conserve intrinsic skeletal support are quickly becoming the workhorse of contemporary rhinoplasty.

The goal of tip refinement surgery is a slender and attractive lobule while avoiding an overly pointed, "uni-tip" deformity. In most noses, this requires two distinct cartilaginous domes separated anteriorly by a small amount of soft tissue to create a gentle rounding of the most projecting tip segment as seen from the basal view. Domal width can be reduced with "intradomal" or "dome-unit" mattress sutures to narrow domal angulation. However, care must be taken to avoid overtightening of the suture, which can lead to collapse of the lateral crus and lobular pinching. Similarly, "transdomal" mattress sutures can be used to bring individual domes into closer proximity and to improve domal symmetry, but care must be taken to place the suture posteriorly so as to allow a slight divergence of the domes anteriorly (◘ Fig. 11.2), thereby preventing unsightly pinching of the infratip lobule. Divergence of the domal folds can also be established using a shield graft to maintain a slight flaring of the intermediate crura (◘ Fig. 11.3). In many instances, the use of transdomal sutures may obviate the need for intradomal tip sutures, since domal narrowing often occurs as the domes are sutured in closer proximity. In some cases, excessive subcutaneous soft tissue can obscure tip definition to the point that surgical debulking of the subcutaneous soft tissues is necessary for optimal surface contour enhancement of the tip (◘ Fig. 11.1). Although volume reduction can be accomplished with trimming of the cephalic margin, cephalic resection should be performed judiciously because overresection of the lateral crura is one of the most common causes of postsurgical tip deformity. The cephalic resection should be performed medial to the junction of the intermediate and lateral crus to prevent collapse and/or retraction of the lateral segment. Conservative resection is advised in all cases, but particularly with weak tip cartilages. Following resection, weak lateral crura should be stabilized using ancillary techniques such as onlay batten grafts, lateral crural strut grafts, or fold-under flaps. The last one is our preferred technique (◘ Fig. 11.4). However, exceptionally thick and stiff cartilage necessitates a combination of excisional and suture techniques (◘ Fig. 11.5), since suture techniques alone are seldom adequate.

Tip definition is defined by Rollin K. Daniel as the visibility or distinctive setting apart from the dome defining point from the rest of the ala. Tip definition can be enhanced using tip suture techniques to sculpt the tip cartilages or by placing a shield graft to increase tip projection (◘ Fig. 11.3). Good tip definition is always a goal of tip rhinoplasty. However, aesthetic preferences vary, and we strive to create a more or less straight alar margin between the tip lobule and the lateral ala as seen on basal view (◘ Fig. 11.6). Alar rim grafts, placed into skin pockets dissected along the nostril rims via the marginal incision (◘ Fig. 11.7), are used liberally to prevent notching of the nostril rim (the so-called seagull deformity) and/or retraction of the alar rim. When the need for alar rim grafts becomes evident after skin closure, we insert the graft via an external skin incision placed within the alar crease (◘ Fig. 11.6). Graft length is variable, but when necessary, the graft may extend all the way into the soft-tissue triangle to prevent deformation of the entire alar rim (◘ Fig. 11.7).

To correct excessive tip volume and bulbosity, conservative resection of the lateral crus at the cephalic margin is a standard part of our refinement technique. However, we perform the traditional cephalic resection only in thick crural cartilages. In thin or medium-thickness cartilage, we retain the cephalic margin as a fold-under flap to flatten and strengthen the lateral crus (◘ Fig. 11.4). This is done by first dissecting the vestibular skin off the undersurface of the lateral crus and then incising the cephalic segment from above. The excised segment is then folded under as an underlayment graft such that the concave surfaces are placed face-to-face. The fold-under graft is then sutured with 6-0 PDS sutures. Alternatively, to correct concavity of the lateral crus, we suture the cephalic margin as a fold-over flap to bend the lateral crus in the opposite direction (◘ Fig. 11.8). In both cases, the retained cephalic margin serves to correct contour deformities while simultaneously strengthening the lateral crus against collapse. In this manner, we can later apply spanning sutures to control flaring without fear of deforming the lateral crura.

Another method for strengthening the lateral crus is horizontal mattress sutures (◘ Fig. 11.9). Using horizontal mattress sutures to flatten the lateral crus simultaneously serves to increase crural rigidity to allow placement of spanning sutures with less risk of crural deformity (◘ Fig. 11.10).

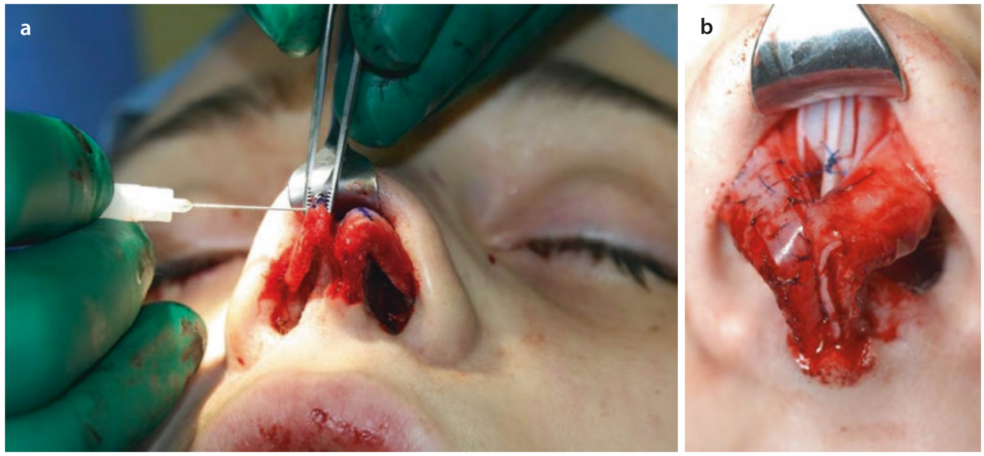


Fig. 11.2 (**a**, **b**) Suture technique, preparing the transdomal suture

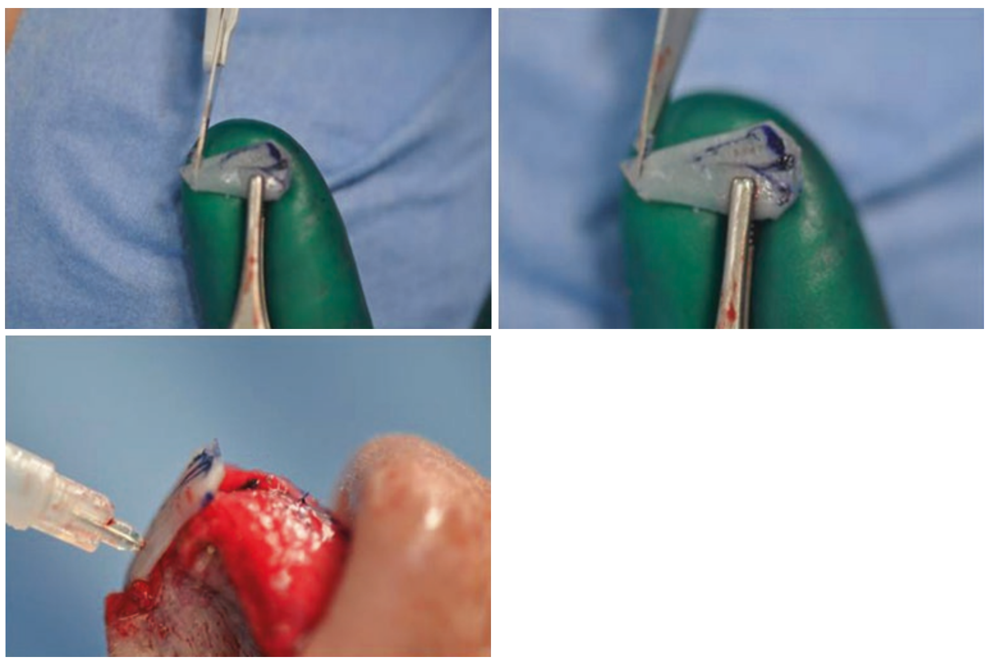


Fig. 11.3 Shield graft

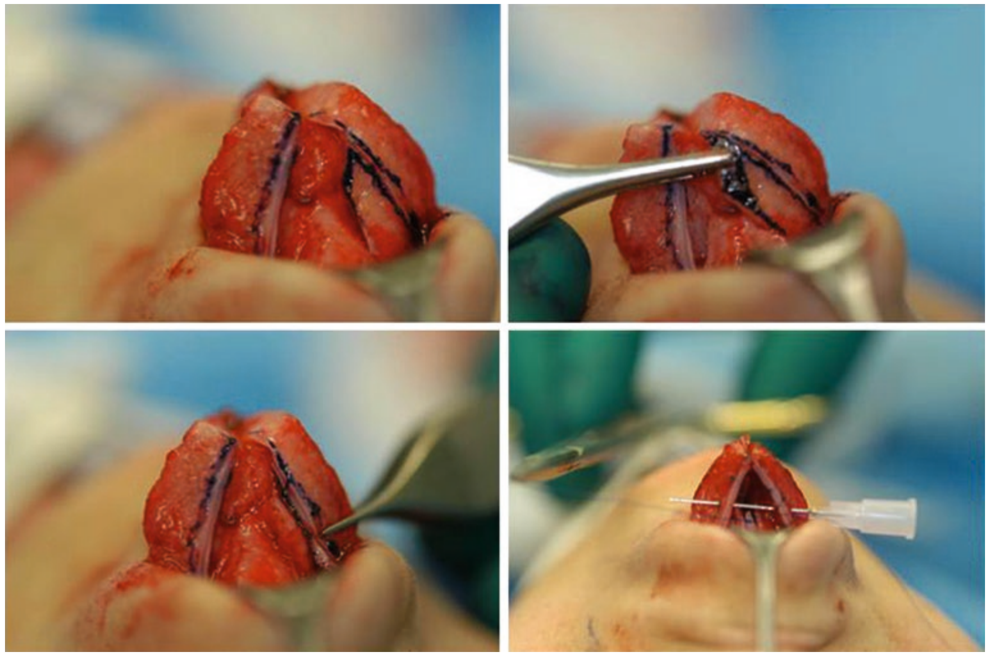


Fig. 11.4 Combined suture/cutting technique fold-under flap technique (lateral crural underlay)

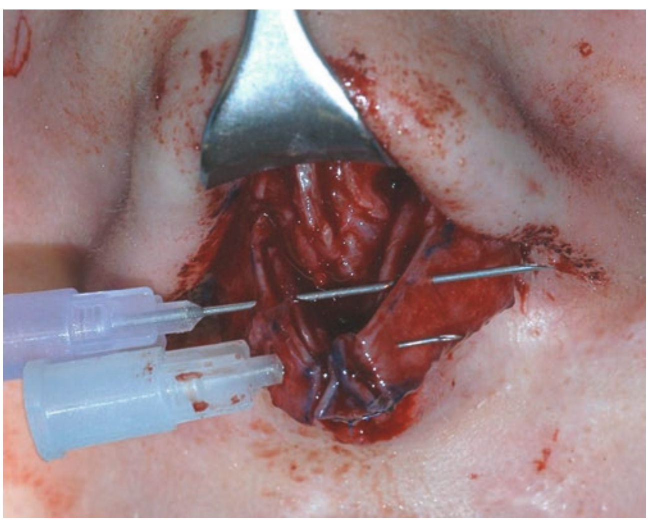


Fig. 11.5 Preparing ala spannning sutures

Fig. 11.6 (**a**, **b**) Rim grafts

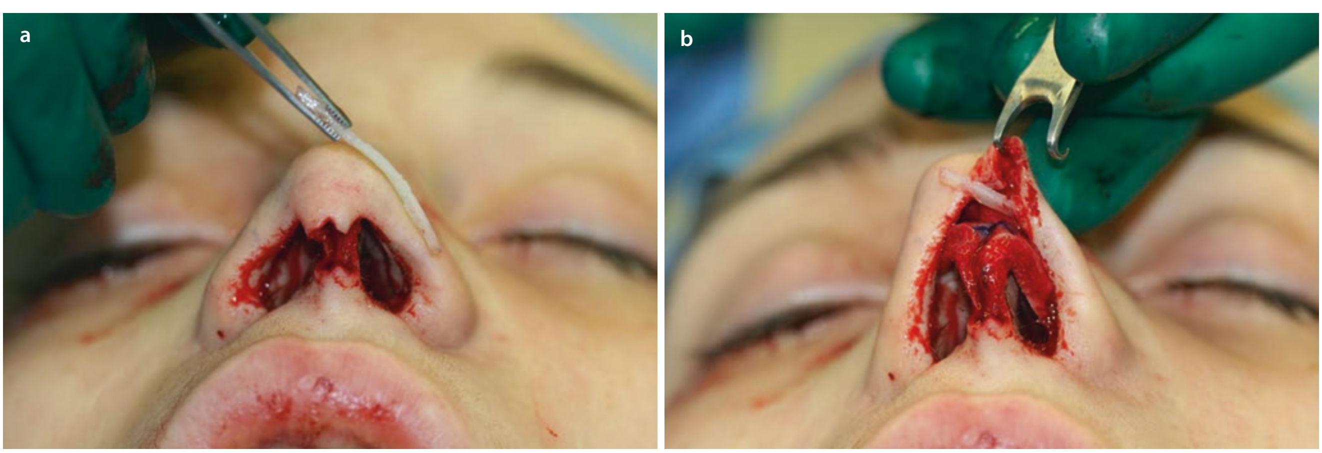


Fig. 11.7 (**a**, **b**) Rim grafts

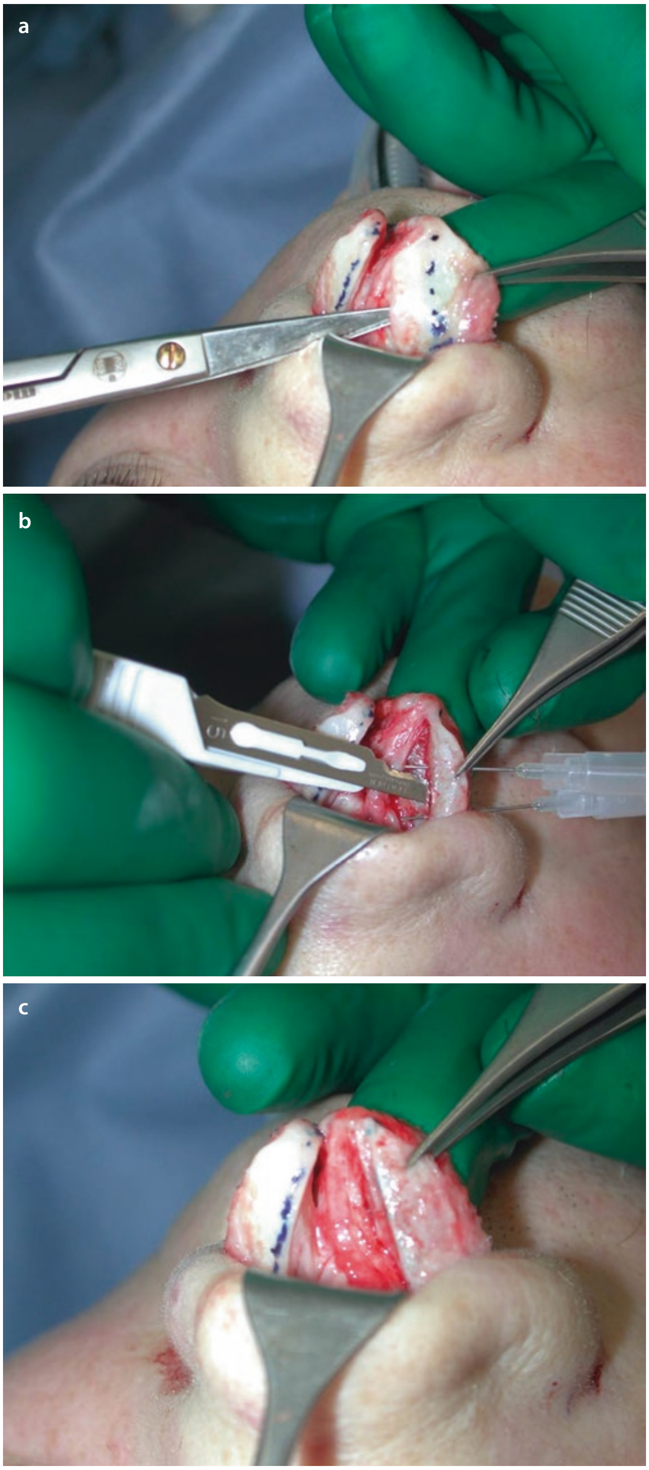
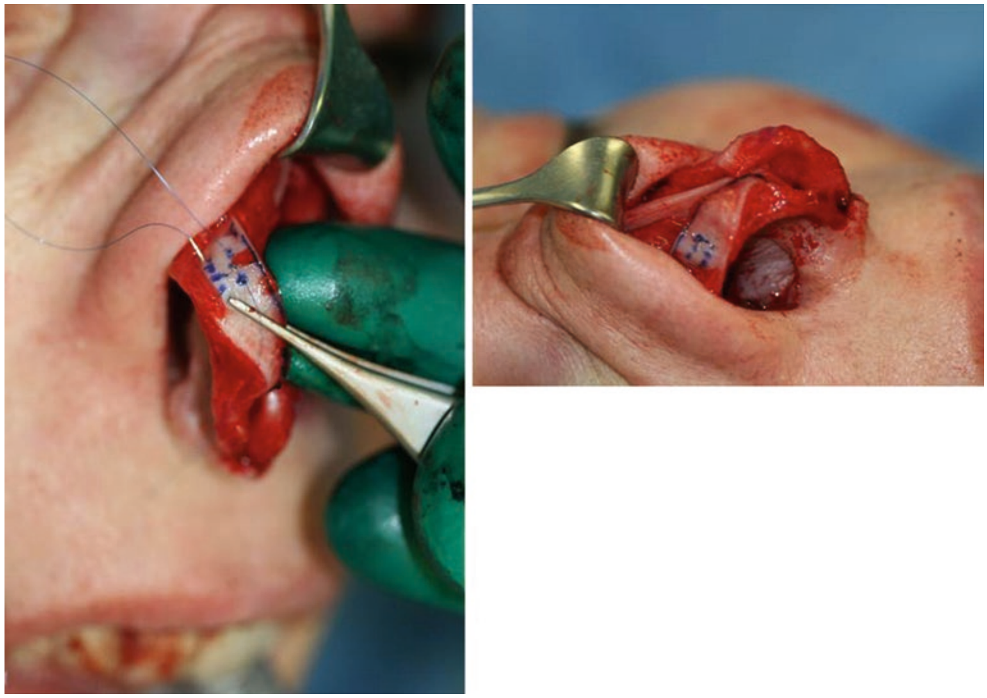
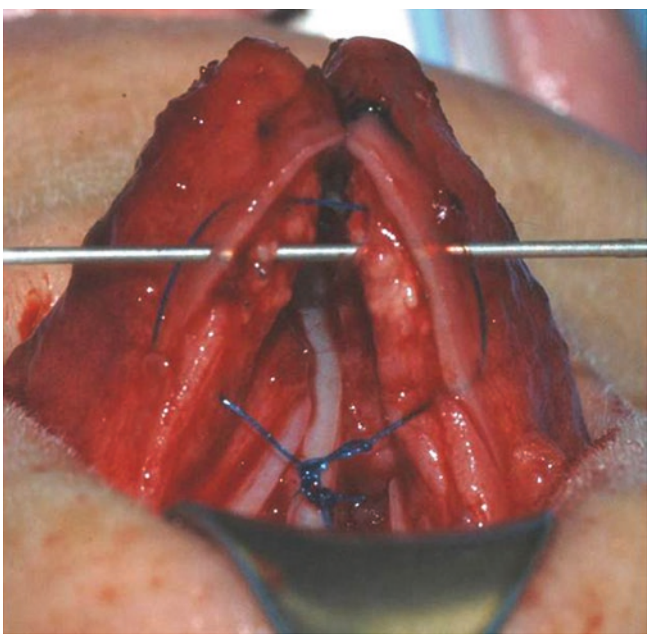


Fig. 11.8 (**a**–**c**) Lateral crural overlay technique



■ **Fig. 11.9** Horizontal mattress suture



■ **Fig. 11.10** Spanning sutures combined with tip suspension suture and posterior sling

11.1.2 Projection of the Tip

Tip projection is an important parameter defined as the distance the nose protrudes from the face. Abnormalities in tip projection include both overprojection and underprojection. Typically in the overprojected tip, the patient complains about a big nose. However, when analyzing a large nose, it is important to differentiate between an overprojected dorsum (nasal hump), an overprojected tip (Pinocchio nose), or both an overprojected dorsum and an overprojected tip (rhinomegaly). In cases of rhinomegaly where the overprojected tip is not recognized and treated appropriately, even after a successful dorsal realignment the nose will appear to “jump off the face” because of the persistent and now even more obvious overprojected nasal tip. Although an isolated overprojected tip is easily recognized, a normally projected tip with an adjacent saddle-nose collapse may also give the (false) impression of an overprojected tip. Therefore, care must also be taken to differentiate between these two similar looking but distinctly different contour deformities.

Early techniques for treatment of the overprojected tip relied upon segmental excision of the nasal domes without suture reapproximation of the alar cartilages to restore skeletal continuity. The result was often tip ptosis and polly-beak formation and/or a pinched tip. However, safer and more effective alternatives, such as the sliding techniques, are now available. A variety of sliding techniques have been described, including alar dome reduction (Hamra), alar cartilage overlap (Adamson), lateral crural overlap (Kridel/Foda), or alar cartilage setback (Foda). All of these techniques rely upon altering the relative length of the medial and lateral crura, and sliding techniques can be used both medially (Fig. 11.11) and laterally (Fig. 11.12). Medial sliding techniques decrease tip projection while simultaneously decreasing tip rotation (tip counterrotation). In contrast, lateral sliding techniques decrease tip projection while simultaneously increasing tip rotation. By performing both medial and lateral sliding techniques simultaneously, opposing changes in tip rotation can be offset to prevent changes in tip rotation if desired. Alternatively, the balance can also be manipulated to achieve subtle changes in tip rotation and/or tip alignment when necessary. The overall impact of adjusting medial or lateral crural length can be easily understood using the “tripod” model of tip dynamics as originally described by Anderson.

Medial sliding techniques are also indicated for correcting deformities involving the junction of the medial and intermediate crura. Often a medial sliding technique is indicated for correction of asymmetrical buckling at the junction of the medial and intermediate crus, but counterrotation is contraindicated. In this scenario, the buckled cartilage is divided, and the cartilages are overlapped to eliminate the buckling. However, to eliminate counterrotation, the upper segment is rotated cephalically, creating a partial overlap and a protruding upper segment that must be excised (Fig. 11.13).

Another means of achieving tip deprojection is the push-down technique (Fig. 11.14). The push-down technique involves repositioning the medial crura inferiorly in closer proximity to the premaxilla. This works best in noses with a protruding caudal septum, since the medial crura can be sutured to the caudal septum for fixation. Depending upon the natural length of the medial crura, the push-down technique can dramatically reduce tip projection without transecting the tip cartilages. As adjunct to tip deprojection, excess skin can be excised from the columella (Fig. 11.15). Typically, this is performed at the transcolumellar incision in order to avoid an additional scar.

A variety of techniques are also available for increasing tip projection. In the wide tip, a small amount of increased tip projection is achieved simply with intradomal suture placement (Fig. 11.16). Columellar strut placement will increase tip projection per se only minimally, but it does serve to stabilize weak and underprojected tip cartilages. And for many techniques that increase tip projection, a columellar strut is essential. One such technique is the lateral crural steal procedure. This technique recruits cartilage from the lateral crus to elongate the medial crus and thus to increase tip projection. This is accomplished by folding the lateral crus at a point lateral to the existing nasal dome in order to create a new, more projected nasal dome (Fig. 11.17). However, a columellar strut or equivalent graft is needed to strengthen the medial crura and support the newly projected domes.

Other means of increasing tip projection are augmentation grafts such as cap grafts (Fig. 11.18), onlay grafts (Fig. 11.19), or even a nonintegrated shield graft (Fig. 11.3). However, these grafts are all associated with the potential risk of graft visibility from gradual thinning and/or contracture of the overlying skin. Moreover, unsightly graft prominence can develop many years following graft placement. Consequently, in noses with thin or intermediate skin thickness that are at risk for excessive graft visibility, we use a soft-tissue overlay graft such as allogenic fascia lata or perichondrium to cover the cartilage framework and prevent excessive graft prominence (Fig. 11.19). Finally, in cases where tip projection is exceedingly poor, such as some ethnic noses, total reconstruction of the nasal tip framework may be needed to achieve adequate tip projection (Fig. 11.20).

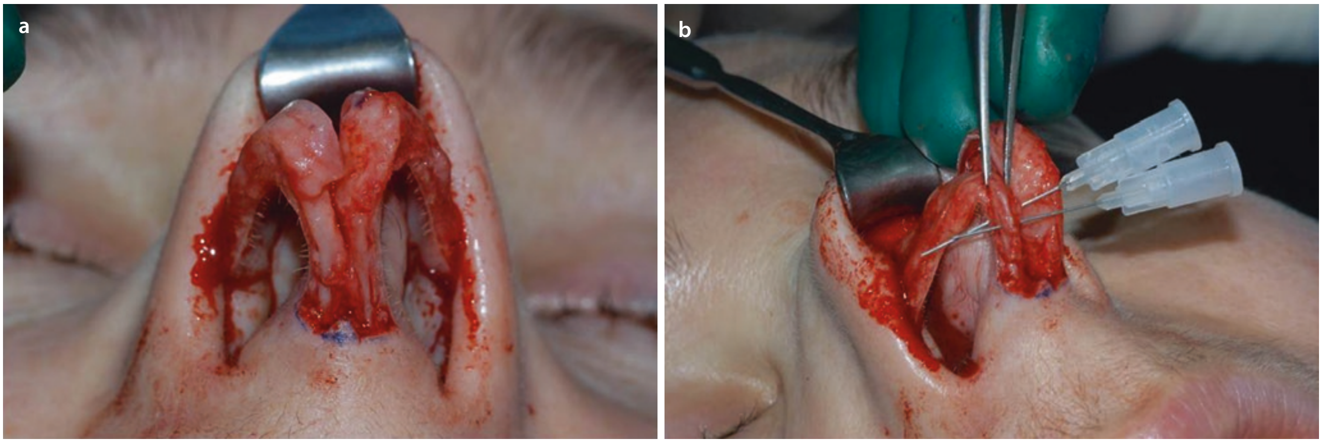


Fig. 11.11 (**a**, **b**) Medial sliding technique

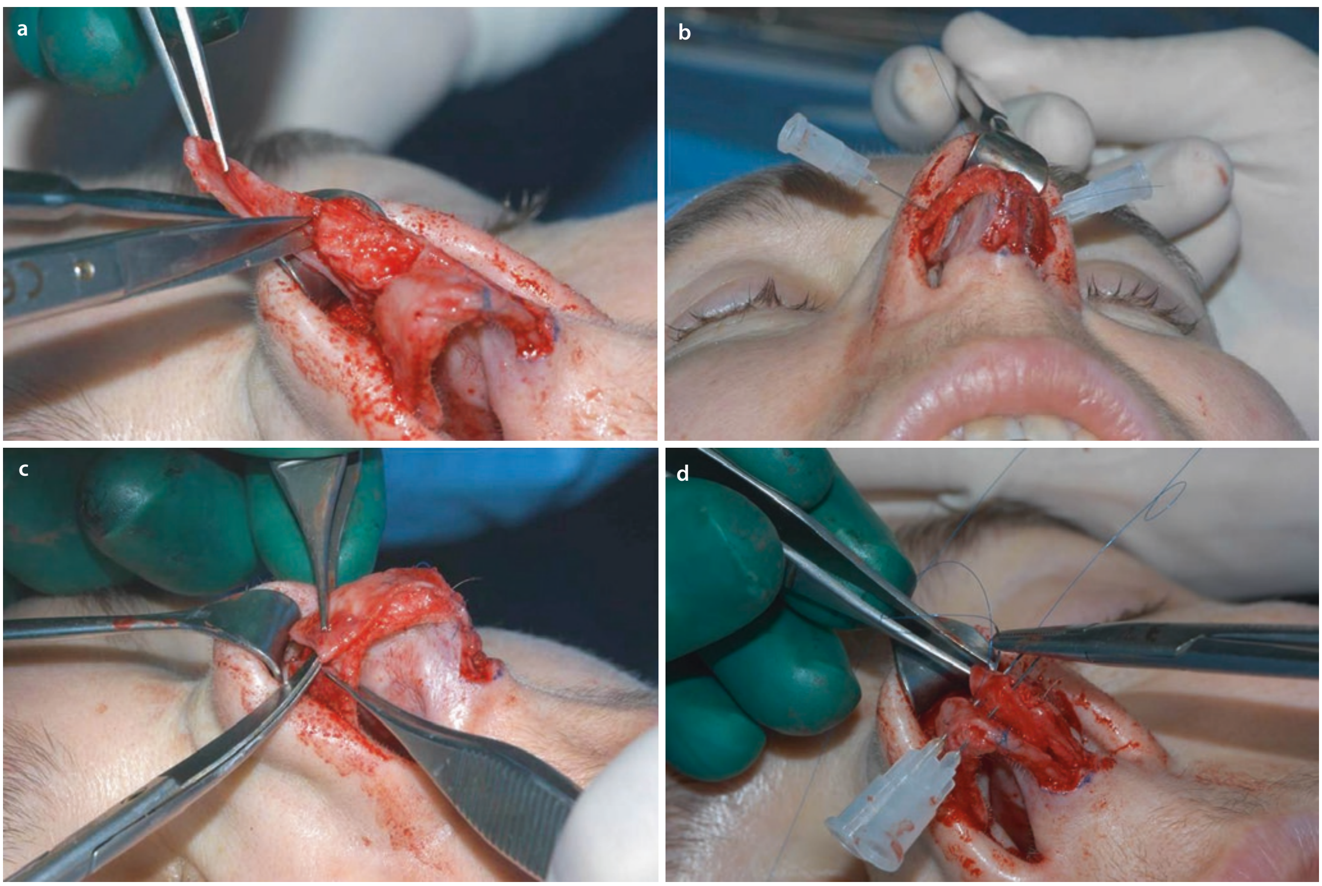
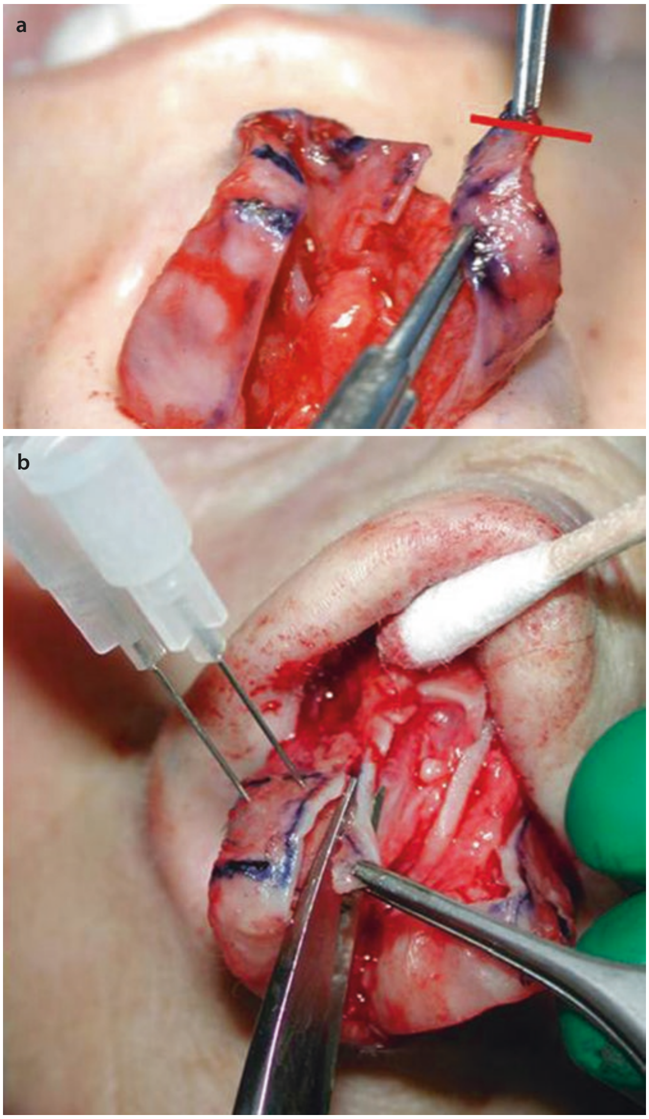
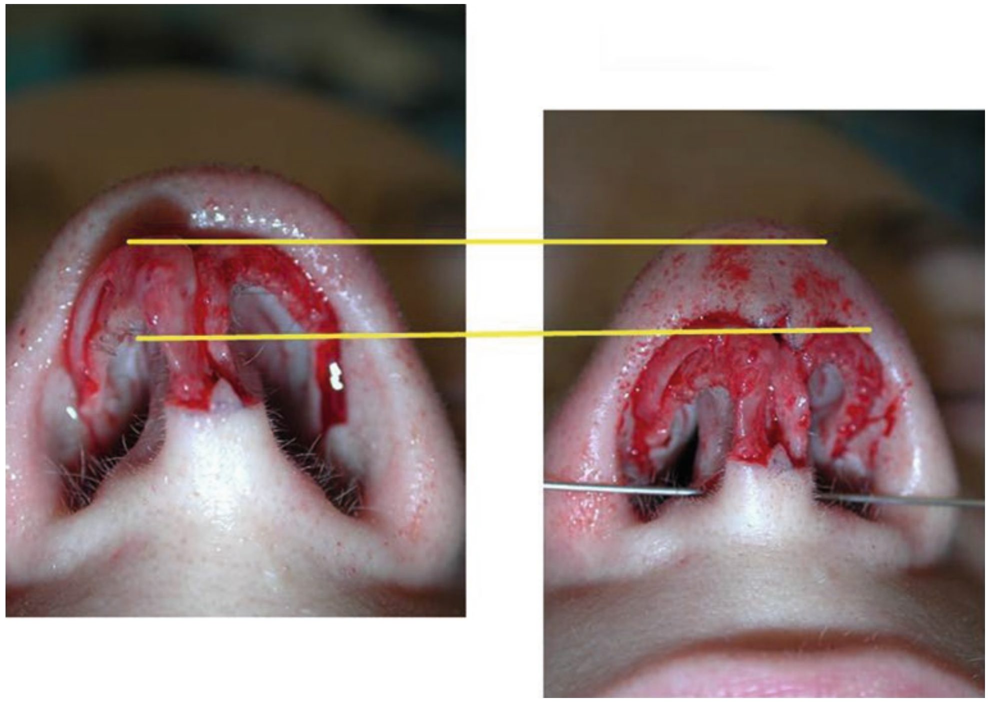


Fig. 11.12 (**a**–**d**) Lateral sliding technique



■ **Fig. 11.13** (**a**, **b**) Medial sliding with cranial rotation

■ **Fig. 11.14** Push down



■ **Fig. 11.15** Shortening of the columella

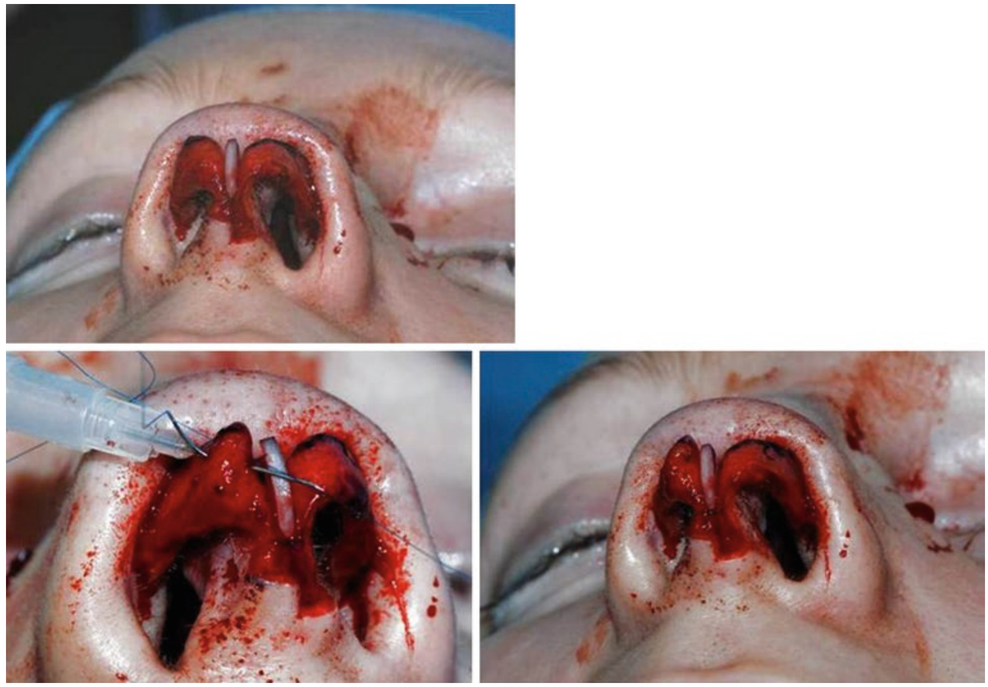


Fig. 11.16 Intradomal sutures (identical with dome defining suture (RK Daniel))

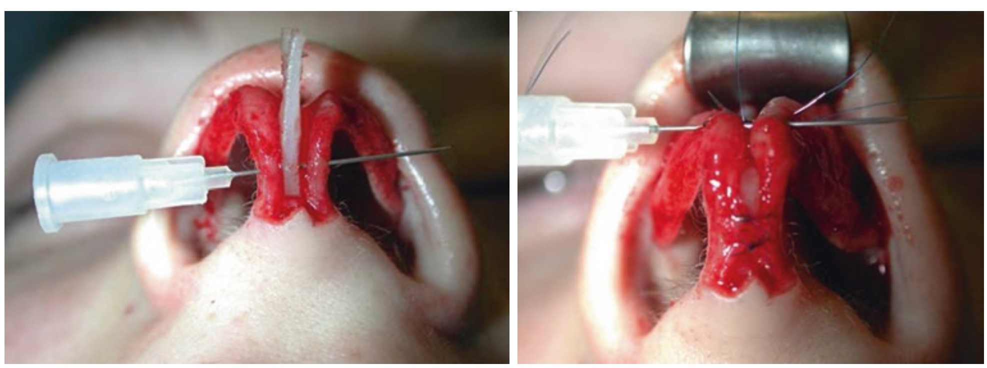
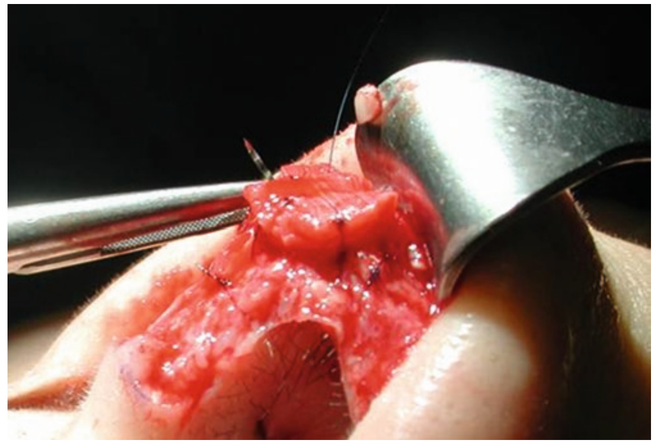


Fig. 11.17 Lateral crural steal technique

■ **Fig. 11.18** Cap graft from cartilage



■ **Fig. 11.19** Cap graft from fascia

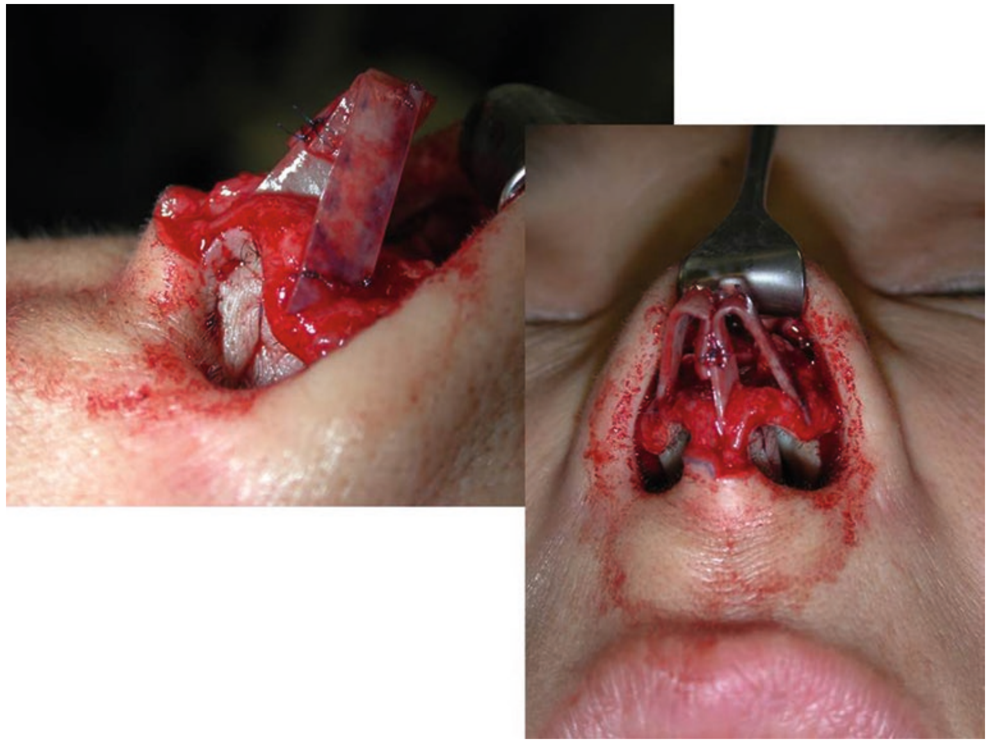


Fig. 11.20 Reconstruction of a new lower framework from strips of septal cartilage, fixed to a columellar strut from the septum

11.1.3 Rotation of the Tip

The extent of tip rotation governs the absolute length of the nose. According to Jack Gunter, nasal length is defined as the distance separating the nasal starting point from the tip defining point. Positioning of the nasal starting point can be altered by either raising or lowering radix height. Increasing radix height by augmenting the nasion will result in cephalic repositioning of the nasal starting point, whereas lowering the nasion will deproject the radix and shift the nasal starting point caudally. Although repositioning the nasal starting point is cosmetically significant, these changes are primarily visual, since the absolute distance from the nasal tip to the brow ridge does not change. However, unlike changes in radix height, which fail to alter absolute nasal length, changes in tip rotation physically alter absolute nasal length. For instance, when tip rotation is increased, the lobule is repositioned cephalically and absolute nasal length is decreased. Conversely, when the nasal tip is counterrotated (i.e., reduced tip rotation), the lobule moves away from the nasal starting point, and absolute nasal length is increased. For this reason, changes in tip rotation can be used to correct an overly long or short nose. The overly short and upturned "piggy" nose is highly objectionable because it results in excessive nostril show, whereas the overly long nose is often characterized by a droopy and aged appearance. Because tip rotation is largely governed by tip support, a droopy nasal tip may also be associated with an acute nasolabial angle, which is often an indicator of inadequate tip support.

One of the most difficult challenges in rhinoplasty is nasal lengthening. Even in primary rhinoplasty, it is usually far more difficult to lengthen the nose than to shorten it, since the soft-tissue envelope and scar contracture often resist substantial nasal elongation. Previously we used the closed rhinoplasty approach in conjunction with a complete transfixion incision to lengthen the nose. However, this approach typically cut all tip support mechanisms, resulting not only in counterrotation of the tip but also in tip deprojection and ultimately in tip ptosis. While this approach can be used for modest nasal lengthening, the procedure is imprecise and unpredictable. Moreover, using finger pressure applied to the nasolabial angle to predict the drooping of the tip and the extent of nasal lengthening is equally unreliable and will only provide a crude estimate of counterrotation. Finally, weakening of septal support may also lead to some degree of tip counterrotation. However, trimming the anterior septum is both destructive and imprecise and is ill-advised. On the other hand, using the medial crural sliding overlay technique will produce noticeable counterrotation, but at the expense of tip deprojection. Consequently, this approach for nasal lengthening should be reserved for short, overprojected noses (◘ Fig. 11.21).

At present we prefer the external rhinoplasty approach for nasal lengthening, and cartilage augmentation grafts are our preferred method for creating precise increases in nasal length. For modest increases in nasal length, a shield graft, or several layers of shield graft, can be used to counterrotate the tip and create modest increases in nasal length (◘ Fig. 11.22). However, for sizable increases in nasal length, the most effective technique in our hands is to lengthen the entire cartilaginous framework. One approach for aggressive lengthening is to place an ultrawide columellar strut graft in which the upper half is much broader than the typical columellar strut graft. The best graft for this purpose is the double-layered conchal sandwich graft (◘ Fig. 11.23). Owing to the extra graft width and double-layered graft construction, the conchal sandwich graft can be positioned and secured to the caudal septum using a tongue-in-groove fixation. In addition to providing a strong and stable union, tongue-in-groove fixation to the caudal septum serves to buttress the elongated tip against upward displacement by a tight or inelastic skin envelope. For noses that require even greater elongation, we use extended spreader grafts to maintain positioning of a columellar strut graft (◘ Fig. 11.24). Alternatively, septal cartilage can be used to create a septal extension graft for aggressive nasal elongation (◘ Fig. 11.25). There are two different ways to fix such a graft: end to end or side to side. Using an end-to-end fixation, the septal extension graft must be contoured carefully so that it fits precisely with the anterior septal border. To provide a strong fixation to the septum, we prefer using either a splinting graft of perpendicular ethmoid bone or extended spreader grafts for tip stabilization. Alternatively, a side-to-side fixation is possible, which gives a firmer construction, but by overlapping cartilages, a slight asymmetry may result.

In contrast to nasal lengthening, decreasing nasal length is not restricted by soft-tissue elasticity. Modest decreases in nasal length can be achieved by increasing tip rotation. Historically this has been accomplished with excision of the cephalic margin of the lateral crus—the so-called "cephalic trim" procedure. Although this technique simultaneously reduces tip volume and potentially facilitates cephalic tip rotation, it also frequently results in unsightly upward retraction of the alar rims. Because of that possible complication, the cephalic trim should be regarded as an unreliable and unpredictable technique for tip rotation. Shortening the nose by excising a vertical strip of vestibular skin or nasal mucosa and trimming the caudal septum are other destructive procedures that should be reserved for extreme circumstances in which severe tissue excess justifies potentially irreversible tissue excision.

Our preference for modest reductions in nasal length is to rotate the nasal tip using suspension sutures. In noses with cartilage of sufficient rigidity, we often combine the suspension suture with a spanning suture to prevent the lateral crural flaring that results from aggressive tip rotation (◘ Fig. 11.10). However, with weak tip cartilages, the combined suture may result in concave collapse of the lateral crura. Consequently, in noses with weak tip cartilage, the lateral crura must first be strengthened with cephalic fold-under (◘ Fig. 11.4) or fold-over flaps (◘ Fig. 11.8) or with augmentation grafts such as crural batten grafts. When using the combined suture, a spanning suture is placed first and then knotted to preserve the desired tip contour. The same suture is then sewn to the dorsal septum, tightened to achieve the appropriate degree of tip rotation, and knotted a second time to suspend the tip (▶ *see* Fig. 11.10).

When pure tip rotation is desired without changes in lateral crural contour, we use nonresorbable 4-0 monofilament suspension sutures without the combined spanning suture. Two suspension options are available: suspension with a posterior sling (◘ Fig. 11.26) or suspension with an anterior sling (◘ Fig. 11.27). Although the posterior sling utilizes a deeply buried and fully hidden knot, the anterior sling offers easier insertion and greater precision with an increased risk of a visible subcutaneous knot.

For this purpose, R.K. Daniel uses a suture catching the posterior part of the medial crura and fixing them to the anterior border of the septum (called a tip position suture).

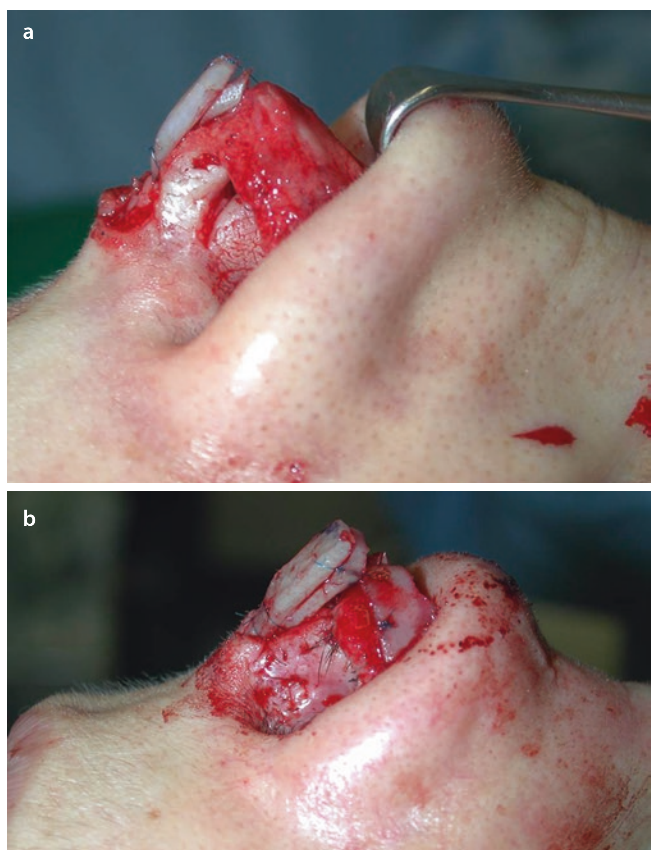
Fixation of the medial crura to the anterior septal border by the tongue-in-groove technique is also very effective to control tip rotation. This technique requires a long septum. Therefore, we always try to avoid shortening the anterior septum in case we want to apply this technique for a precise tip rotation. The disadvantage of the tongue-in-groove technique is the loss of natural mobility. Therefore, some patients complain about unnatural stiffness, which is a high but acceptable price to be sure that the tip does not droop (◘ Fig. 11.28).

If the anterior border of the septum is far behind so that such a tongue-in-groove technique would lead to an overrotated tip, the following technique advised by Tim Marten is possible: the anterior border of the septum is cut but stays pedicled to the periosteum of the premaxilla. Then this strip of cartilage is down-rotated until the medial crura can be fixed to it in the planned way. To fix this amount of rotation, the new position of this anterior septal border is anchored by extended spreader grafts. Alternatively, a thin splint from the perpendicular plate is also possible for fixation.

Specifically in older patients in whom an excess of skin exists that will not shrink after cranial rotation and may lead to additional wrinkles, a nose lift (◘ Fig. 11.29) at the root of the nose will not only remove the excess of skin but will also be an additional technique for cranial rotation of the tip, especially if the undermined skin envelope of the nose is fixed to the frontal periosteum.

The tongue-in-groove technique and the tip suspension techniques, specifically in the modification with the anterior sling, enable us to position the tip and to anchor it by nonresorbable sutures so that there is no chance of drooping. This was a common problem in the older techniques that used a closed approach because the sacrificed support mechanisms could not be reconstructed properly. With these new suspension techniques, by using an open approach, polly-beak deformity as a result of drooping of the tip can be avoided.

◘ **Fig. 11.21** Medial sliding technique



◘ **Fig. 11.22** (**a**, **b**) Shield grafts

Fig. 11.23 Sandwich graft from the concha

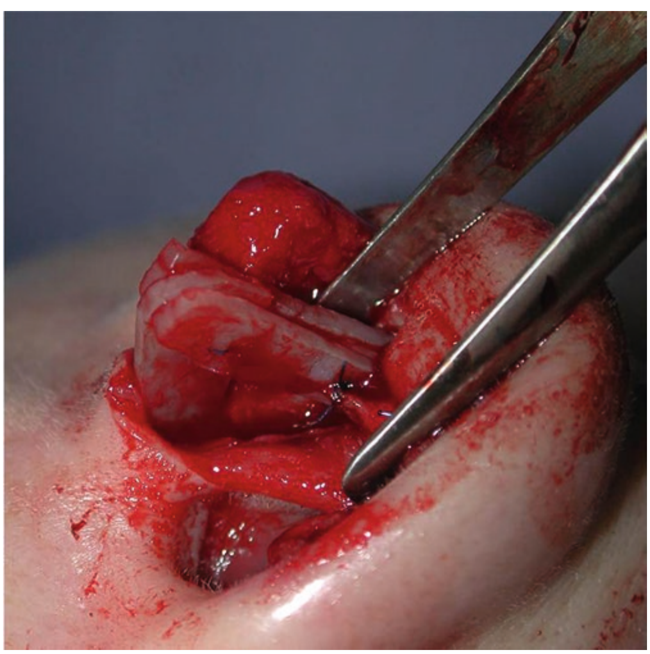
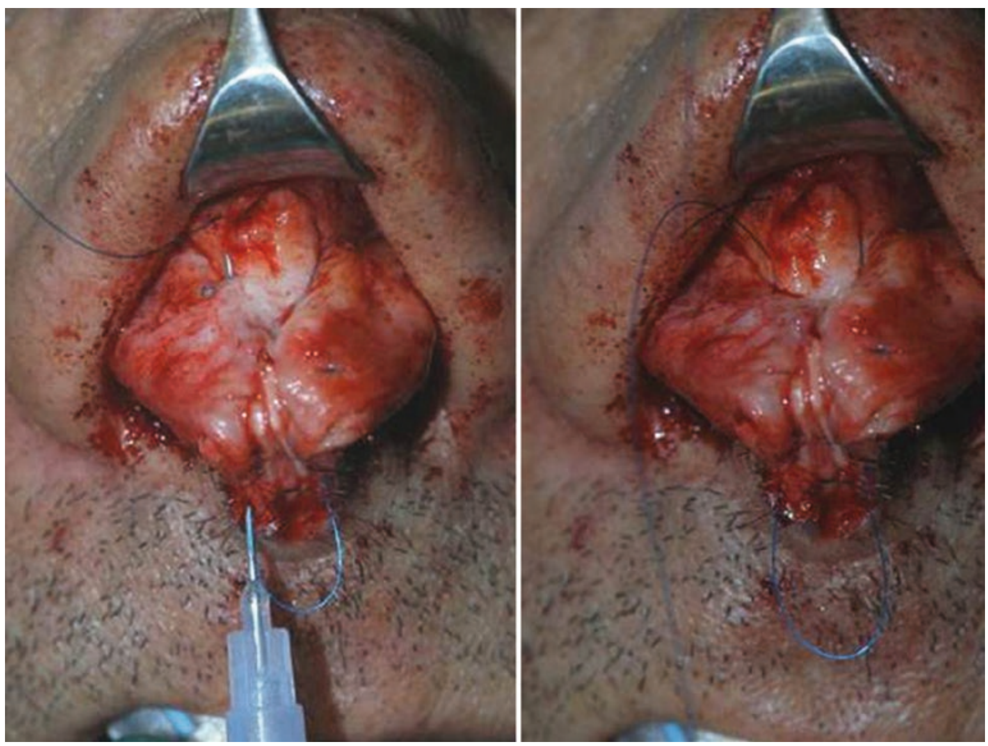


Fig. 11.24 Extended spreader grafts with columellar strut

Fig. 11.25 Septal extension graft, end to end-fixation with extended spreader grafts

Fig. 11.26 Tip suspension suture with posterior sling



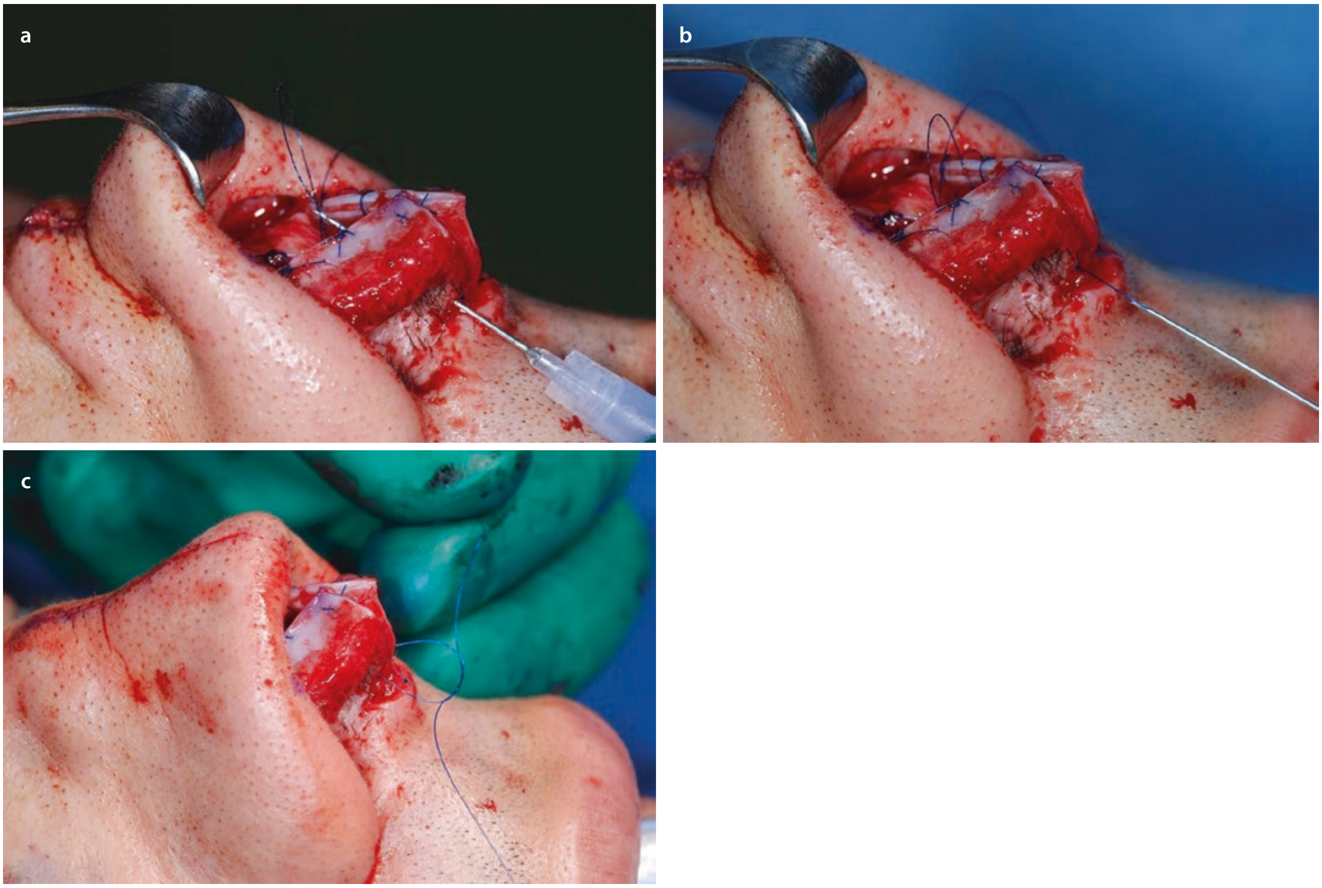


Fig. 11.27 (**a**–**c**) Tip suspension suture with anterior sling

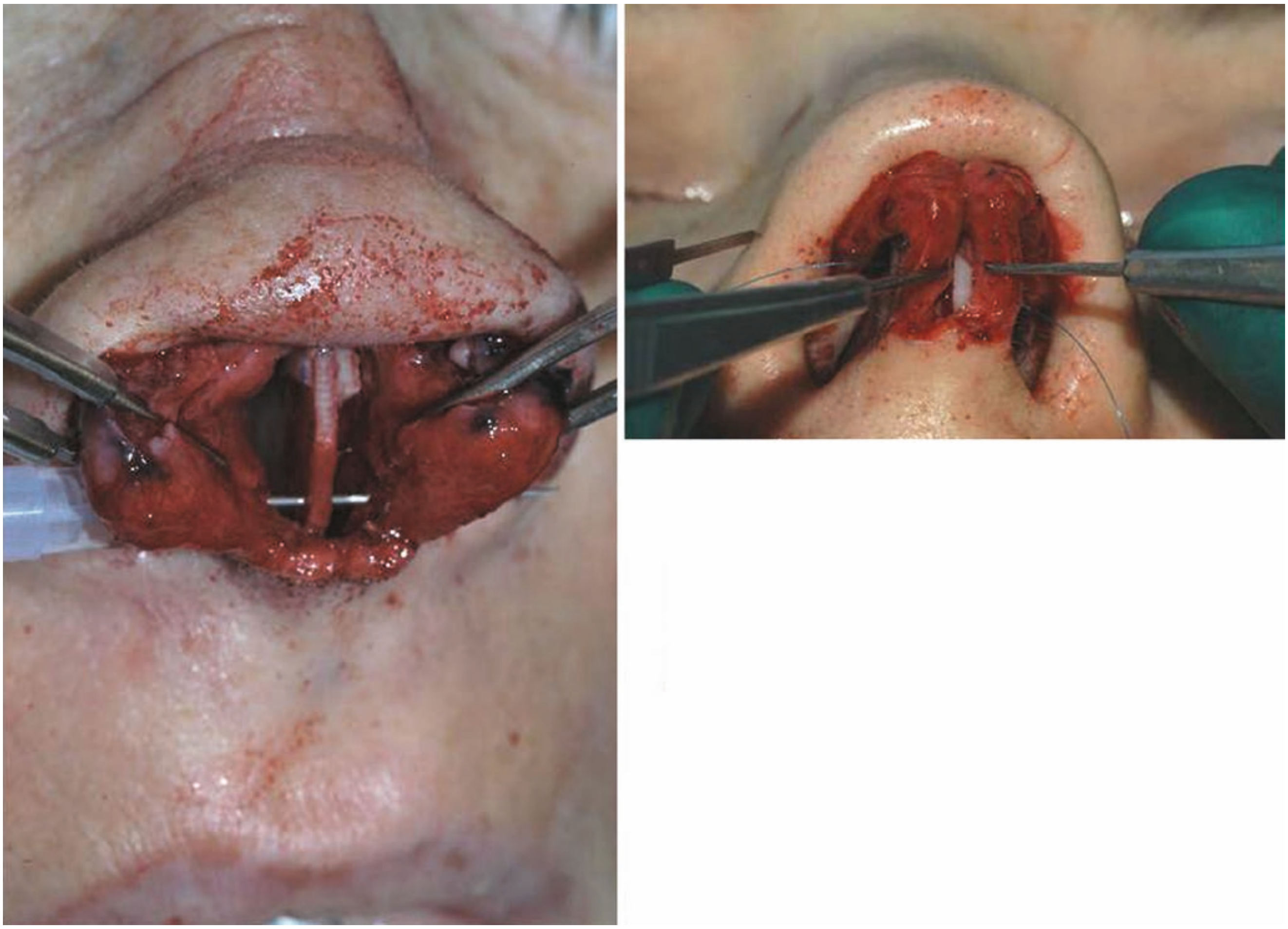


Fig. 11.28 Tongue-in-groove technique

Fig. 11.29 External nose lift

11.2 Case Studies: Contour

11.2.1 Case 1: Debulking of the Tip

A 19-year-old female presented for primary rhinoplasty. On examination, the profile view revealed an overly short nose and a low nasal dorsum. On frontal view, a wide and bulky nasal tip was observed.

Using the external rhinoplasty approach, a large fat pad was removed from between the lower lateral cartilages. Nasal length was increased using a columellar strut graft buttressed by bilateral extender spreader grafts. Spanning sutures were also used for further tip refinement. The dorsum was augmented with three layers of allogenic fascia lata (◘ Fig. 11.30).

◘ **Fig. 11.30** (**a**–**d**) Debulking of the tip. (**a**) Removal of the intercrural fat pad. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 11.30 (continued)

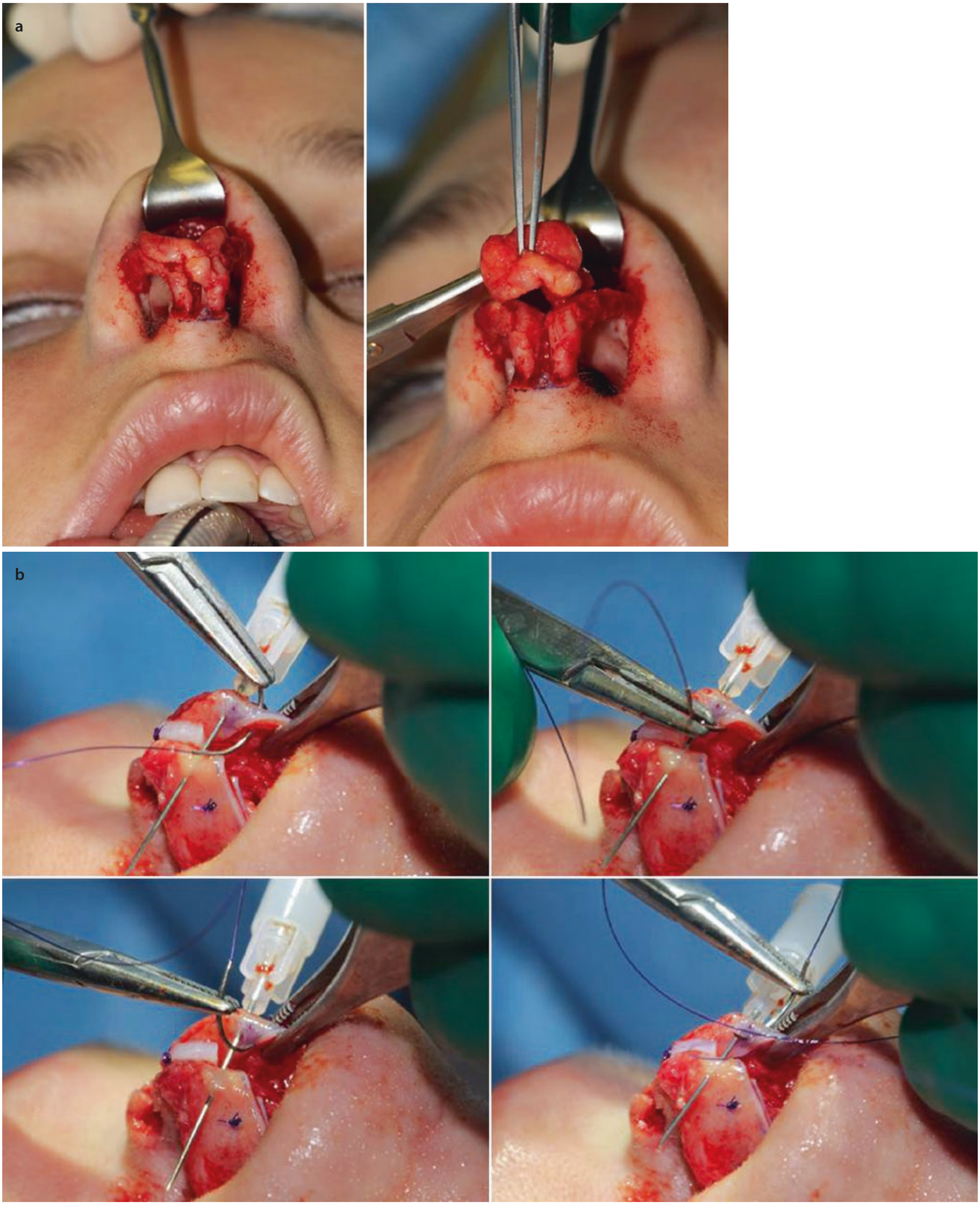
c

d

11.2.2 Case 2: Debulking of the Tip

An 18-year-old female presented with an overprojected dorsum and a wide nasal pyramid that made it difficult for her to comfortably wear eyeglasses. The tip was also very bulky.

Using an open rhinoplasty approach, we first removed a large interdomal fat pad. After dividing the ULCs from the dorsal septum, we harvested septal cartilage for fabrication of a columellar strut graft. The bony dorsum was then lowered with a carbide rasp, and the dorsal septum was trimmed with a straight scissors. A thick Lindemann burr was used to create parasagittal (medial) osteotomies and to widen both osteotomy cuts by 1.5 mm for more aggressive bone narrowing. The bony pyramid was then successfully narrowed using percutaneous low-to-low lateral and transverse osteotomies. The overprojected ULCs were then invaginated and sewn flush with the cartilaginous dorsum as spreader flaps. A columellar strut graft was placed into a small pocket created between the medial crura. Vestibular skin pockets were also dissected on the underside of the lateral crura, leaving the skin attached along a 2.0-mm strip at the caudal margin. The cephalic margins of the lateral crura were then marked and cut and turned under the lateral crura, where they were fixated with suture. Transdomal sutures were also placed near the cephalic margins of both domes in order to narrow the domes but preserve the divergence. Lateral crural flaring was controlled using a spanning suture. A rim graft was placed to shape the alar margin, and after closing the transcolumellar incision, the nasion was augmented using free diced cartilage (FDC) injected through a tuberculin syringe (◘ Fig. 11.31).



11

Fig. 11.31 (**a**) Debulking. (**b**) Transdomal (= interdomal) suture after fold-under flaps (= lateral crural underlay). (**c**) Rim graft. (**d**) Spanning suture fixed to the dorsal septum (tip suspension suture with posterior sling). (**e**–**g**) Narrowing the tip: Front view, profile view, base view pre-op/post-op

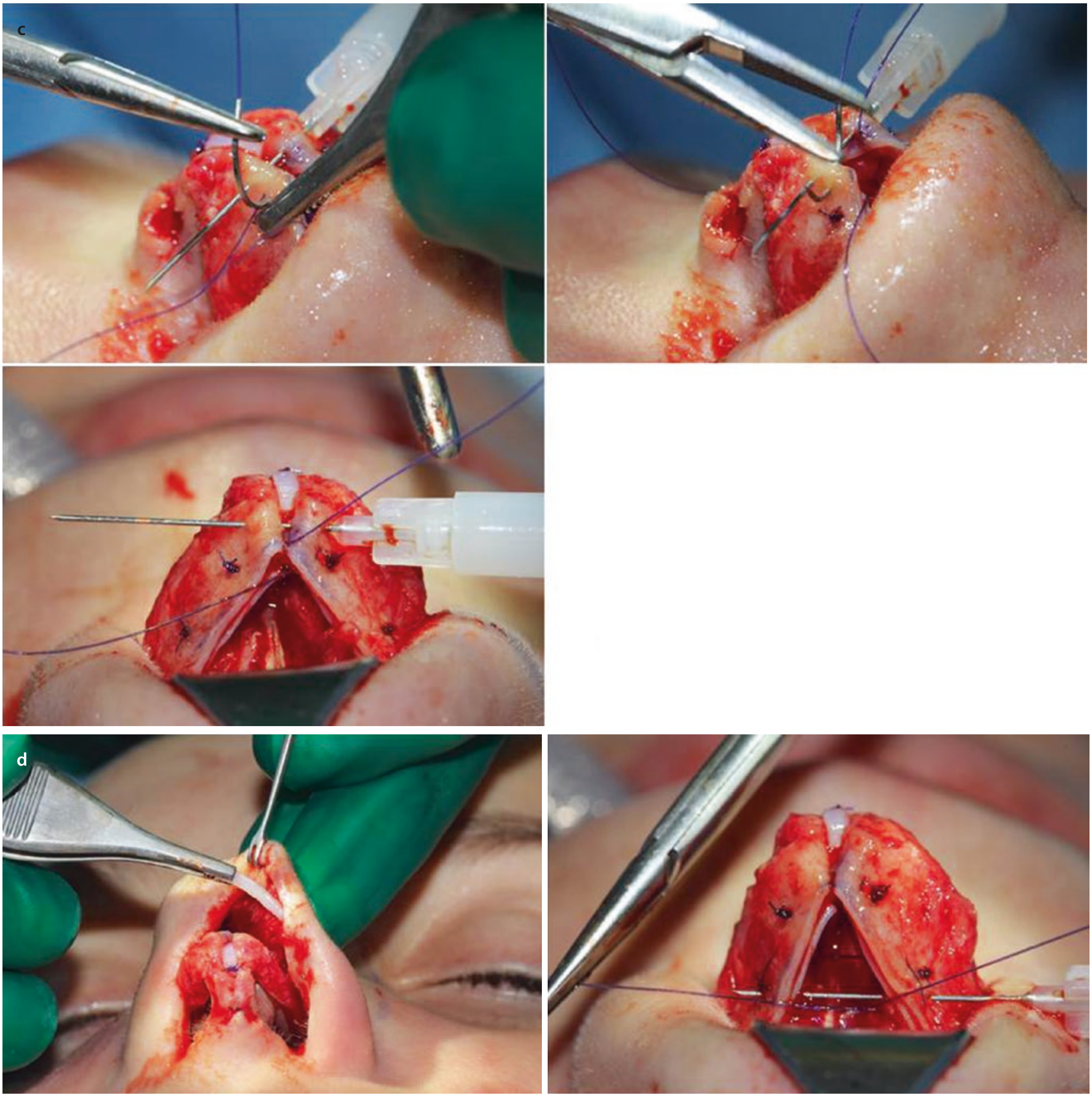


Fig. 11.31 (continued)

Fig. 11.31 (continued)

Fig. 11.31 (continued)

11.2.3 Case 3: Augmentation of the Soft Triangle

A 28-year-old female with facial asymmetry presented for primary rhinoplasty. Examination revealed a deviated nose with a prominent rhinion hump. Inspection of the nostrils revealed retraction of the left alar rim with accentuation of the soft-tissue facet and pronounced nostril asymmetry.

Using the external rhinoplasty approach, rightward subluxation of the caudal septum was corrected by midline repositioning and suture fixation to the anterior nasal spine. Following hump reduction, the dorsum was narrowed and straightened using parasagittal and lateral (low-to-low) osteotomies. Tip refinement was achieved using a cephalic trim, transdomal and spanning sutures, and a tip suspension suture with a posterior sling. The overly prominent soft-tissue facet was augmented using remnants of the cephalic resection (Fig. 11.32).

Fig. 11.32 (a–c) Augmentation of the soft triangle and lowering the retracted ala. Front view, profile view, base view pre-op/post-op

Fig. 11.32 (continued)

11.2.4 Case 4: Contouring by Suture Technique

A 36-year-old female with tip bifidity and an overly wide columellar pedestal presented for primary rhinoplasty.

Tip-plasty was accomplished using both transdomal and spanning sutures. The overly wide columella was treated by resecting the intercrural component of the depressor septi muscle, dividing both medial crura just proximal to the crural footpods and then using transseptal mattress sutures to narrow the columellar pedestal (Fig. 11.33).

Fig. 11.33 (a–j) Suture techniques with ten years follow-up : Transdomal suture with columellar strut

Fig. 11.33 (continued)

Fig. 11.33 (continued)

Fig. 11.33 (continued)

Fig. 11.33 (continued)

11.2.5 Case 5: Contouring by Suture Technique After Lateral Crural Overlay

A 25-year-old female presented with rhinomegaly in which the entire nose was overly large. The nasal skin was also noted to be exceptionally thin. Treatment necessitated lowering dorsal height and tip projection, tip refinement, and narrowing the columellar pedestal.

Using the open approach, the dorsum was lowered with a component (split) technique in which various components are resected individually. In this case, the upper lateral cartilages were preserved and used as spreader flaps for middle vault reconstruction. Owing to weak lower lateral cartilages and bilateral crural concavities, the cephalic margins (and the perichondrium) were used as fold-over flaps to stiffen the lower lateral cartilages and simultaneously eliminate the crural concavities. Tip projection was reduced using a tongue-in-groove setback (or "push-down") technique, and the soft-tissue facets were augmented with bruised septal cartilage grafts. Tip rotation was stabilized using a tip suspension suture with a posterior sling. Owing to exceptionally thin nasal skin, a single layer of allogenic fascia lata was used to ensure a smooth dorsal contour (Fig. 11.34).

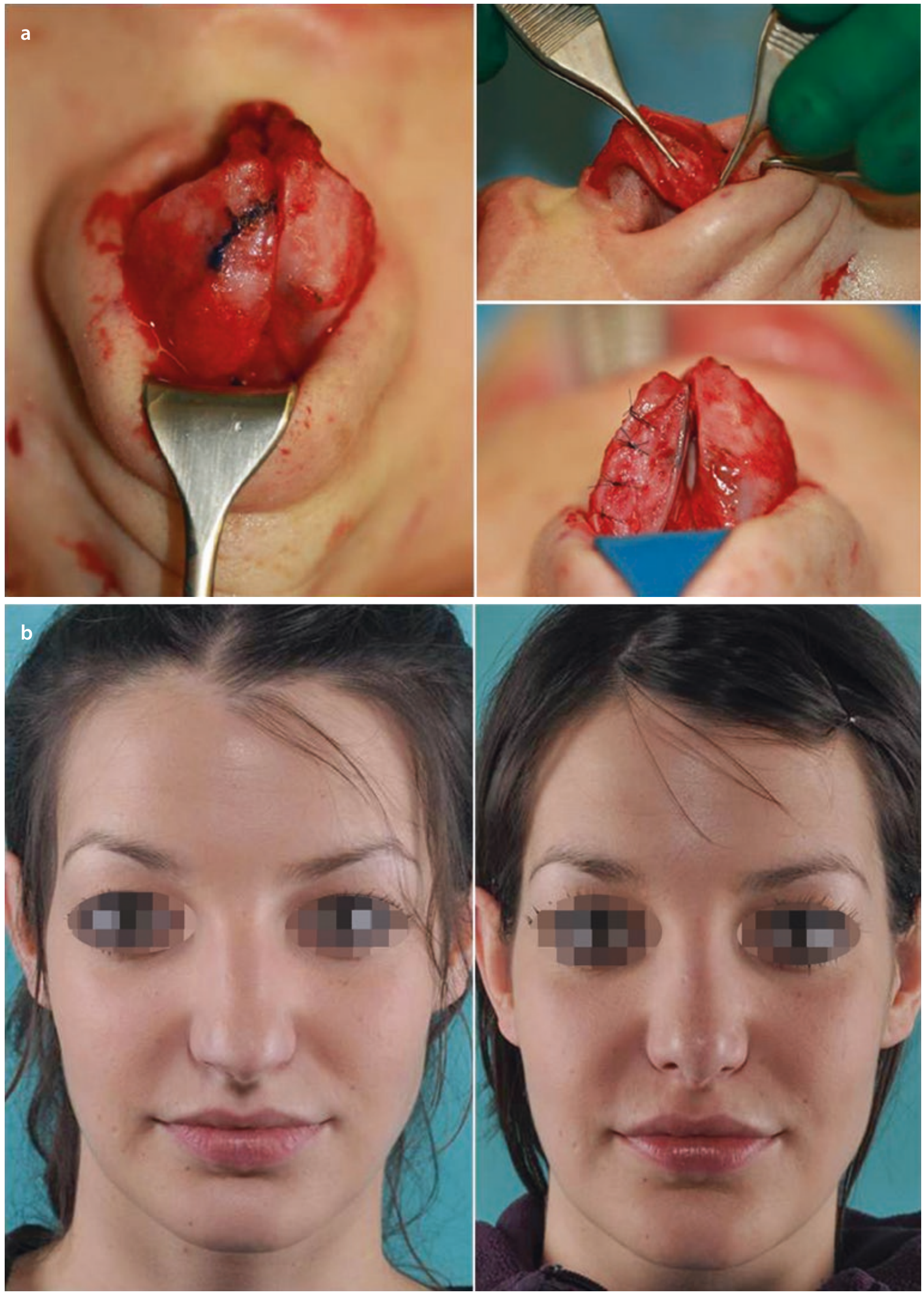


Fig. 11.34 (**a**–**d**) Fold-over flap technique (lateral crural overlay). (**a**) Marking the cephalic portion, incising the cartilage from below, the flipped over and fixed cephalic part of the LLC

Fig. 11.34 (continued)

11.2.6 Case 6: Contouring by Lateral Crural Steal and Transposition

A 29-year-old female presented with a bulbous and overly round nasal tip. Pinched alae were observed caused by cephalic malposition of both lateral crura. From the frontal view, an hourglass-type deformity led to disruption of the dorsal aesthetic lines.

Using an open rhinoplasty approach, the vestibular skin was dissected off the undersurface of both lateral crura. The cephalic portion of the lateral crus was then trimmed and folded under the residual lateral crus and sutured into position. After sharply dividing both ULCs from the dorsal septum and removing the deviated central septum, the bony dorsum was lowered using a carbide rasp, and the cartilaginous dorsum was trimmed with straight scissors. Parasagittal (medial) osteotomies were performed using a powered Lindemann burr, and percutaneous low-to-low lateral and transverse osteotomies were then performed to narrow the bony vault. The overprojected ULCs were then used to create spreader flaps and sewn flush to the dorsal septal line for correction of the hourglass-type dorsal deformity.

After placement of a columellar strut graft harvested from the septum, both medial crura were sutured to the graft. A lateral crural steal technique was performed to increase tip projection and narrow the lobule. The lateral crura were also transposed inferiorly, the cephalic portion was flipped under and then they were sutured into position for elimination of alar pinching (seagull deformity). Additionally, rim grafts were placed (▪ Fig. 11.35).

▪ **Fig. 11.35** (**a**) Tip correction by fold-under flap with lateral crural steal and transposition. (**b**–**d**) Front view, profile view and base view pre-op/post-op

Fig. 11.35 (continued)

11.2.7 Case 7: Contouring in a Thick LLC by Dome Division Technique

A 57-year-old female presented with a very wide nasal tip and ultrathick lower lateral cartilages. Owing to excessive cartilage thickness, tip suture techniques alone were inadequate. Consequently, tip refinement was accomplished using a cephalic trim and vertical dome division followed by immediate suture reapproximation of the divided domes. By dividing the ultrathick tip cartilages, the lobule was narrowed sufficiently to produce a smaller, more attractive, and natural-appearing nasal tip (Fig. 11.36).

Fig. 11.36 (**a**) Tip correction with dome division technique. (**b**–**c**) Front view, profile view and base view pre-op/post-op

Fig. 11.36 (continued)

11.2.8 Case 8: Contouring in a Thick LLC by Dome Division Technique

A 19-year-old female presented with an overly wide and bulky nasal tip and thick tip cartilage. Tip-plasty included cephalic trim to reduce cartilage bulk, columellar strut placement to maintain tip support, vertical dome division with reanastomosis to narrow the lobule, and placement of alar rim grafts to ensure contour stability (Fig. 11.37).

Fig. 11.37 (**a**–**d**) Tip correction with dome division technique. (**a**) Defining the dome before division, placing a columellar strut, inserting a rim graft. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 11.37 (continued)

11.2.9 Case 9: Technique: Contouring in a Thin-Skinned Patient with Suture Technique and Additional Camouflaging with Allogenic Fascia Lata and Foot Plate Resection

In the thin-skinned nose, there is a greater risk of skeletal irregularities becoming visible through the overlying skin. This problem is best prevented by avoiding imperfections in the skeletal framework. However, when minor irregularities are unavoidable, camouflage of the skeletal imperfections with an onlay of allogenic fascia lata will typically result in a smooth and even outer nasal contour.

This fascia graft is first rehydrated in antibiotic solution before the final thickness can be determined. It has an excellent structure with parallel collagen fibers and can be used as a multilayered onlay graft.

A 22-year-old female presented for primary rhinoplasty with ultrathin nasal skin and weak tip cartilages. Tip-plasty began with lateral crural fold-under flaps to stiffen the naturally weak lateral crura against collapse. Crural stiffening then permitted the use of lateral crural spanning sutures to control flaring. However, tip narrowing led to an unwanted increase in tip projection that was eliminated using a tongue-in-groove setback. To stabilize the alar rims and prevent alar retraction, alar rim grafts were also used. Finally, owing to the overly thin nasal tip skin, the entire tip complex was draped in allogenic fascia lata for camouflage (Fig. 11.38).

Fig. 11.38 (**a**) Tip and dorsum camouflage with allogenic fascia lata. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 11.38 (continued)

11.3 Case Studies: Projection

11.3.1 Case 10: Deprojection and Lengthening of the Nose by Modified Lateral Sliding (Overlay) Technique

A 23-year-old female presented with an overprojected tip and dorsum and an obtuse nasolabial angle. Hence, both deprojection and counterrotation of the tip were needed.

Tip-plasty was accomplished using a modified lateral crural overlay technique. Unlike the classic lateral crural overlay technique in which the divided crural segments remain in perfect longitudinal alignment, in the modified version the medial segments are angled 40° caudally to facilitate counterrotation of the tip (Fig. 11.39).

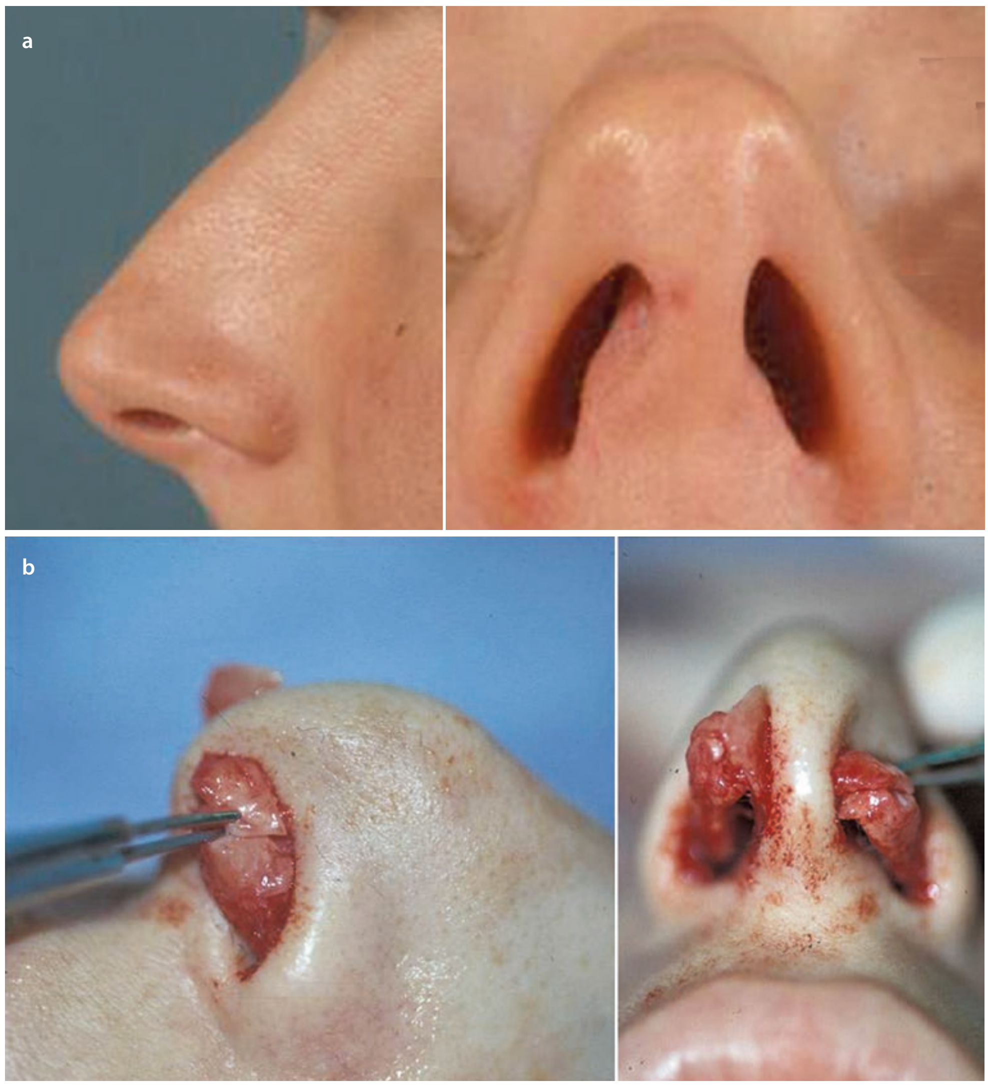


Fig. 11.39 Modified lateral sliding (overlay) technique with derotation of the tip. (**a**) Overprojected tip. (**b**) Lateral sliding (crural overlay) technique through a closed approach. (**c**–**d**) Profile view, base view pre-op/post-op

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Fig. 11.39 (continued)

11.3.2 Case 11: Deprojection by Medial Sliding

A 49-year-old female presented with a strongly overprojected tip and dorsum. Although deprojection of the tip and dorsum was planned, no change in tip rotation was desired. Since the classic medial crural overlap technique results in counterrotation of the tip, a modified technique was used for tip deprojection in which the deprojected segment is rotated cephalically to prevent derotation. After suture fixation of the overlapping medial crura, a protruding triangle of cartilage was excised to restore the columellar profile (Fig. 11.40).

Fig. 11.40 (**a**–**e**) Deprojection by medial crural overlay (sliding) technique. (**a**) Planning of the medial sliding (overlay). (**b**) Simultaneous cranial rotation creates an excess at the anterior border. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 11.40 (continued)

11.3.3 Case 12: Deprojection by Medial and Lateral Sliding

A 41-year-old female presented with an overprojected tip and dorsum and satisfactory tip rotation. Tip deprojection was performed using a combined medial and lateral crural overlap technique in order to avoid changes in tip rotation. Ten-year follow-up (Fig. 11.41)

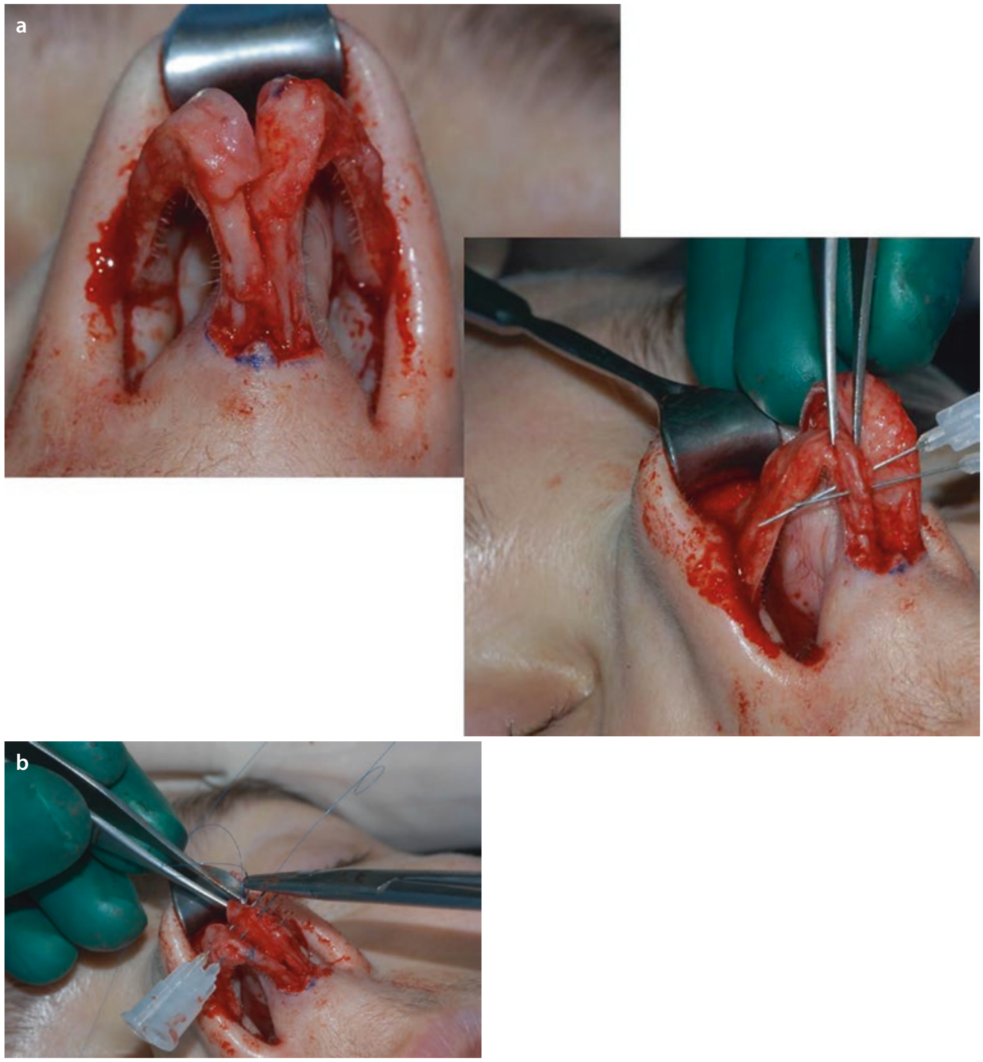


Fig. 11.41 (**a**) Medial sliding (crural overlay). (**b**) Contouring the tip. (**c**) Lateral sliding (crural overlay). (**d**–**f**) Front view, profile view, base view pre-op/post-op. (**g**–**i**) Ten-year follow-up

Fig. 11.41 (continued)

Fig. 11.41 (continued)

Fig. 11.41 (continued)

Fig. 11.41 (continued)

11.3.4 Case 13: Deprojection

A 30-year-old female presented with a bulbous and overprojected tip and retraction of both soft-tissue facets. Both alae were pinched, and the bony pyramid was asymmetrical from lateral displacement of the left nasal bone.

Using an open rhinoplasty approach, the septal angle was exposed, and both ULCs were divided from the dorsal septum. After elevating mucosal tunnels over the quadrangular septum, a piece of septal cartilage was harvested for use as a columellar strut graft and for creation of diced cartilage. The depressor septi muscle was then partially resected, and after dissecting the vestibular skin from the LLCs, a lateral crural overlap procedure was performed. Reference marks were placed at the domes as well as at 10.0 mm and 15 mm lateral to the domes. The lateral crura were then divided vertically at the 10.0-mm reference mark and then overlapped and sutured at the 15.0-mm reference mark. A columellar strut graft was then inserted to augment tip support. For improved tip contour, a transdomal suture was also used to narrow the domes. The nasal pyramid was straightened and narrowed using (internal) parasagittal medial osteotomies followed by percutaneous low-to-low lateral and transverse osteotomies. After suturing the nasal skin flap back into position, the final camouflage and contour were established with free diced cartilage created from the remaining cartilage graft material (Fig. 11.42).

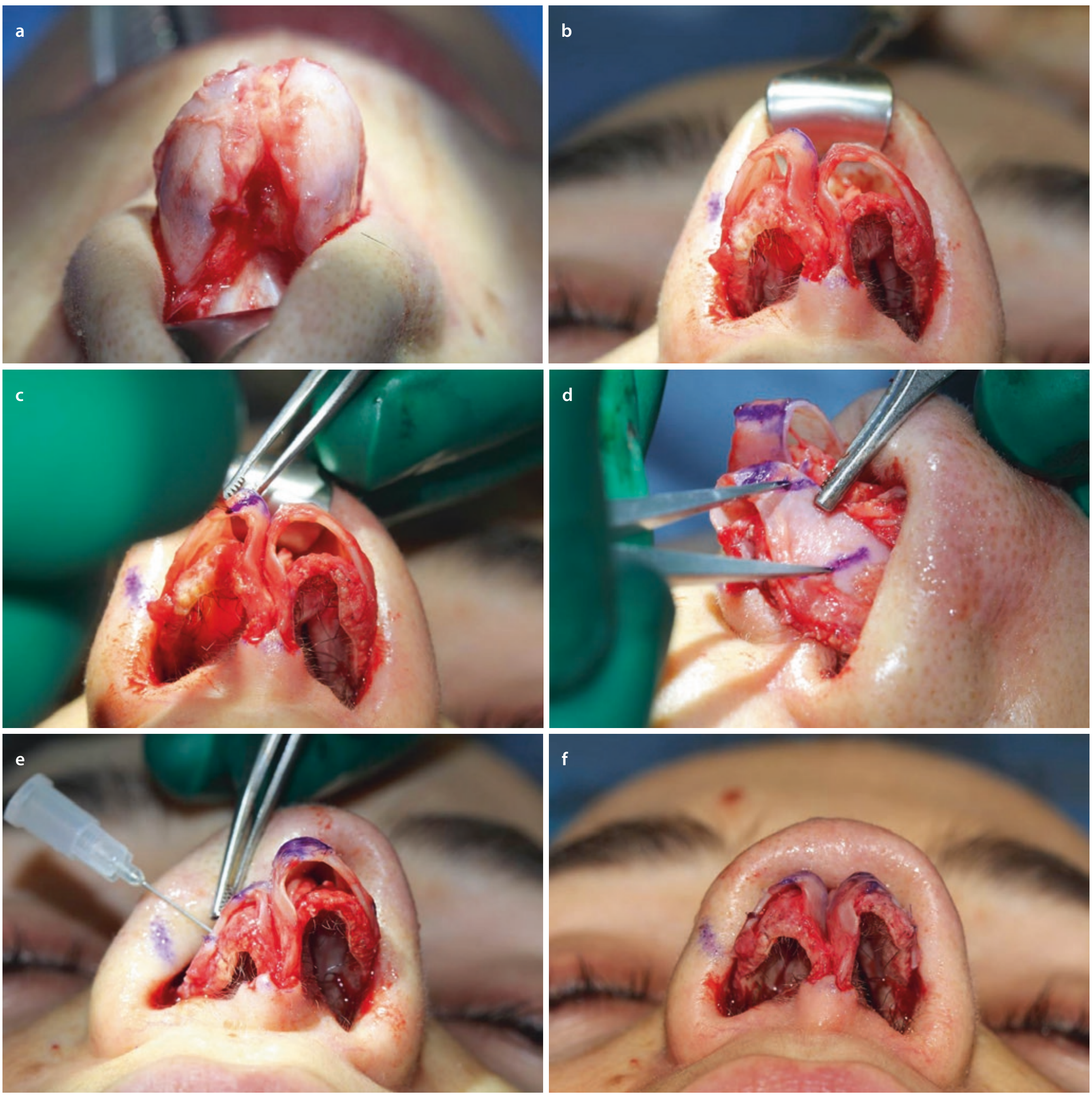


Fig. 11.42 (**a–f**) Deprojection by lateral crural overlay (sliding) technique. (**g**) Tip contouring with transdomal suture. (**h–i**) Dorsal refinement with free diced cartilage (FDC). (**j–l**) Front view, profile view, base view pre-op/post-op

■ **Fig. 11.42** (continued)

■ **Fig. 11.42** (continued)

11.3.5 Case 14: Technique: Reduction Rhinoplasty with Tip Deprojection and Correction of Concave Lateral Crura Using the Lateral Crural (Sliding) Overlap Technique

A 36-year-old female presented with an overprojected and pinched tip and an overprojected dorsum seeking reduction rhinoplasty. Using an open rhinoplasty approach, the dorsal septum was dissected in a submucosal plane allowing for extramucosal separation of the ULC from the septal cartilage. Blunt dissection was then used to release the ULC from the undersurface of the nasal bones in the area of planned hump resection. The cartilaginous septum was lowered with scissors, and the bony hump was resected with a sharpened chisel. The resulting open roof was so large that no paramedian osteotomy was necessary. The bony pyramid was then narrowed by percutaneous (low-to-low) lateral and transverse osteotomies, bilaterally. The overprojected ULCs were invaginated medially to form spreader flaps and then fixed to the septum to fill the open roof and to reconstitute the middle vault for attractive dorsal aesthetic dorsal lines. Additionally, the spreader flaps served to reshape the internal nasal valves for optimal function. Tip refinement was begun by placing a columellar strut graft and shaping the domes with intradomal and dome equalization sutures. Then a lateral crural (sliding) overlap technique was used to deproject the tip and to simultaneously correct concavities of both lateral crura. By using the lateral crural overlap technique, the lateral crura were also strengthened so that spanning sutures could be applied to control crural flaring without fear of concave collapse. Rim grafts were then inserted and free diced cartilage was used for final smoothing of the dorsum and for augmentation of the soft triangles (Fig. 11.43).

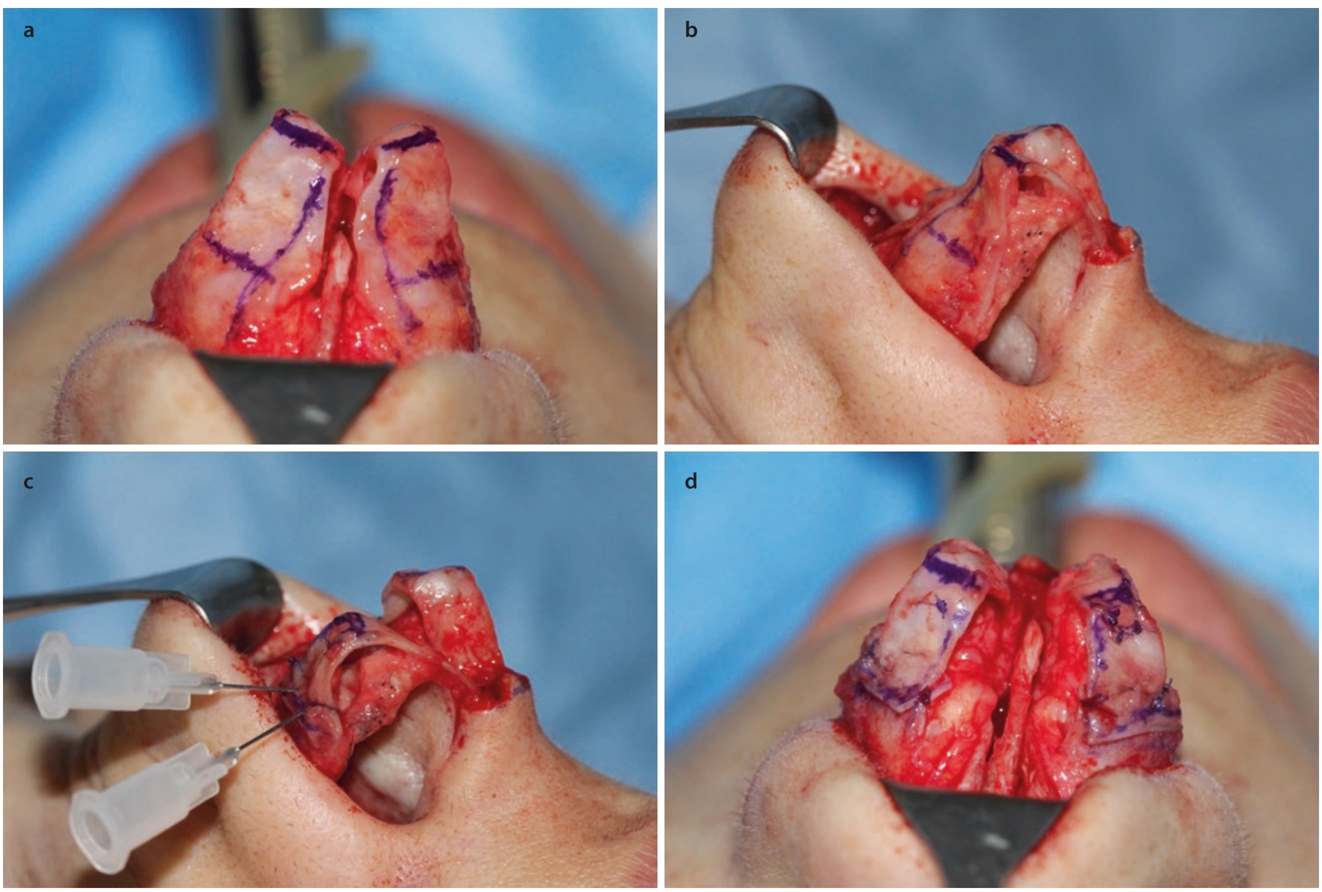
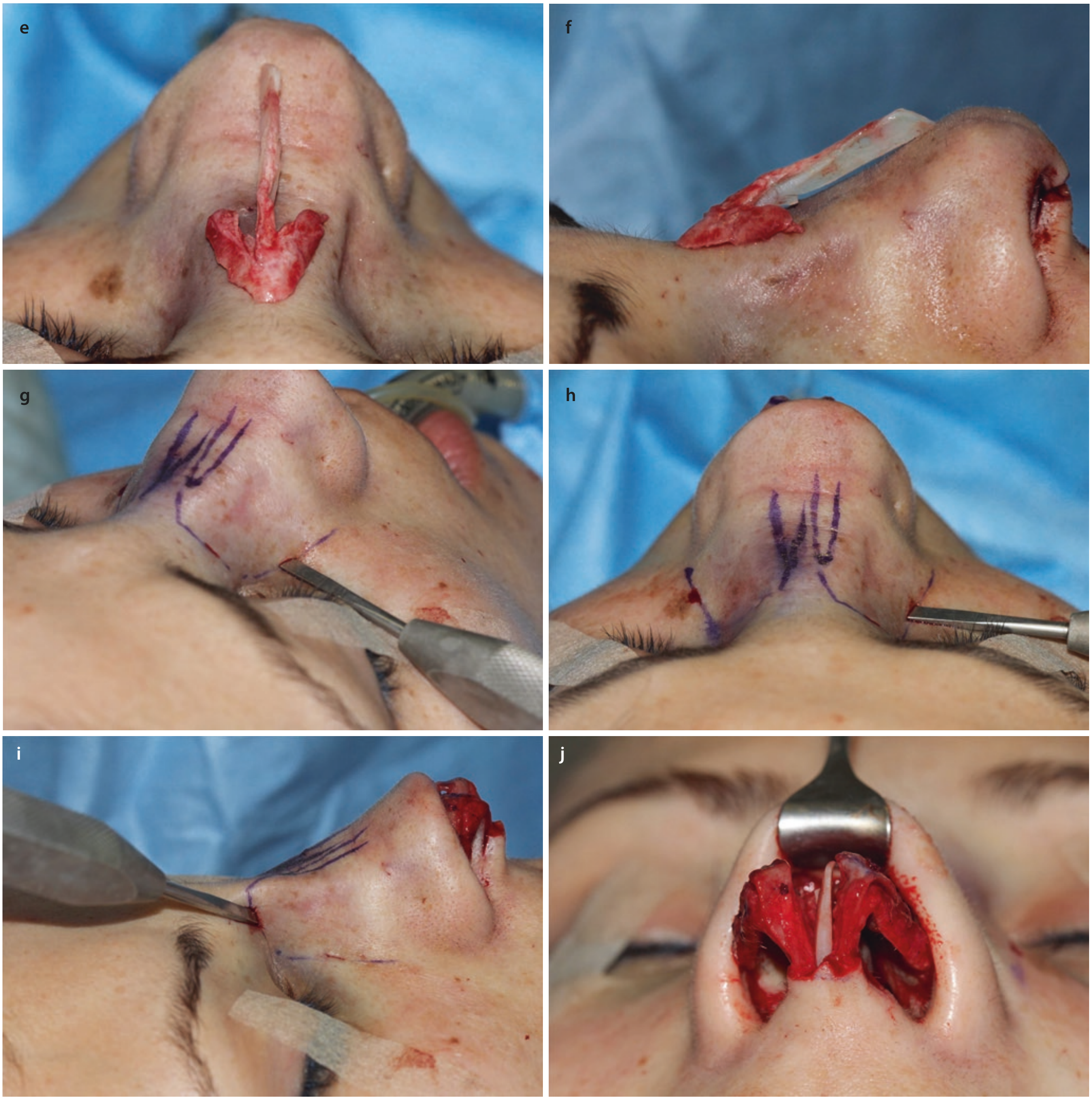


Fig. 11.43 Reduction rhinoplasty. (**a**–**d**) Tip deprojection and correcting the concavity by lateral crural overlay (sliding) technique. (**e**–**f**) Hump reduction using the component technique. (**g**–**i**) Lateral and transverse osteotomies. (**j**) Placing a columellar strut. (**k**–**m**) Front view, profile view, base view pre-op/post-op



■ **Fig. 11.43** (continued)

■ **Fig. 11.43** (continued)

Fig. 11.43 (continued)

11.3.6 Case 15: Increasing the Projection by Grafting

A 22-year-old female presented with a wide and underprojected nasal tip.

Modest increases in tip projection often result from suture techniques to narrow the domes, but additional tip augmentation with onlay or cap grafts is required for greater degrees of projection. Tip-plasty was begun with transdomal sutures, which narrowed the domes and provided a modest initial increase in tip projection. Additional projection was then obtained using a cap graft. To prevent unwanted visibility of the graft edges, multiple layers of allogenic fascia lata were then used for graft camouflage (Fig. 11.44).

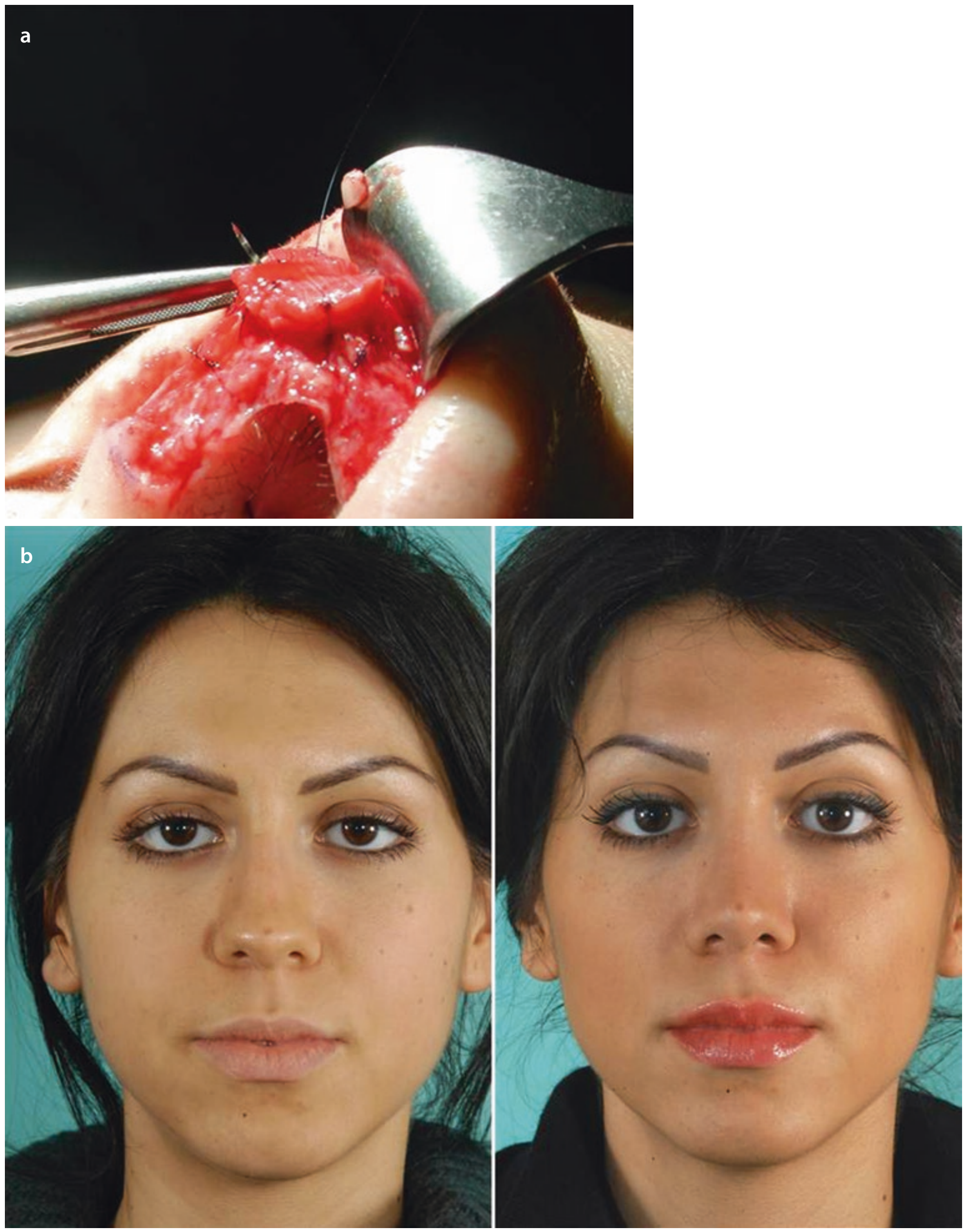


Fig. 11.44 (**a**–**d**) Increasing projection with onlay graft. (**a**) Tip onlay graft from allogenic fascia lata. (**b**–**d**) Front view,profile view, base view pre-op/post-op

Fig. 11.44 (continued)

11.3.7 Case 16: Increasing the Projection

A 43-year-old male presented with a wide, ptotic, and under-projected nasal tip. When large increases in projection are required in a wide tip, the lateral crural "steal" can be used. However, the lateral crural steal requires strong central tip support using a columellar strut or a caudal septal extension graft for successful tip reconfiguration. In this patient, tip-plasty was initiated with a double-layered conchal strut graft for increased central tip support. After suturing the medial crura and intermediate crura to the strut graft, medial portions of the lateral crura were inverted and sewn to the upper end of the strut graft. This served to simultaneously elongate the central support column for increased tip projection and to narrow the domes for improved tip refinement (Fig. 11.45).

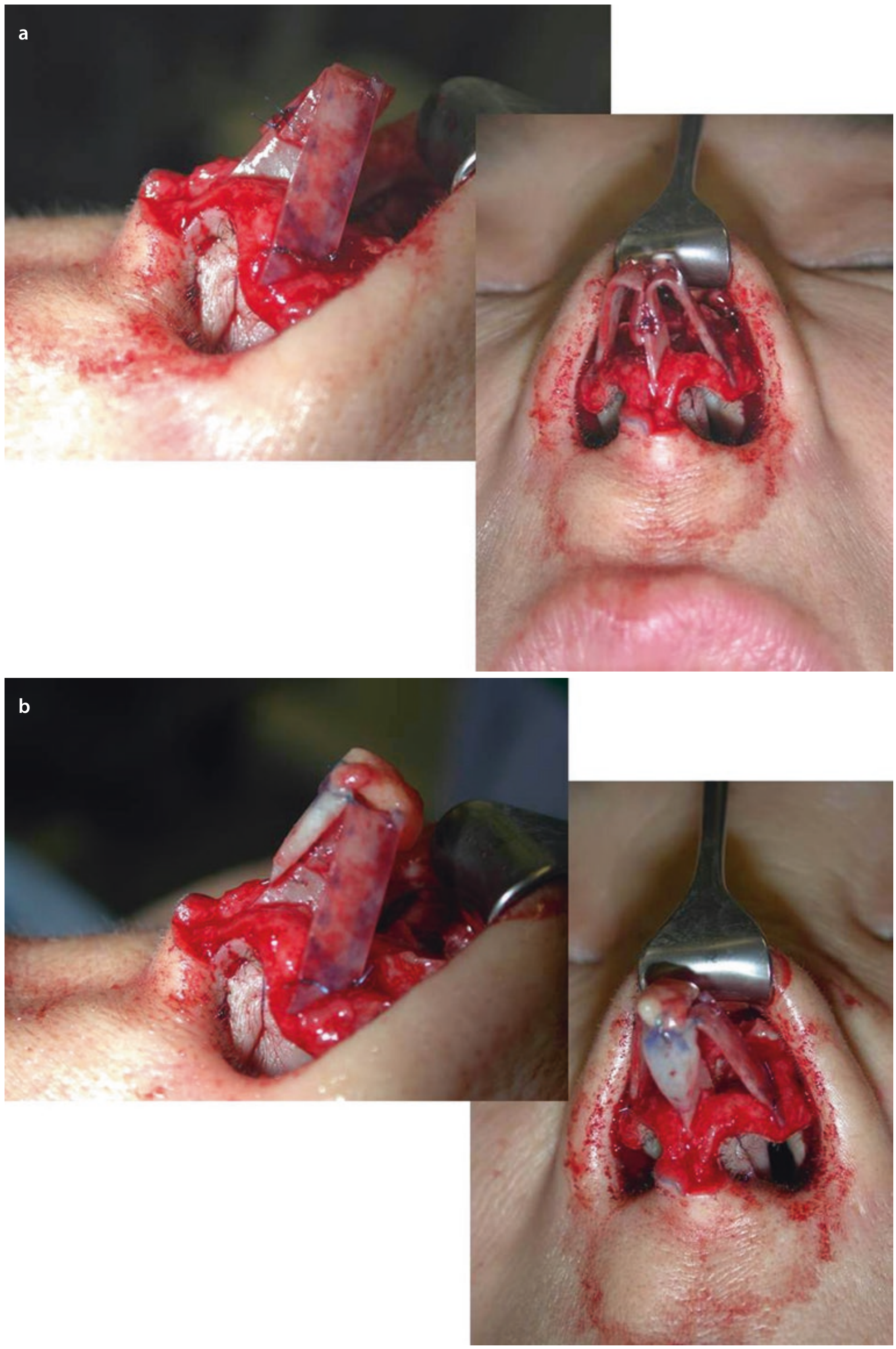
Fig. 11.45 (**a**–**b**) Increasing of the projection by lateral crural steal technique in combination with columellar strut from sandwich graft. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 11.45 (continued)

Fig. 11.45 (continued)

11.3.8 Case 17: Increasing the Projection by Grafting

When even greater tip projection is required, a new and larger tip framework can be constructed on top of the natural tip tripod. This approach worked effectively in this 56-year-old female with a substantially underprojected ethnic nose (◘ Fig. 11.46).



◘ **Fig. 11.46** (**a**–**c**) Increasing of the projection by complex grafts from septal cartilage in combination with soft tissue graft

Fig. 11.46 (continued)

11.4 Case Studies: Rotation

11.4.1 Case 18: Lengthening: Derotation by Columellar Strut Combined with Extended Spreader Grafts

Lengthening of the nose requires counterrotation of the nasal tip framework. However, counterrotation of the nasal tip is often limited or even prohibited by noncompliant and inelastic nasal skin. Therefore, when elongating the nasal framework, the counterrotated tip must be supported with extended spreader grafts to avoid upward tip displacement from an inelastic or a contracting skin envelope. In this scenario, a columellar strut graft is stabilized using bilateral extended spreader grafts for maximum stability (◘ Fig. 11.47).

◘ **Fig. 11.47** (a, b) Lengthening = derotation by columellar strut and extended spreader grafts

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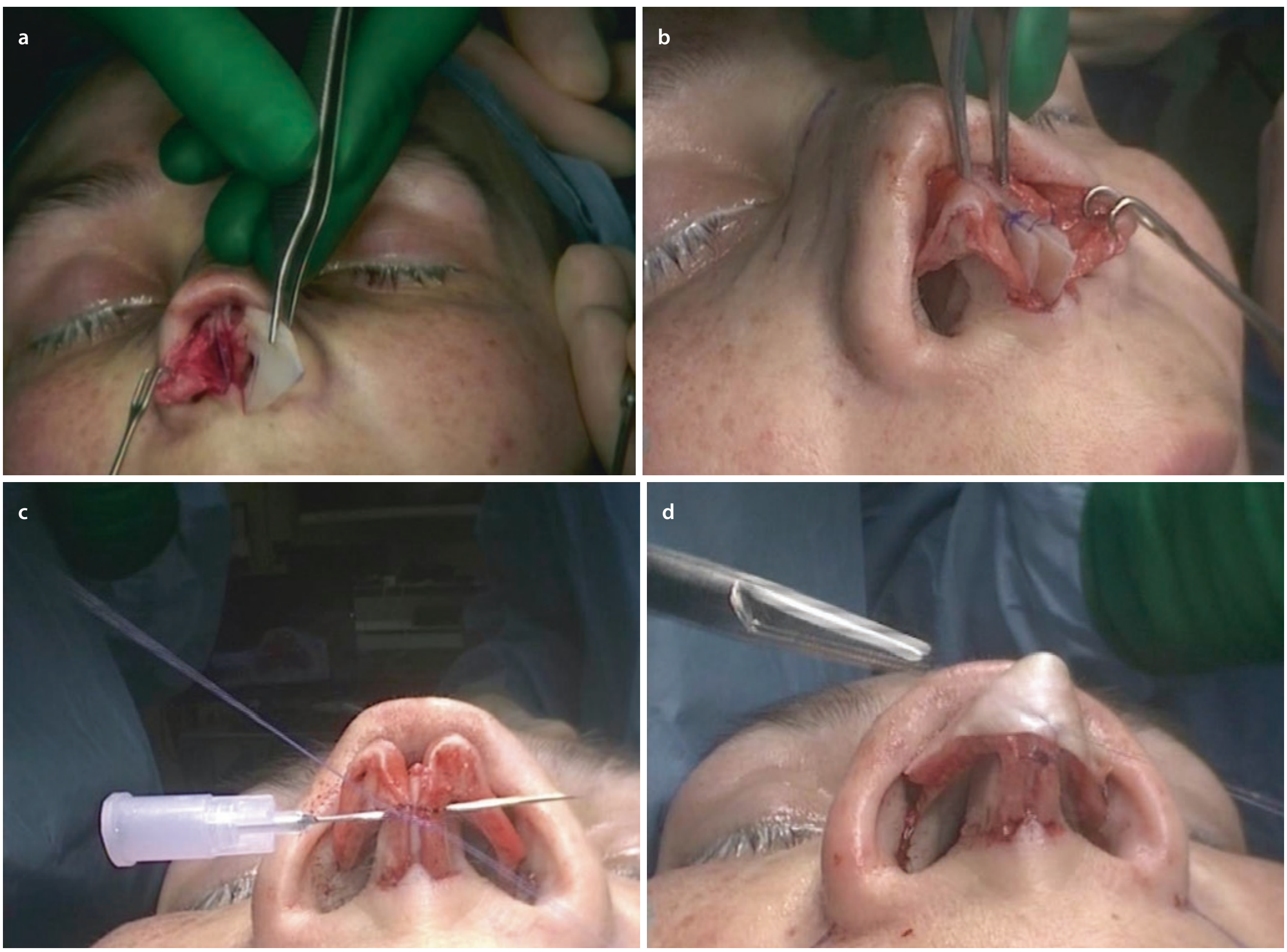
11.4.2 Case 19: Lengthening: Derotation by Septal Extension Graft

At present our preferred technique for nasal elongation is a septal extension graft as advocated by Rick Davis.

A 41-year-old female presented with an overly short but severely overprojected nose and a low radix. The nasolabial angle was also overly obtuse. Bilateral concavities of the lateral crura were also seen on inspection.

Using the open rhinoplasty approach, the dorsum was lowered using a component hump reduction technique as follows: after extramucosal dissection and separation of the ULCs from the dorsal septum, the cartilaginous septum was lowered with straight scissors. The bony dorsum was then resected level with the newly established profile line using a sharpened chisel. A large piece of cartilage was then harvested from the quadrangular septum and used to create a septal extension graft (SEG). The SEG was secured using side-to-side suture fixation to the caudal septum. To create symmetry with the nasal dorsum, the previously resected cartilaginous hump was also used as a spreader graft on the opposite side. After narrowing the bony pyramid using parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies, the overprojected ULCs were used to create spreader flaps and sutured flush with the new dorsal line. The medial crura were then advanced caudally and sutured to the leading edge of the SEG in a tongue-in-groove configuration. To eliminate the lateral crural concavities, cephalic fold-under flaps were performed bilaterally. Owing to the patient's extremely thin and shiny nasal skin, the domes were then covered with a single layer of allogenic fascia lata (◘ Fig. 11.48).



◘ **Fig. 11.48** (**a–d**) Derotation (lengthening) with septal extension graft and camouflaging the tip with allogenic fascia lata. (**e–g**) Front view, profile view, base view pre-op/post-op

Fig. 11.48 (continued)

Fig. 11.48 (continued)

11.4.3 Case 20: Shortening: Cranial Rotation by Tongue-in-Groove Technique

A 48-year-old male presented with pronounced tip ptosis resulting from childhood trauma. Treatment of tip ptosis required tip rotation, which resulted in a reduction of nasal length. However, because decreasing nasal length is not influenced by the skin soft-tissue envelope, tip rotation is typically much easier than counterrotation. A reliable and exacting procedure for increasing tip rotation is the tongue-in-groove technique, in which the medial crura are sutured to the caudal septum for precise tip repositioning. Noses with a protrusive caudal septum allow for greater versatility in tip positioning, but the tongue-in-groove technique may result in considerable tip rigidity (Fig. 11.49).

Fig. 11.49 (**a**) Cranial rotation (shortening) by tongue-in-groove technique. (**b**–**d**) Front view,profile view, base view pre-op/post-op

Fig. 11.49 (continued)

11.4.4 Case 21: Shortening: Cranial Rotation by Modified Tongue-in-Groove Technique

A 27-year-old female presented for primary rhinoplasty with an overly long nose. Surgical exploration revealed inadequate septal length for execution of the tongue-in-groove technique. Using a modification described by Marten, the anterior septal border was sharply divided from the caudal septum, but the attachments to the nasal spine were preserved. The severed segment was then hinged caudally and secured using extended spreader grafts, thereby lengthening the caudal septum and facilitating use of the tongue-in-groove technique (Fig. 11.50).

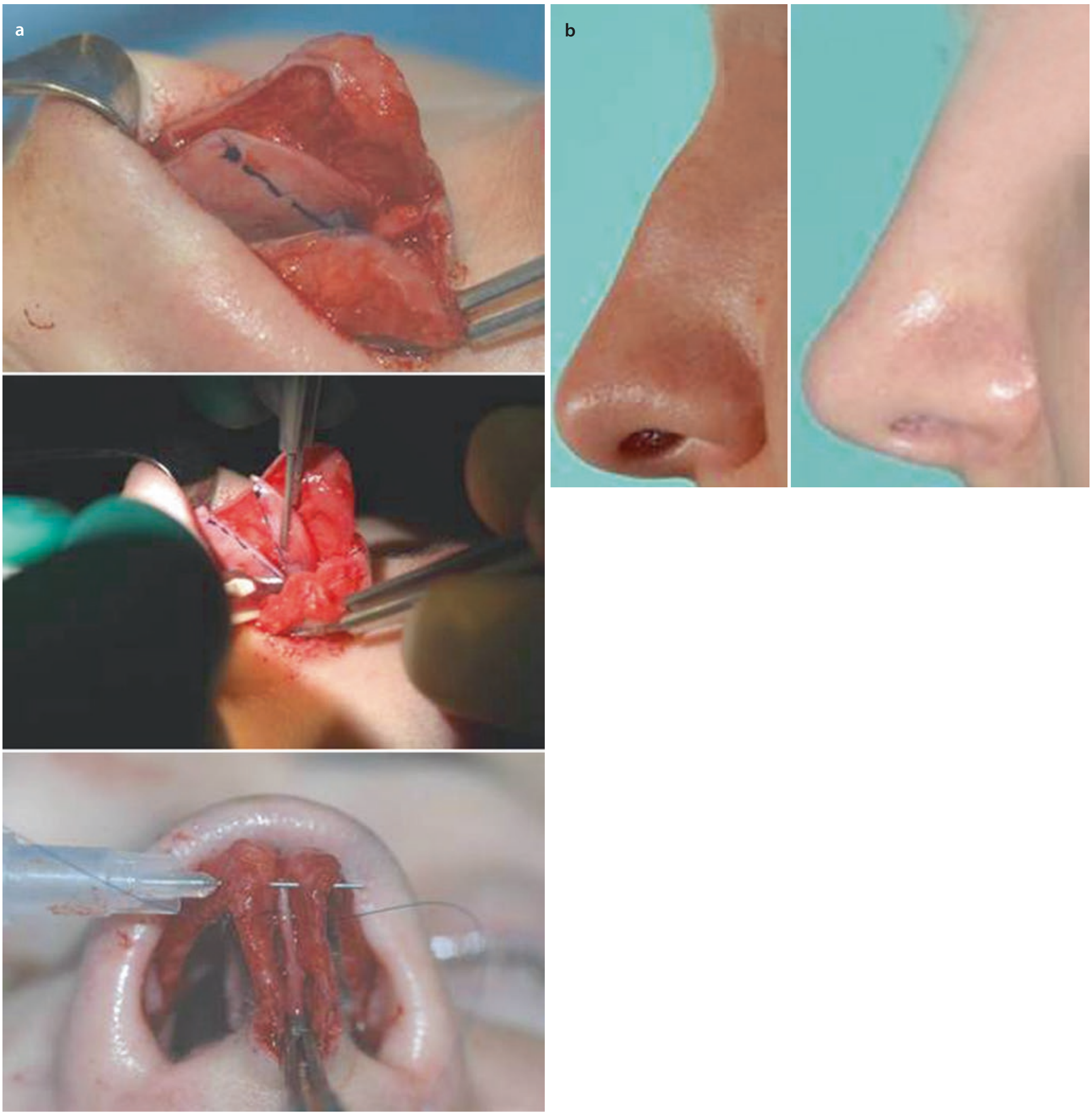


Fig. 11.50 (**a**, **b**) Modified tongue-in-groove technique

11.4.5 Case 22: Shortening: Cranial Rotation by Suspension with Anterior Sling Plasty

A 22-year-old female presented with an oversized and conspicuous nose. Examination revealed an overprojected dorsum, an overly long nose, and a short upper lip. Treatment began with cephalic fold-under flaps to strengthen the lateral crura, and tip rotation was increased using the lateral crural steal technique. A shield graft covered with soft tissue was used for additional tip contouring. The repositioned tip was then stabilized using a tip suspension suture with an anterior sling (◘ Fig. 11.51).

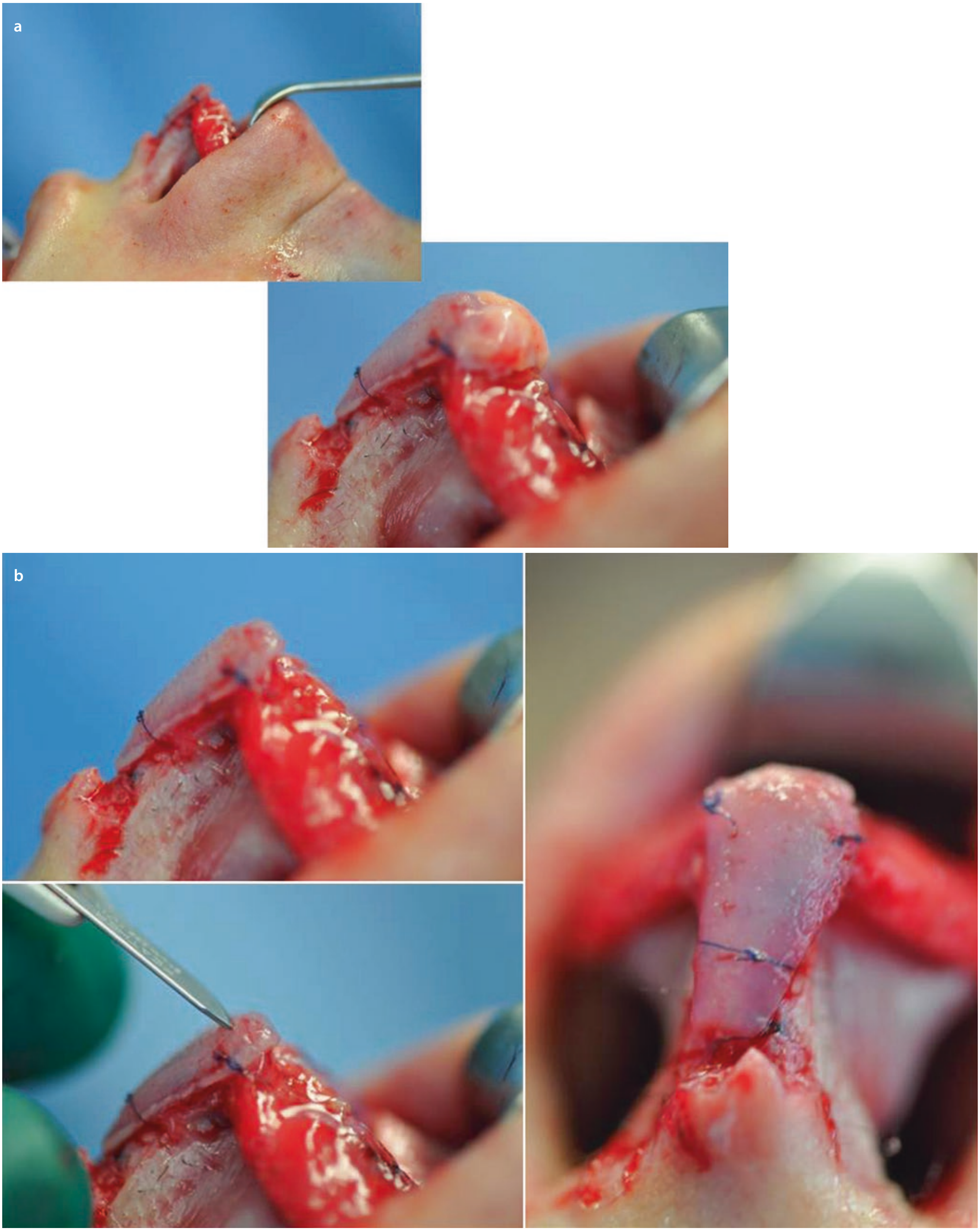


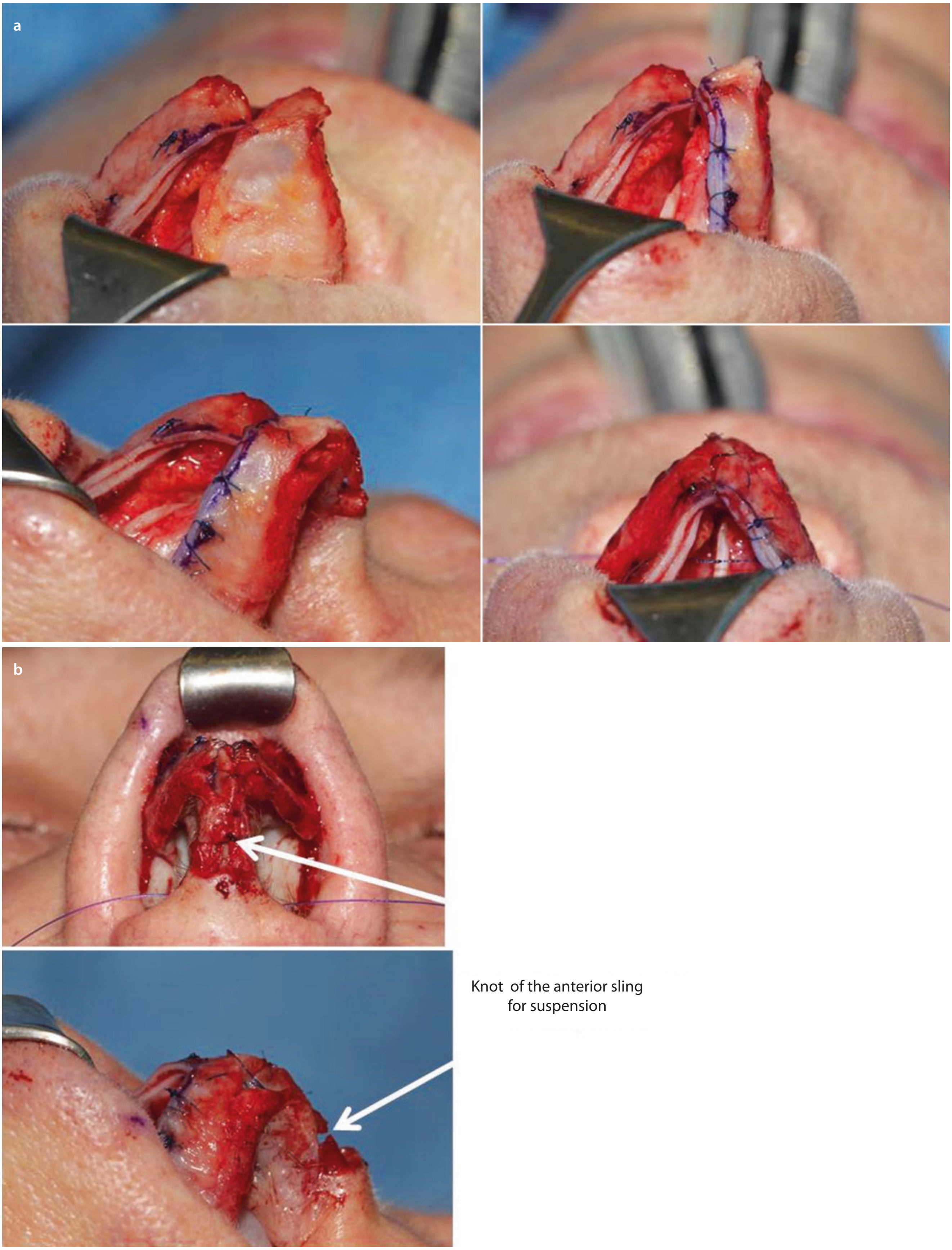
Fig. 11.51 (**a**, **b**) Tip suspension suture with anterior sling, knot covered with shield graft. (**c**–**e**) Reduction rhinoplasty with shortening the length by tip rotation. Front view, profile view, base view pre-op/post-op

Fig. 11.51 (continued)

Fig. 11.51 (continued)

11.4.6 Case 23: Shortening: Cranial Rotation by Suspension with Anterior Sling Plasty

A 54-year-old female presented with an overly long and overprojected nose. The nasolabial angle was hyperacute, measuring only about 45°. The radix was also underprojected, and the left alar rim was retracted. Intraoperative exploration revealed severe malformation of the right LLC with a concave lateral crus and buckling of the intermediate crus. Using an open rhinoplasty approach, we first corrected the crural malformation using a cephalic fold-under flap and horizontal mattress sutures to flatten the buckled segment. The overprojected dorsum was then lowered using a component technique, and the bony hump was resected using a power drill. Before using the overprojected ULC to create spreader flaps, a columellar strut graft was harvested from the quadrangular septum. The graft was placed in a separate pocket anterior to the caudal septum in order to augment the retracted columella, and the medial crura were then sutured to the strut graft in a tongue-in- groove configuration. To reduce nasal length, a suspension suture with an anterior sling was placed to rotate the tip complex. This technique enabled us to adjust the nasolabial angle to the precise degree. The radix was then augmented with a tragal cartilage graft, and a composite graft was used to correct the alar retraction. However, the composite graft failed to adequately correct the retraction, and therefore the cartilaginous portion of the composite graft was used as a unilateral rim graft (▪ Fig. 11.52).



■ **Fig. 11.52** (**a**) Tip correction by fold-under flap and additional horizontal mattress sutures on the right side. (**b**) Cranial rotation by tip suspension suture with anterior sling. (**c**–**e**) Shortening the nasal length by suture technique: front view, profile view, base view pre-op/post-op

Fig. 11.52 (continued)

Fig. 11.52 (continued)

11.4.7 Case 24: Shortening: Cranial Rotation by Suspension with Posterior Sling Plasty

A 32-year-old female presented with modest tip ptosis. Increased tip rotation was achieved using only a tip suspension suture with a posterior sling (Fig. 11.53).

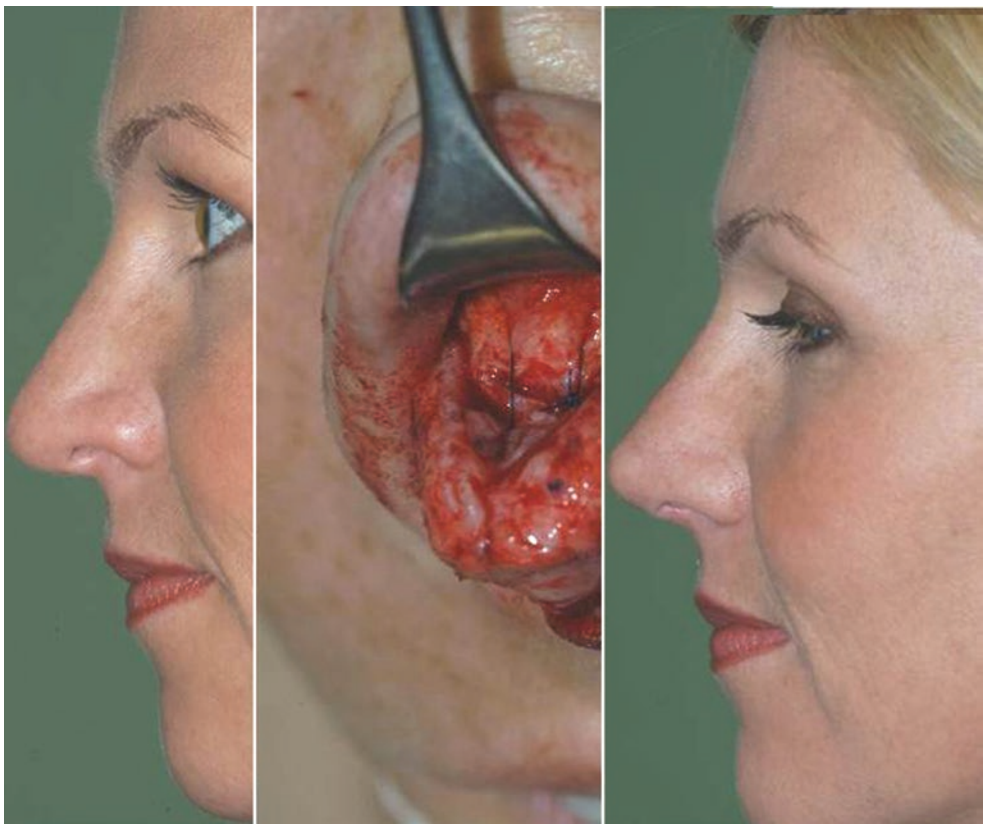
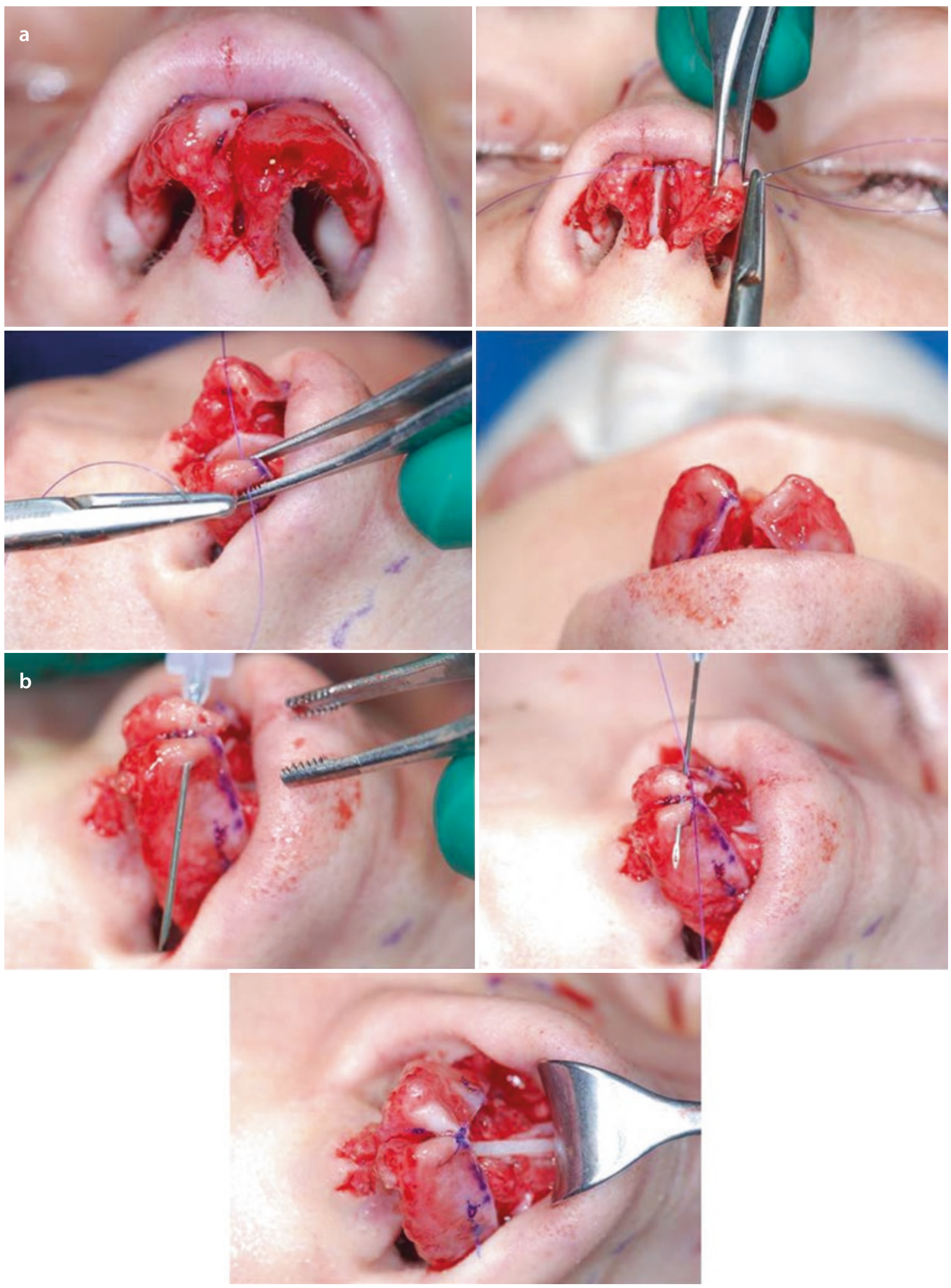


Fig. 11.53 Tip suspension suture with posterior sling

11.4.8 Case 25: Identical to Case 2 in Primary Dorsum: Tip Correction with Fold-Under Flap Technique, Transdomal Suture, Spanning Suture, and Tip Suspension with Posterior Sling

An 18-year-old female presented with a narrow and overprojected dorsum, a wide nasal tip, and obstruction of the nasal airway. On profile examination, the nasolabial angle was overly obtuse (130°).

Using the external rhinoplasty approach, tip refinement began with cephalic fold-under flaps of the lateral crura followed by transdomal tip sutures to reduce tip width. The domes were temporarily stabilized in the desired position by pinning the cartilages transversely with a small-caliber needle until transdomal suture placement was complete. After strengthening the lateral crura with cephalic fold-under flaps, spanning sutures were used to reduce crural flaring without risking iatrogenic collapse. Finally, the residual septal cartilage was finely diced and injected beneath the skin flap (via the marginal incisions after closing the columellar incision) to smooth and refine the outer nasal contour (◘ Fig. 11.54).



◘ **Fig. 11.54** (**a**–**d**) Tip correction with fold-under flap transdomal suture, spanning suture and tip suspension suture with posterior sling. (**e**–**g**) Front view, profile view, base view pre-op/post-op

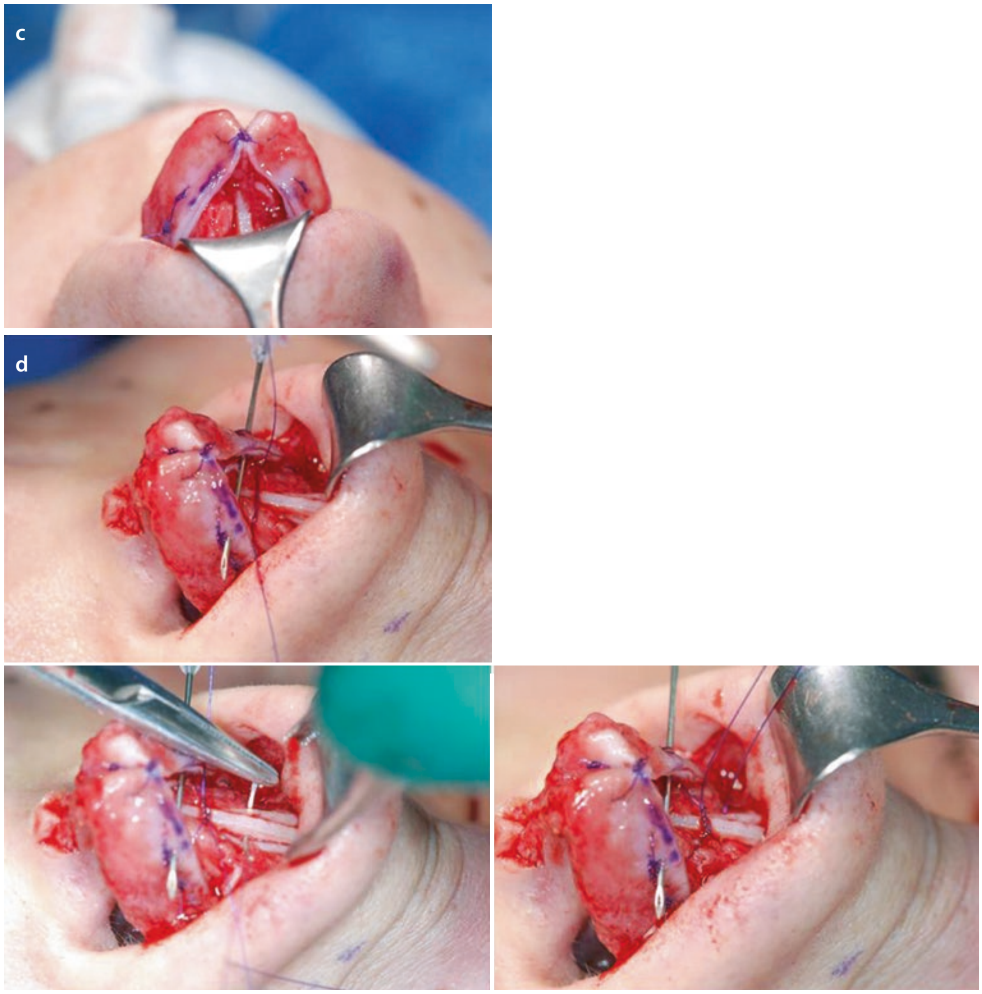


Fig. 11.54 (continued)

■ **Fig. 11.54** (continued)

Fig. 11.54 (continued)

11.4.9 Case 26: Shortening: Cranial Rotation by External Nose Lift

A 59-year-old female presented with severe tip ptosis and nasal skin laxity. Owing to an extreme abundance of nasal skin, the rhino-lift procedure was used to simultaneously increase tip rotation and reduce the excess nasal skin. The external skin excision was performed using a trapezoidal shape in order to limit lateral extension of the scar. In addition to increasing tip rotation for a satisfactory cosmetic result, the patient also experienced better nasal airflow. At the same time the tip was narrowed. Because of the thick sebbaceus skin a dome division technique was used (Fig. 11.55).

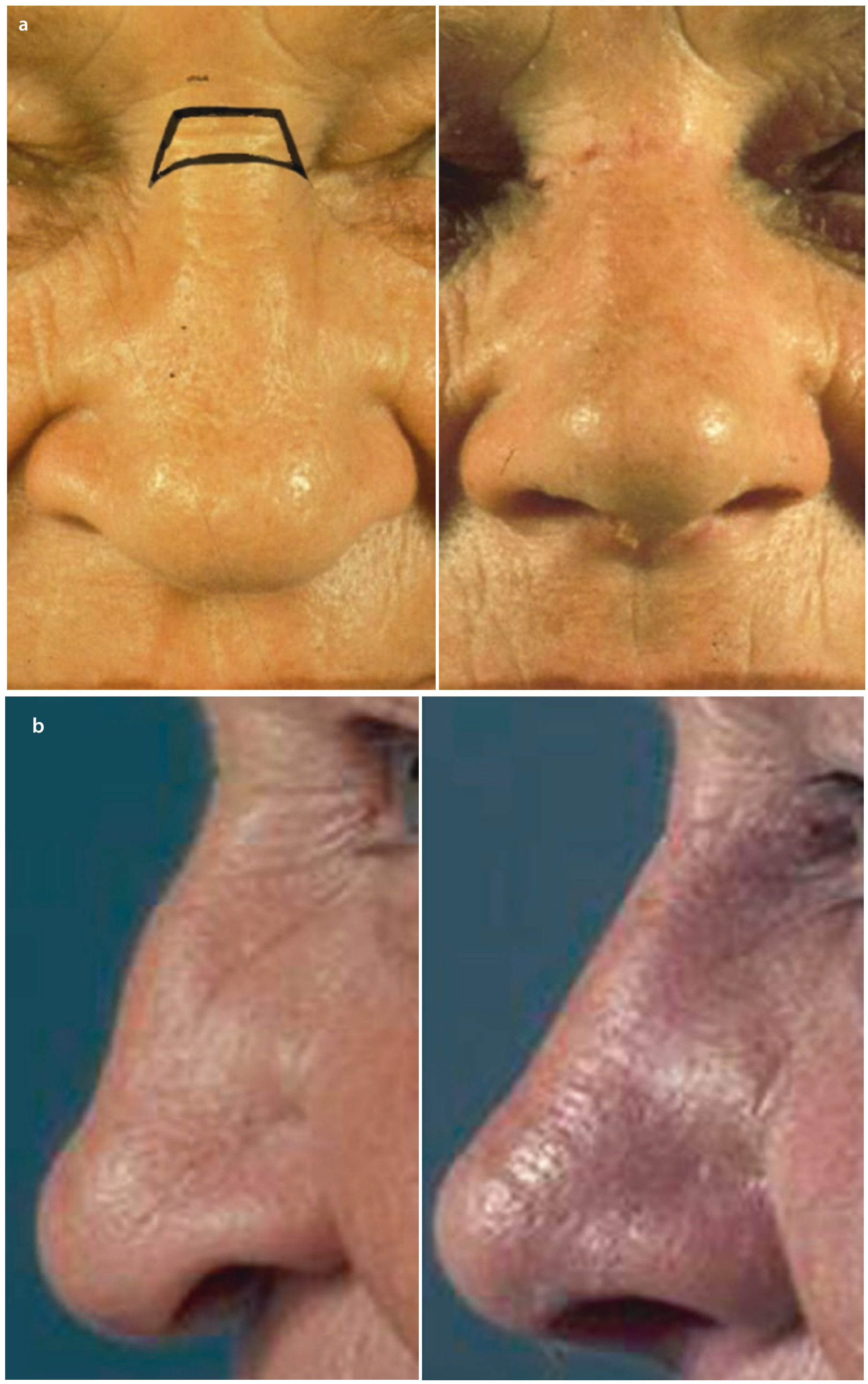
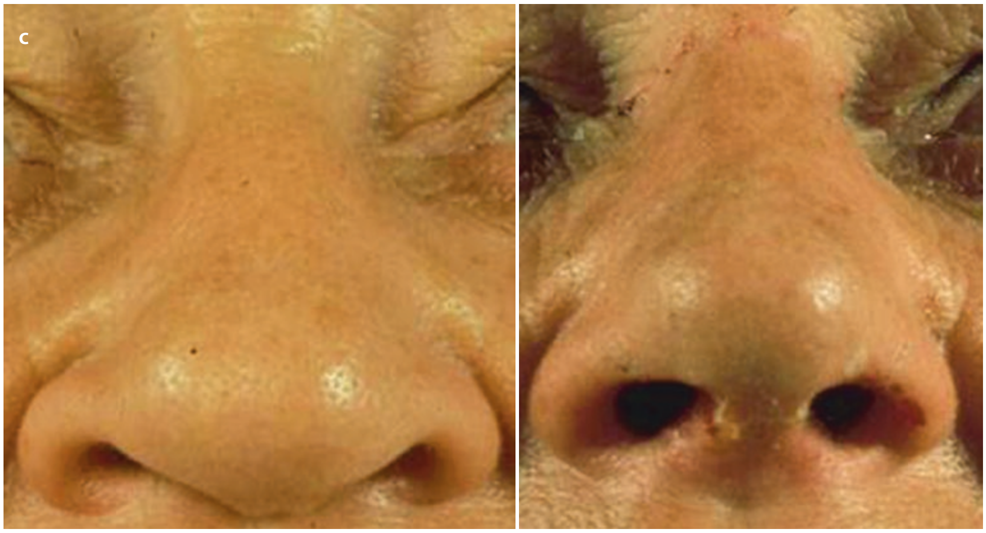


Fig. 11.55 (**a**–**c**) External nose lift

Fig. 11.55 (continued)



11.4.10 Case 27: Shortening: Cranial Rotation by Dome Division Combined with Internal Nose Lift

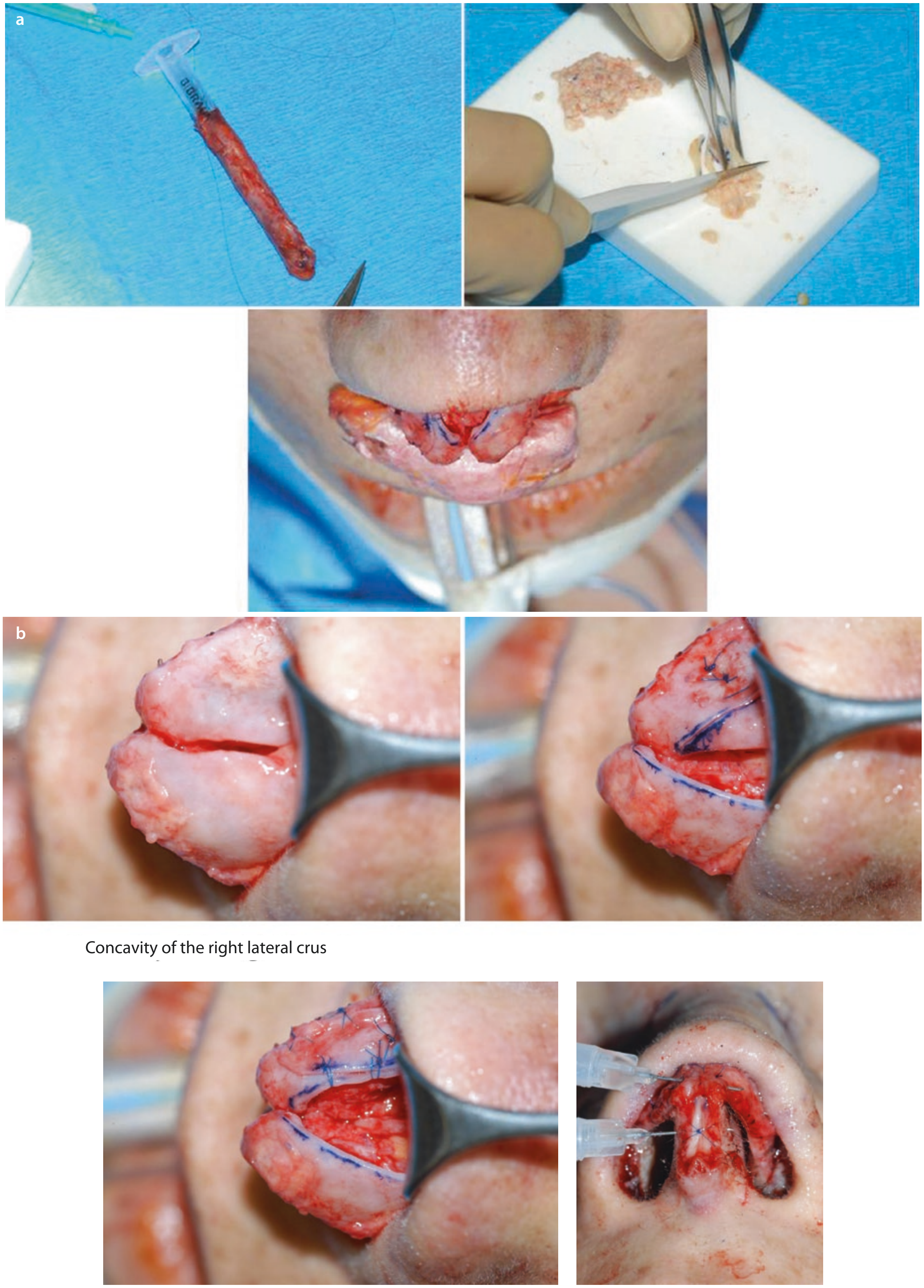
A 41-year-old female presented with a large ptotic nose. Previously we preferred endonasal techniques for rhinoplasty. However, in this case we performed a complete transfixion incision and resected a strip of the membranous septal skin to shorten the nose. Vertical dome division was then used to increase tip rotation and to narrow the tip. Although the cosmetic result was satisfactory, we have since abandoned this method because it is far less precise and reproducible compared with the contemporary suture-based technique (Fig. 11.56).

Fig. 11.56 (**a**–**c**) Internal nose lift

Fig. 11.56 (continued)

11.4.11 Case 28: Tip Correction by Columellar Strut (Sandwich Graft), Lateral Crural Steal Technique, Mattress Sutures Plus Double Layered Onlay Graft in Combination with Premaxillary Augmentation (DC-F Graft)

A 51-year-old female presented with a long nose and a ptotic nasal tip. Examination revealed an overly acute (45°) nasolabial angle from a retruded maxilla, a shortened columella, and collapse of the right lateral crus. Using the open rhinoplasty approach, a DC-F graft fashioned from autologous temporalis fascia and conchal cartilage was first used to augment the premaxilla. Tip support and rotation were then increased using a double-layered conchal strut graft from the contralateral ear. Tip rotation and refinement were further enhanced using the lateral crural steal technique. The right crural concavity was eliminated using the cephalic margins of both sides as a double-layered augmentation graft, and prophylactic augmentation grafts were placed into both soft-tissue facets because of the high risk of facet deformity from extreme tip rotation (Fig. 11.57).



■ **Fig. 11.57** (**a–b**) Fabricating a DCF for maxillary augmentation, correction of right concave lateral crus by horizontal mattress sutures followed by double layered onlay grafts from both cephalic portions. Columellar strut from double layered conchal graft. (**c–e**) Front view, profile view, base view pre-op/post-op

Fig. 11.57 (continued)

Fig. 11.57 (continued)

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Tip Refinement in Secondary Rhinoplasty

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_12

12.1 Surgical Principles in Secondary Tip Correction

The principles of tip rhinoplasty are largely the same for both primary and secondary rhinoplasty. However, in revision surgery, a shortage of inner or outer nasal lining frequently limits re-expansion of a foreshortened and/or underprojected tip framework. Although release of the external skin envelope with wide-field dissection may help to recruit additional external lining, a scarred and contractured internal lining is often the limiting factor in nasal re-expansion. In many cases, the nose was initially shortened by resecting portions of the internal nasal lining. Wide undermining alone seldom provides adequate soft-tissue lengthening, and relaxing incisions may be needed to obtain additional length. In stubborn cases, it is often useful to institute soft-tissue stretching exercises in order to pre-expand the nasal soft tissues. This is accomplished by having the patient repeatedly pull downward on the membranous septum, as well as on the outer nose, for 20–30 min daily over a period of at least 3 months. Sustained and repeated stretching will gradually increase soft-tissue compliance and length similar to tissue expansion.

The most common challenge encountered in secondary tip rhinoplasty is overresection of the tip cartilaginous framework—the lower lateral cartilages (LLCs), the nasal septum, or both. Overresection of the LLCs originates from the misconception that a smaller and more refined tip contour will result merely from cartilage excision. Ironically, aggressive cartilage excision will often have the opposite effect, resulting in poor definition, skeletal destabilization, and unpredictable cartilage collapse. In many cases, collapse will result in tip droop and polly-beak formation, further exacerbating the adverse cosmetic consequences.

To restore the overresected tip framework, the LLCs must be strengthened and reshaped using autologous cartilage grafts. In our hands, the preferred material for tip restoration is septal cartilage. Surplus septal cartilage is frequently available following "aesthetic rhinoplasty," in which the septum remains untouched. We usually thin the stripes of septal cartilage in the area of the intermediate crus with a motor drill so that bending becomes easier (◘ Fig. 12.1). In cases of previous septal cartilage depletion, we prefer autologous rib or ear cartilage as alternatives. Rib cartilage can be easily and precisely contoured using a motorized drill for thinning and smoothing. In younger patients, progressive surgical thinning of the rib graft on one side enables folding of the cartilage without fracture. Folded rib cartilage can be used to replace the nasal domes in reconstruction of overresected tip cartilages (▶ see Chap. 4). In contrast, with many older patients or in partially calcified rib specimens, the bending technique often results in unwanted fractures at the domal fold. When fractures are partial, scoring of the adjacent cartilage sometimes permits additional bending to create a suitable dome unit (◘ Fig. 12.2). In contrast, when the fracture is complete, the grafts are managed similar to a vertical dome division (◘ Fig. 12.3). In the occasional patient, the septal cartilage is extremely thick, enabling the distal columellar strut to be split in two and allowing for replacement of damaged nasal domes (◘ Fig. 12.4). When only segments of the lateral crura are missing, these are replaced with batten grafts (◘ Fig. 12.5).

Another problem in revision tip surgery, especially in thick-skinned noses, is insufficient contracture and adhesion of the skin envelope to the underlying skeletal framework. The result is an imbalance in size between the nasal skin envelope and the skeletal framework, ultimately resulting in the formation of dead space and poor soft-tissue definition. To avoid this problem, either the skeletal framework must be increased in size to stretch the skin envelope or the skin envelope must be reduced in size to improve surface contour and definition. Many patients confronted with this dilemma refuse skeletal enlargement because they are seeking a smaller nose. In those cases that result in poor tip definition and/or supratip fullness (often with polly-beak formation), a supratip skin excision can be helpful. A precise midline fusiform excision of full-thickness skin and subcutaneous soft tissue, followed by a subcutaneous closure, is used to enhance tip definition and minimize surface scarring (◘ Fig. 12.6).

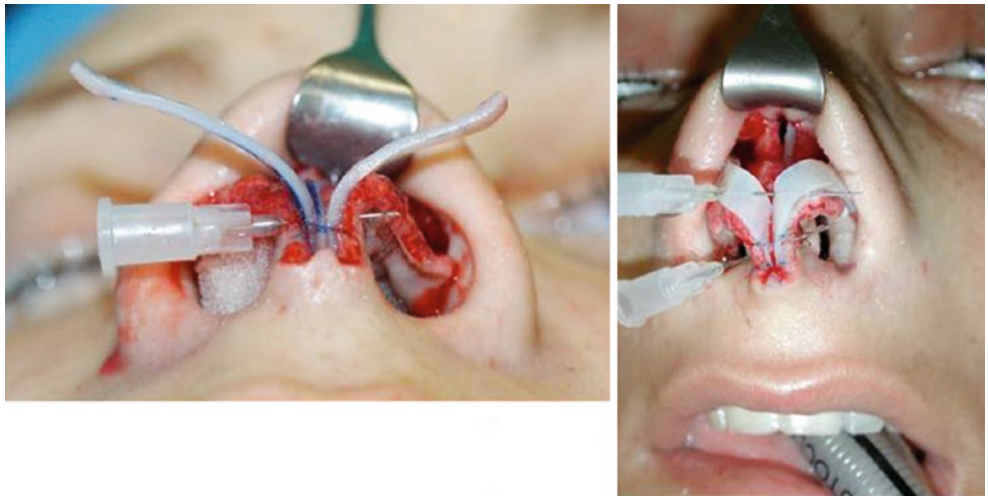


Fig. 12.1 Bending technique

Fig. 12.2 Scoring technique

Fig. 12.3 Dome division technique

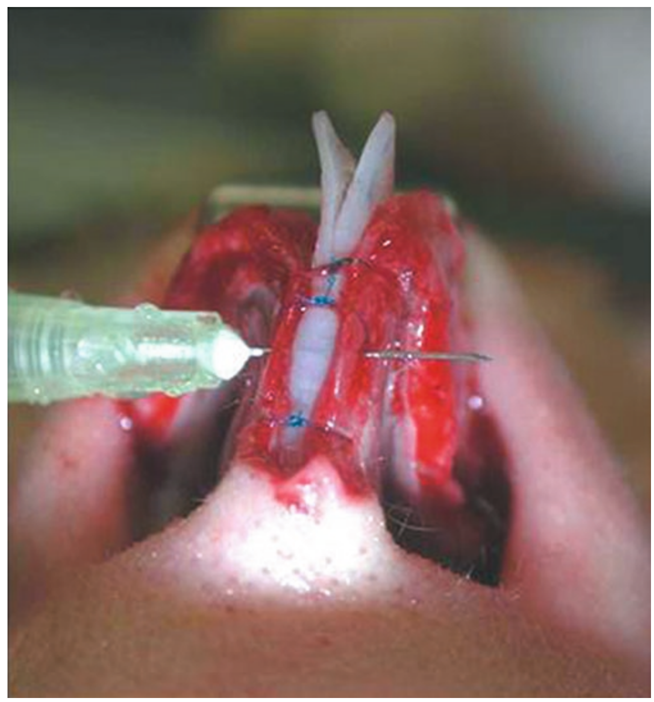


Fig. 12.4 Split technique

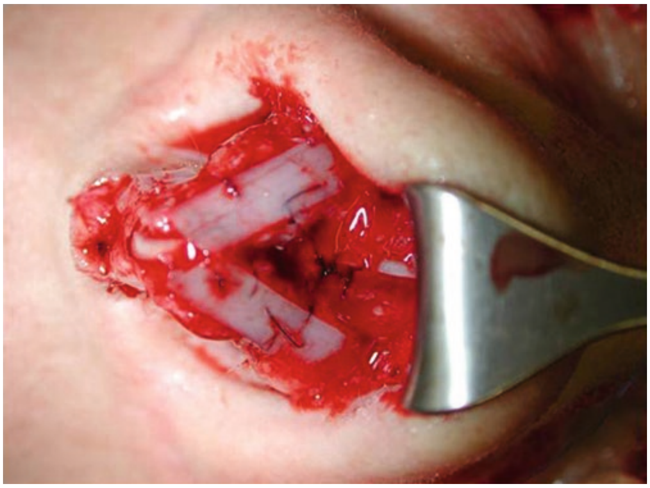


Fig. 12.5 Batten graft technique

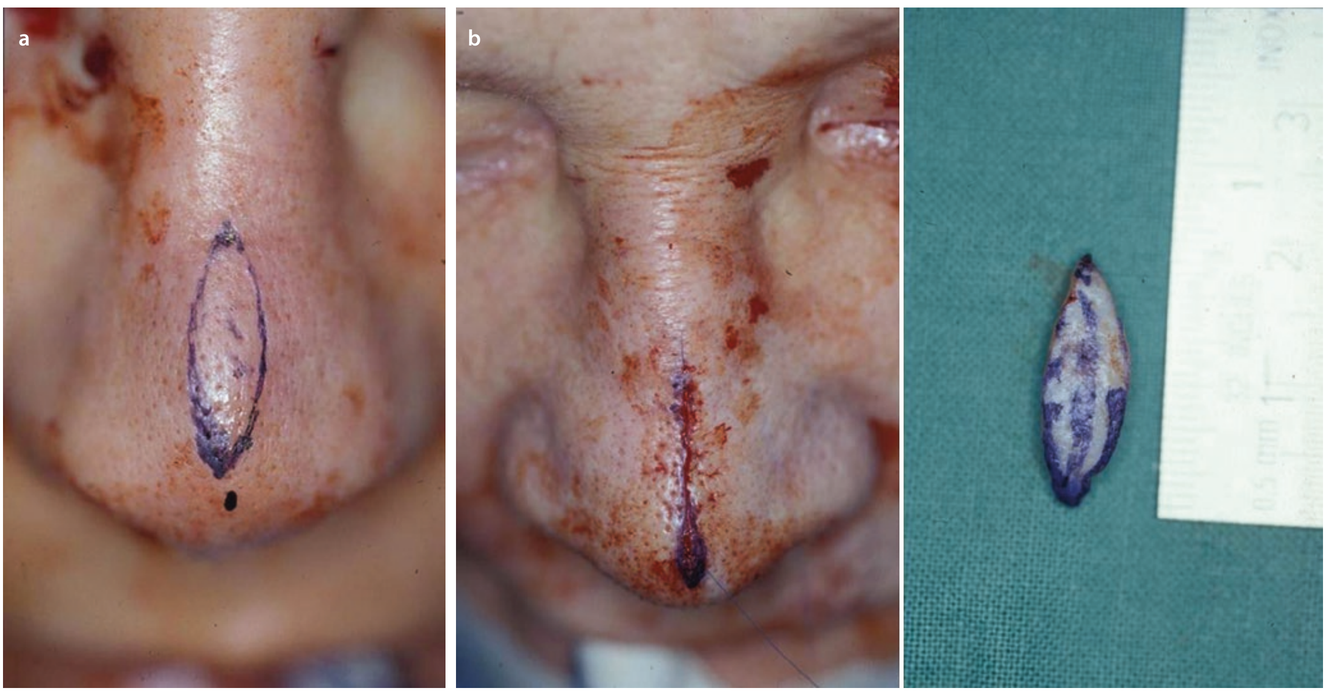


Fig. 12.6 (**a**, **b**) Supratip excision

12.2 Case Studies

12.2.1 Case 1: Suture and Shield Grafts

A 37-year-old female presented after previous septorhinoplasty with a 10-mm septal perforation, inadequate tip projection, and a persistent dorsal hump (Fig. 12.7). Using the open rhinoplasty approach and careful dissection at the ULC/dorsal septal junction, the septal perforation was repaired using the four-flap technique. Surgical exploration also revealed an unstructured mass of cartilage fragments within the nasal tip. The mass was divided vertically in the midline, and a double-layered (conchal) sandwich graft was then placed to stabilize and straighten the medial crura. After lowering the dorsum with a component technique, the over-projected upper lateral cartilages (ULCs) were invaginated and sutured to the dorsal septum as spreader flaps. The tip was then contoured by using horizontal mattress sutures to shape the scar-embedded cartilage fragments. A double-layered shield graft and bilateral alar rim grafts were then placed for better tip projection and tip contour, followed by a tip suspension suture to suspend and immobilize the tip complex.

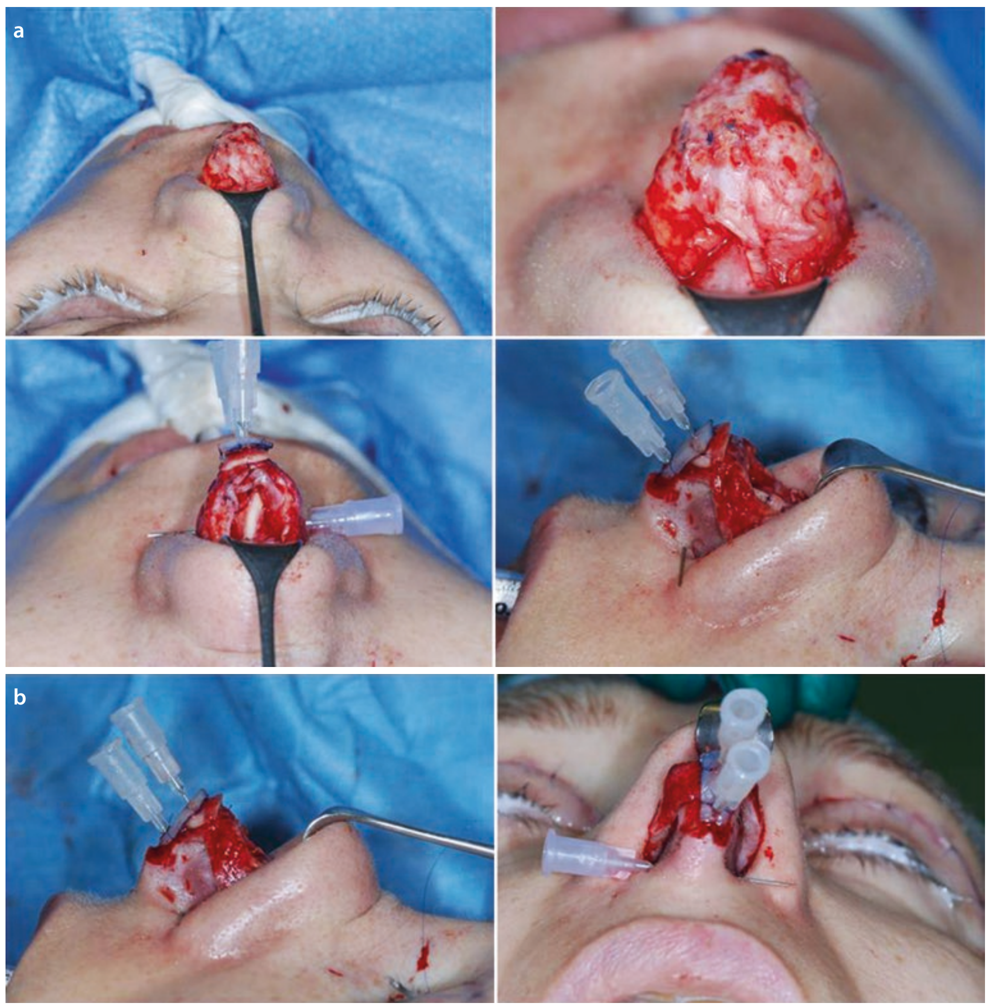


Fig. 12.7 (**a**–**b**) Tip contouring with double-layered shield graft, horizontal mattress sutures, and bilateral alar rim grafts. (**c**–**e**) Front view, profile view, base view pre-op/post-op

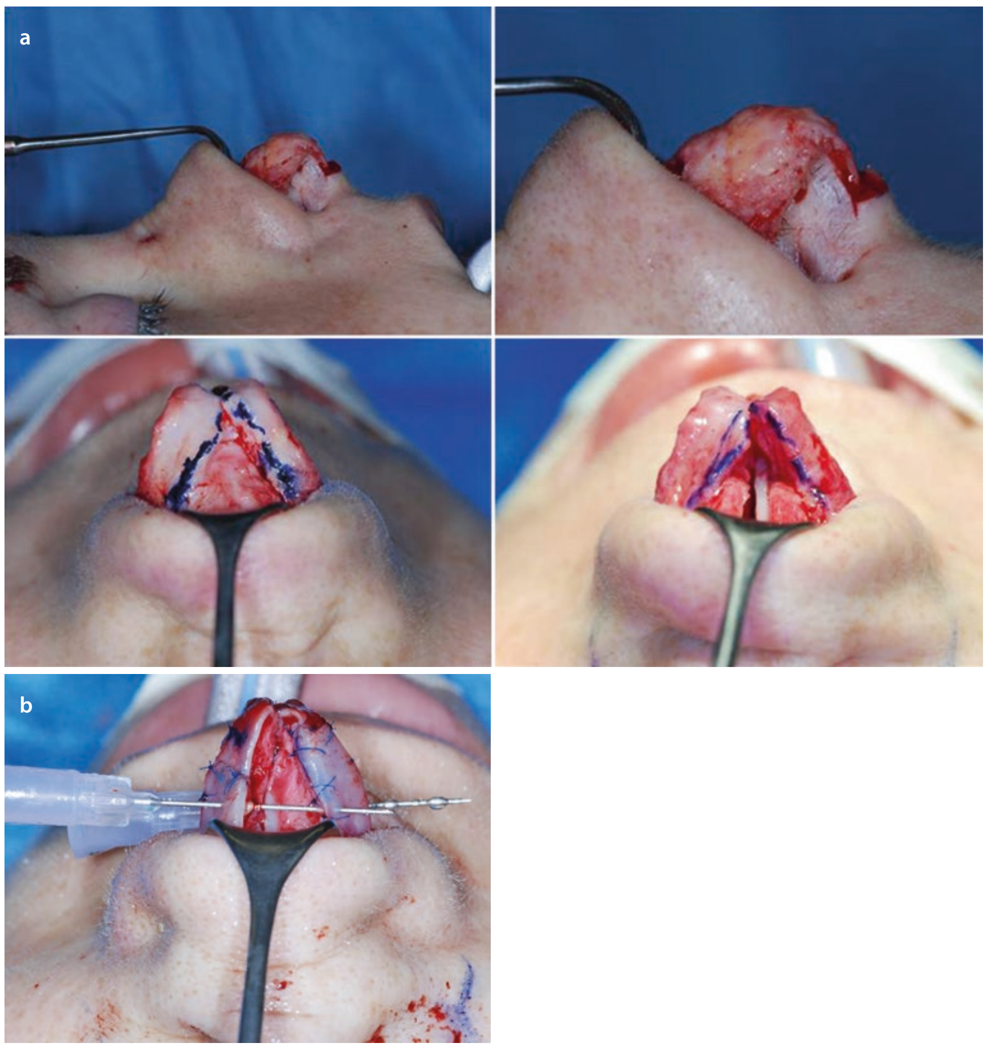
12

Fig. 12.7 (continued)

Fig. 12.7 (continued)

12.2.2 Case 2: Alar Reconstruction with Septal Cartilage

A 26-year-old female presented for revision rhinoplasty complaining of an unattractive nasal profile (◘ Fig. 12.8). Examination revealed facial asymmetry; a polly-beak deformity with a narrow, overprojected, and deviated dorsum; and pinching of the internal nasal valves. Using the external rhinoplasty approach, nasal exploration revealed heavy subcutaneous scarring and asymmetry of the lateral crura caused by overresection of the right crus and inadequate resection of the left. An overprojected and irregular dorsum was lowered to create a straight and smooth dorsal profile. Spreader flaps were then used to reconstitute the middle vault and eliminate internal valve collapse. The bony vault was also reshaped with bilateral osteotomies. Strips of autologous septal cartilage were then harvested to reconstruct the right intermediate and lateral crura, and transdomal sutures were used to contour the tip. Tip rotation was stabilized using a tip suspension suture with a posterior sling, and alar rim grafts were used for alar contour enhancement. The reconstructed tip complex was then covered with a double-layered allogenic fascia lata graft.



◘ **Fig. 12.8** (**a**) Overresected lateral crus right, inadequate trimming of the lateral crus left. (**b**) Reconstruction of the right overresected lateral crus by septal batten graft, then ala spanning sutures. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.8 (continued)

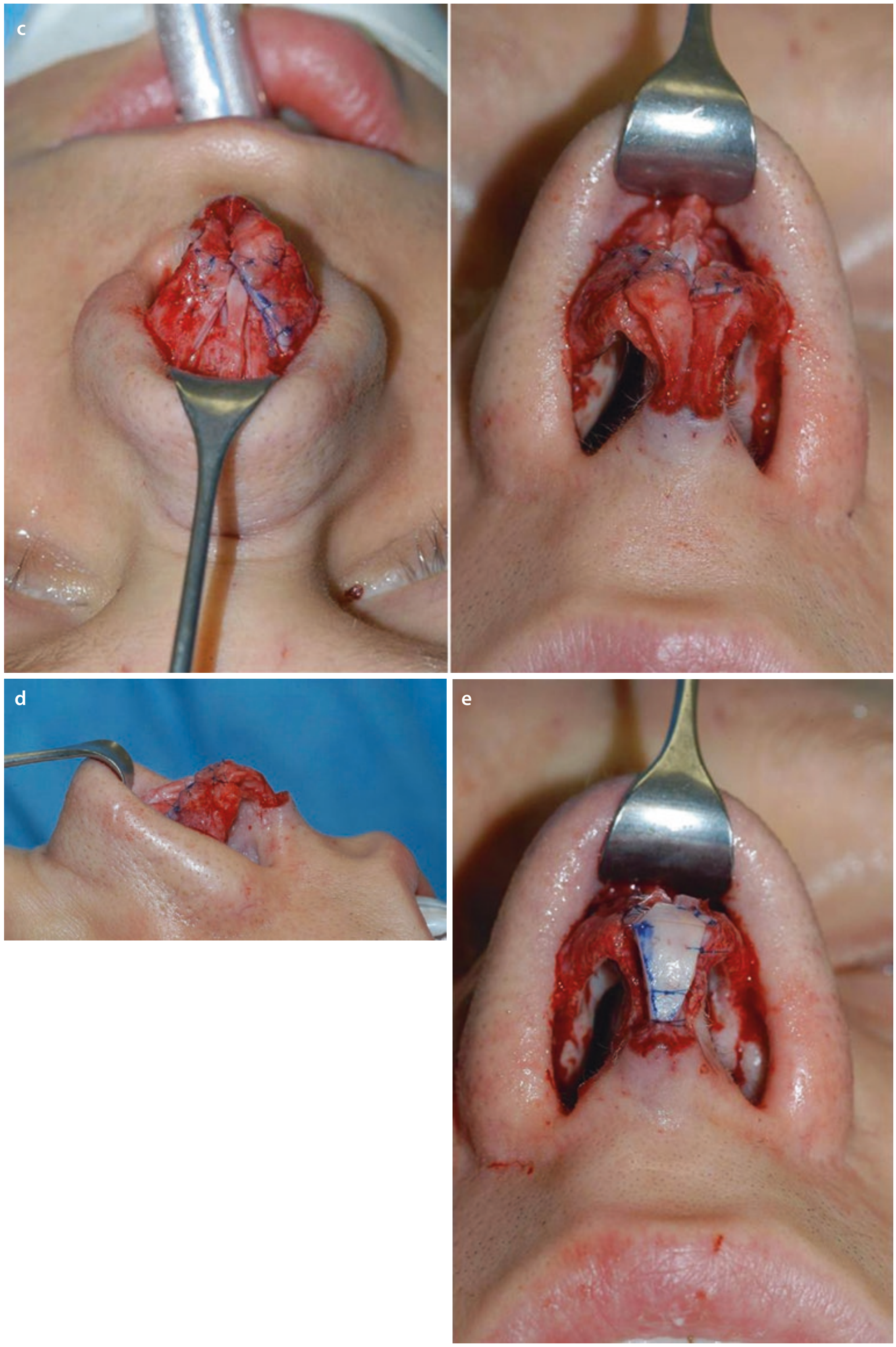
Fig. 12.8 (continued)

12.2.3 Case 3: Fold-Under Flap Combined with Lateral Crural Overlay

A 25-year-old male presented for revision rhinoplasty (◘ Fig. 12.9). Examination revealed a polly-beak profile deformity and external valve collapse during inspiration. On frontal view, the nose was canted to the patient's right side, and on basal view an oblique columella resulted in nostril asymmetry. Using the external approach, the overprojected cartilaginous dorsum was lowered and reconstructed with spreader flaps. The tip was strengthened with fold-under flaps (lateral crural underlay technique) on both sides, and tip symmetry was achieved using a one-sided lateral crural overlap technique. The tip was further contoured using a shield graft harvested from the tragus, and alar rim grafts were placed bilaterally.

◘ **Fig. 12.9** (**a**–**e**) Tip reconstruction with fold-under flaps on both sides combined with an overlap technique on the *left*. Additional shield graft. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 12.9 (continued)



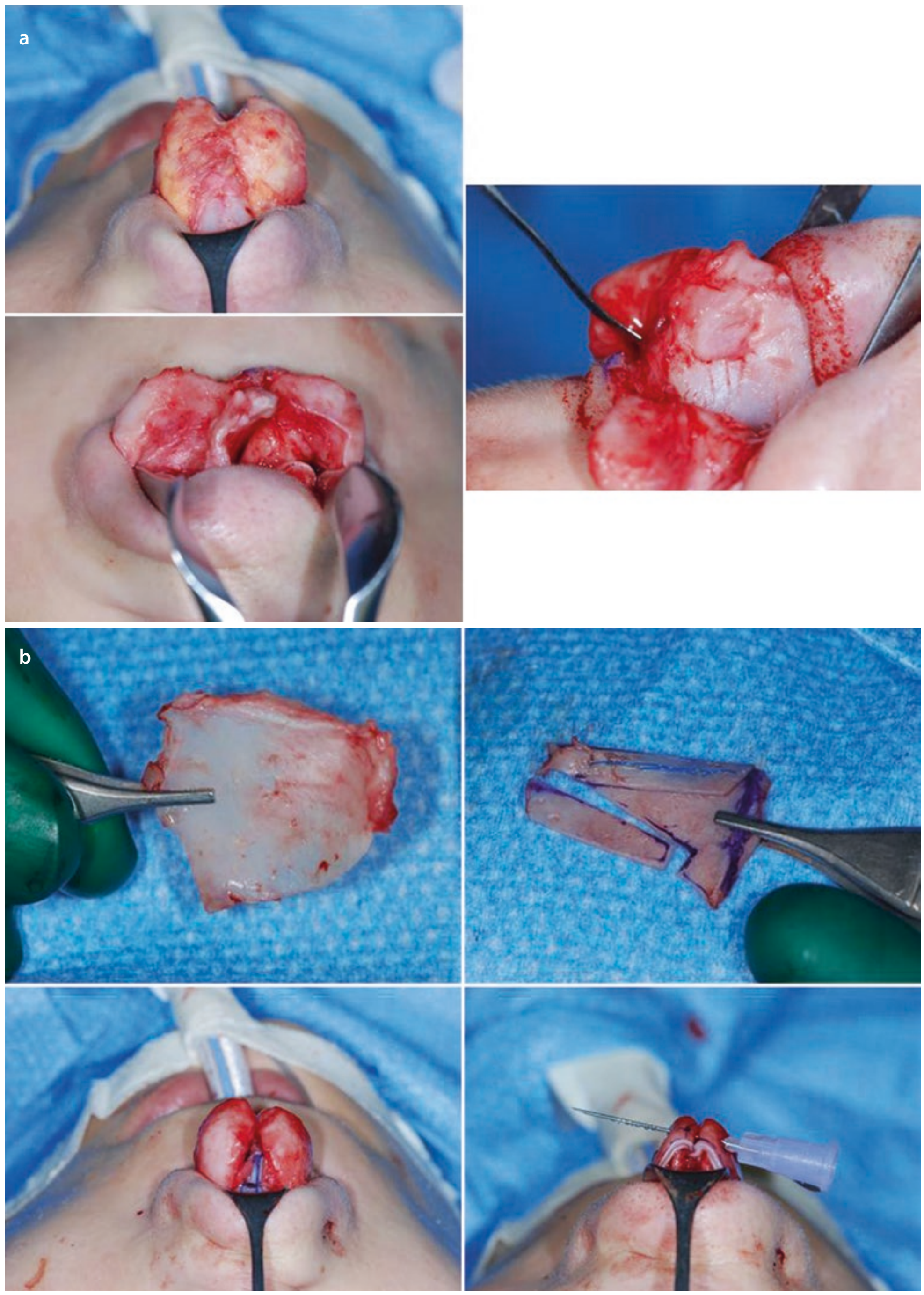
■ **Fig. 12.9** (continued)

Fig. 12.9 (continued)

12.2.4 Case 4: Combination Columellar Strut/Cephalic Fold-Under Flap/Suspension Suture with Anterior Sling

A 30-year-old female presented after unsuccessful rhinoplasty with nasal obstruction (◘ Fig. 12.10). Examination revealed a deformed (oblique) anterior septum obstructing both nasal passages, and the right nostril was observed to collapse on gentle inspiration. The tip was bulbous, wide, and ptotic, with unusually thick skin and poor definition, and the dorsum was overprojected.

Using the open rhinoplasty approach, the residual septum was removed, and spreader grafts were used to create a straight neoseptum. After dorsal hump reduction and osteotomies, the neoseptum was replaced and sutured to the ULCs, nasal bones, and anterior nasal spine (ANS) using drill holes. Following columellar strut placement, the lateral crura were strengthened using cephalic fold-under flaps. A suspension suture with an anterior sling, combined with spanning sutures, was then used for tip rotation and contouring.



◘ **Fig. 12.10** (**a**–**e**) Extracorporeal septal reconstruction, cephalic fold-under flaps. (**a**) Severe septal deformity. (**b**) Extracorporeal septal reconstruction, cephalic fold-under flaps. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.10 (continued)

■ **Fig. 12.10** (continued)

12.2.5 Case 5: Technique: Supratip Excision

In cases of tip refinement with very thick and scarred tip skin, shrinkage and adherence of the skin envelope to the reduced cartilaginous framework is often incomplete and prone to dead space formation and additional subcutaneous scarring (Fig. 12.11). In order to achieve an attractive tip profile, there are only two options to eliminate this problem: either enlarge the framework to stretch the scarred and thickened tip skin or reduce the size of the nasal skin envelope. Since most patients will refuse a bigger nose to achieve better tip contour, reduction of the skin envelope may be advisable. To reduce skin volume and tighten the skin envelope, a supratip elliptical skin excision is performed in the midline just behind the tip-defining point. When the amount of skin excision is judged correctly, the wound edges collapse automatically and need almost no suturing. Only a subcutaneous suture approximation and supportive taping are required.

A 40-year-old female presented with a conspicuous polly-beak deformity after two previous rhinoplasties. The tip skin was extremely thick and sebaceous. The nostrils were also asymmetrical, and the endonasal examination revealed a septal deviation to the left and a subluxation of the caudal septum to the right. The right lateral crus also appeared to have been overresected.

Using an open rhinoplasty approach, the scars on the tip framework and the dorsum were removed, but the skin flap was not thinned. The caudal septum was then shortened at its base and sutured back to the ANS through transverse osseous drill holes. Harvesting of the left concha cartilage was challenging because of previous otoplasty, but it was still possible to fabricate a double-layered sandwich graft from the left ear. The graft was placed in the membranous septal pocket using a percutaneous columellar guiding suture and then sutured to the caudal septum as a septal extension graft. The weak lateral crura were then augmented with onlay batten grafts fashioned from ear cartilage on the left side and septal cartilage on the right. To improve tip contour, a nonintegrated shield graft was placed so that the graft projected slightly higher than the domes. As the final step, a longitudinal supratip skin excision was performed to eliminate the stubborn polly-beak deformity.

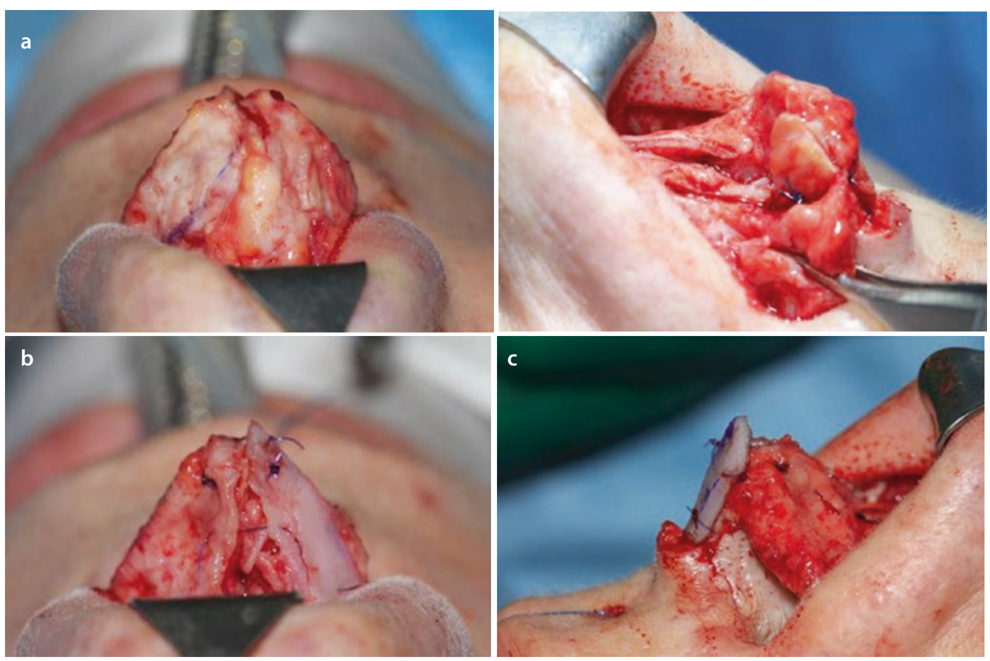


Fig. 12.11 (**a**) Scarred tip. (**b**) Contouring the tip with suture technique. (**c**) Non integrated shield graft to support the contouring. (**d**) Supratip excision: technical details. (**e**–**g**) Polly-beak correction with supratip excision. Front view, profile view, base view pre-op/post-op

Fig. 12.11 (continued)

Fig. 12.11 (continued)

Fig. 12.11 (continued)

12.2.6 Case 6: Reconstruction of the Lower Framework with Septum via Bending Technique

A 27-year-old female presented drooped tip with overprojected dorsum after previous operation (Fig. 12.12). After opening the nose via external approach resection of both intermediate and both lateral crura has been revealed.

The septum was intact, so that after separating the ULC both upper and lower tunnels have been dissected, the dorsum was lowered then the central part of the septum has been harvested, leaving back a 25 mm wide framework. The bony pyramid was narrowed after low-to-low lateral, parasagittal medial, and transcutaneus transverse osteotomies. The excess of the ULC, which resulted from lowering the dorsal septum, was invaginated and fixed to the septum as spreader flaps. Two long strips from septal cartilage have been fixed to the residual medial crural, a columellar strut has been put in between the thin septal cartilage strips could be bended in the dome area, fixed by intradomal sutures and then the lateral part has been fixed directly to the scars on top of the vestibular skin. The contour was shaped by spanning suture, which has been fixed to the dorsal septum (tip suspension suture with posterior sling). A shield graft was placed and two layers of allogenic fascia covered the dorsum.

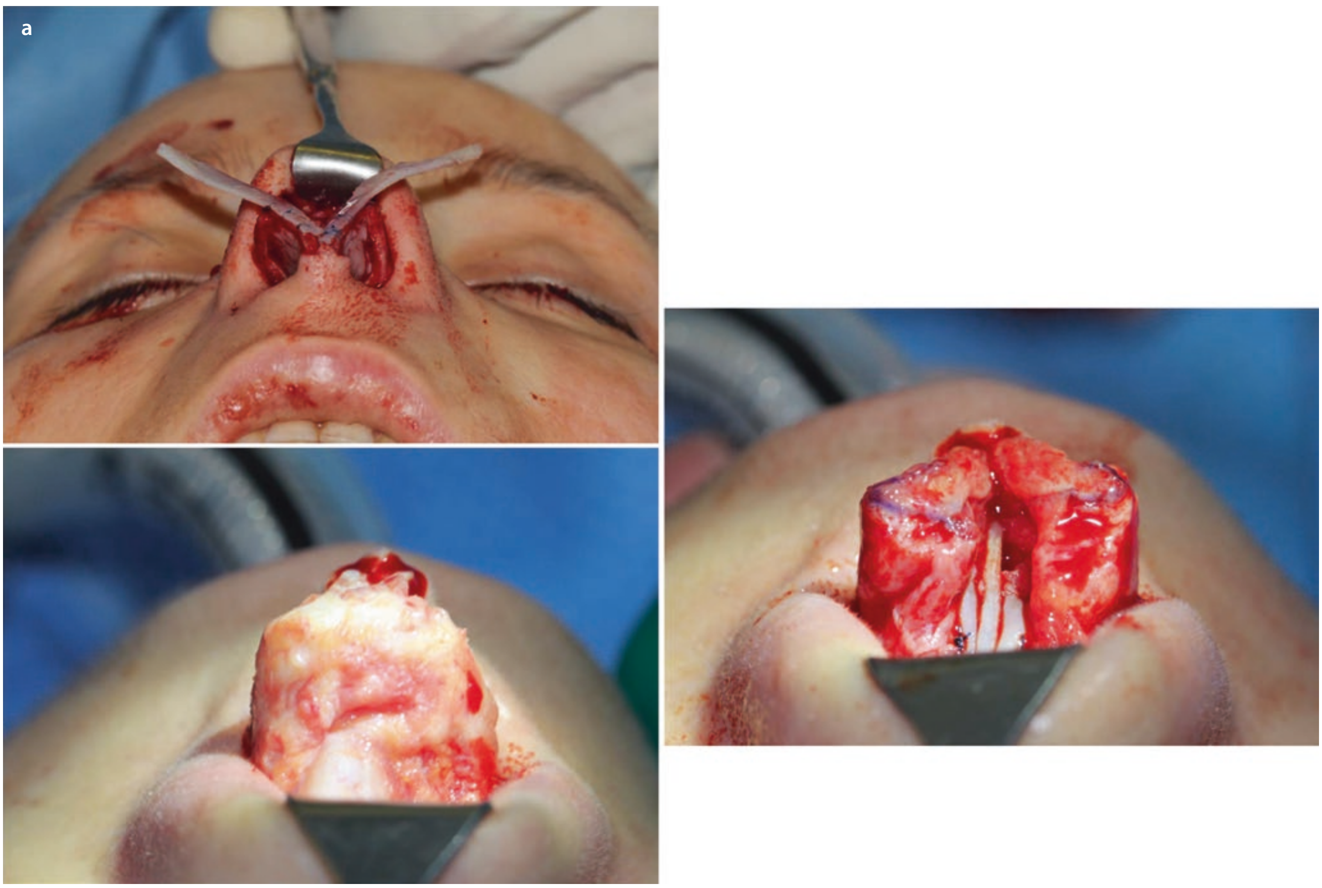
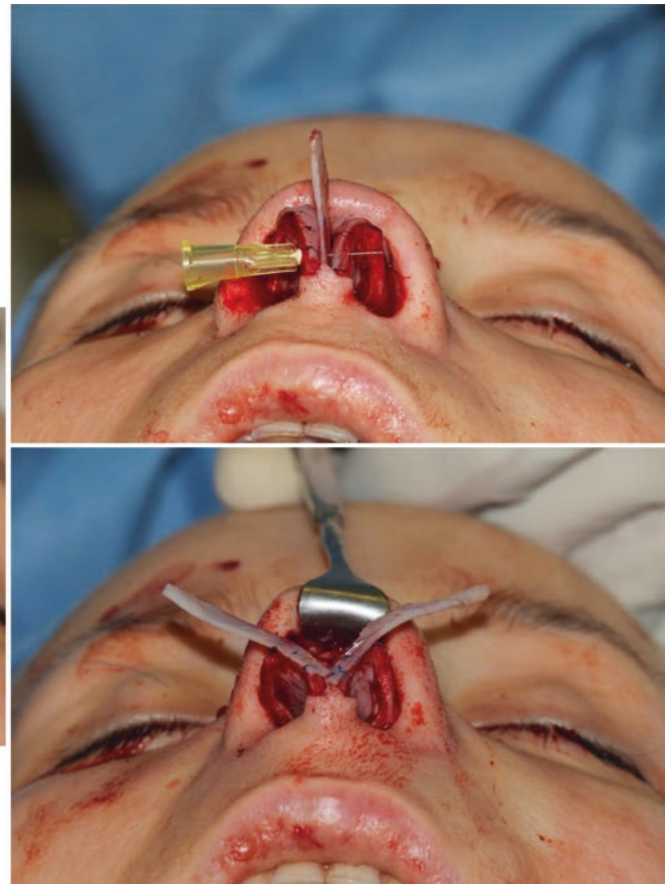


Fig. 12.12 (**a**–**c**) Reconstruction of the lower framework with bending technique using septal cartilage. (**d**–**f**) Front view, profile view, and base view preoperative and 17 months postoperative

b



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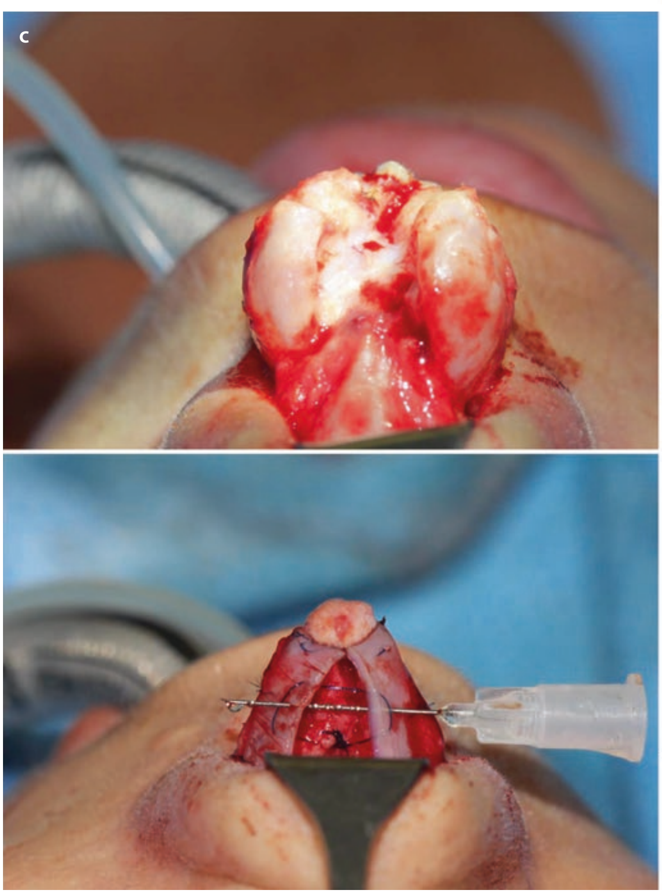


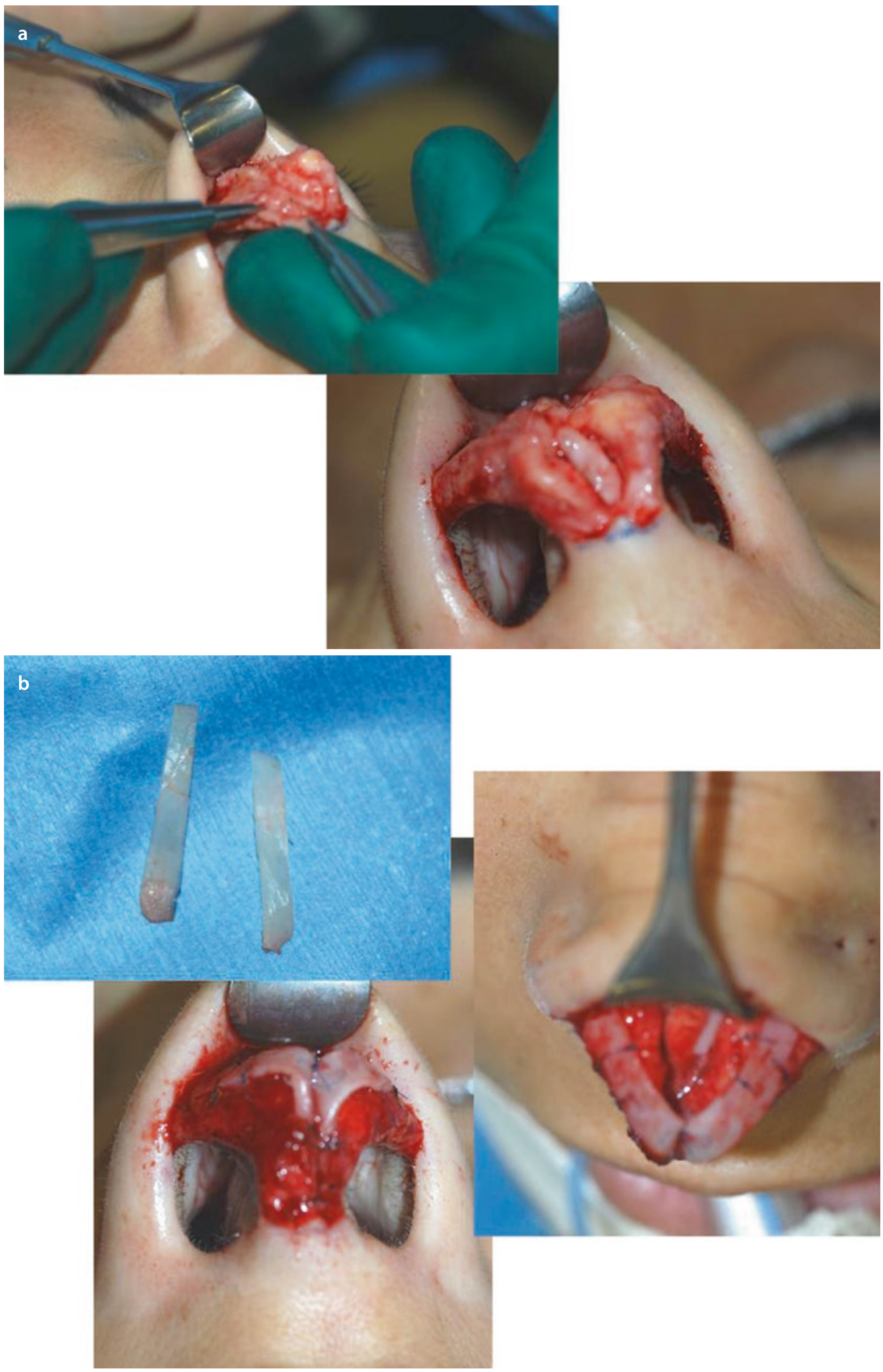
Fig. 12.12 (continued)

Fig. 12.12 (continued)

■ **Fig. 12.12** (continued)

12.2.7 Case 7: Reconstruction of the Lower Framework with Septum via Bending Technique

A 29-year-old female presented for revision rhinoplasty after two previous failed attempts at rhinoplasty elsewhere (■ Fig. 12.13). The patient sought correction of the C-shaped dorsal curvature, pinching of the dorsum, and poor tip projection. Using the open rhinoplasty approach, an S-shaped curvature of the dorsal septum was observed. Correction of the crooked L-strut involved shortening the caudal septum at its base so that it fit into the sagittal groove of the nasal spine, followed by suture fixation of the caudal septum. The cartilaginous dorsum was then lowered and reconstituted using spreader flaps to straighten and widen the middle vault. Strips of septal cartilage were then used to reconstruct the deformed nasal domes previously treated with vertical dome division. The newly created domes were then stabilized with a shield graft. Because of exceptionally thin nasal skin, the tip construct was also covered with two layers of allogenic fascia lata.



■ **Fig. 12.13** (**a**–**b**) Reconstruction of the overresected LLCs with septal cartilage using bending technique. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.13 (continued)

Fig. 12.13 (continued)

12.2.8 Case 8: Reconstruction of the Lower Framework with Septum via Bending Technique

A 24-year-old male presented for revision surgery after two previous rhinoplasties elsewhere (Fig. 12.14). He complained of a feminized nose with overresection of the dorsum, tip deformity, and alar retraction. Using the open approach, the tip framework was found to be severely damaged. Autologous septal cartilage was used to create narrow strips for tip reconstruction using the bending technique. Paired grafts were first sutured to the medial crura and then carefully thinned at the domes using a motorized drill equipped with a diamond fraise. This enabled folding of the grafts to create neodomes, which were then further contoured using transdomal sutures. The opposite ends were then sutured to the underlying lateral crura to contour the alar rims, and the domes were padded with a soft-tissue onlay. The dorsum was also augmented with conchal cartilage and covered with allogenic fascia lata.

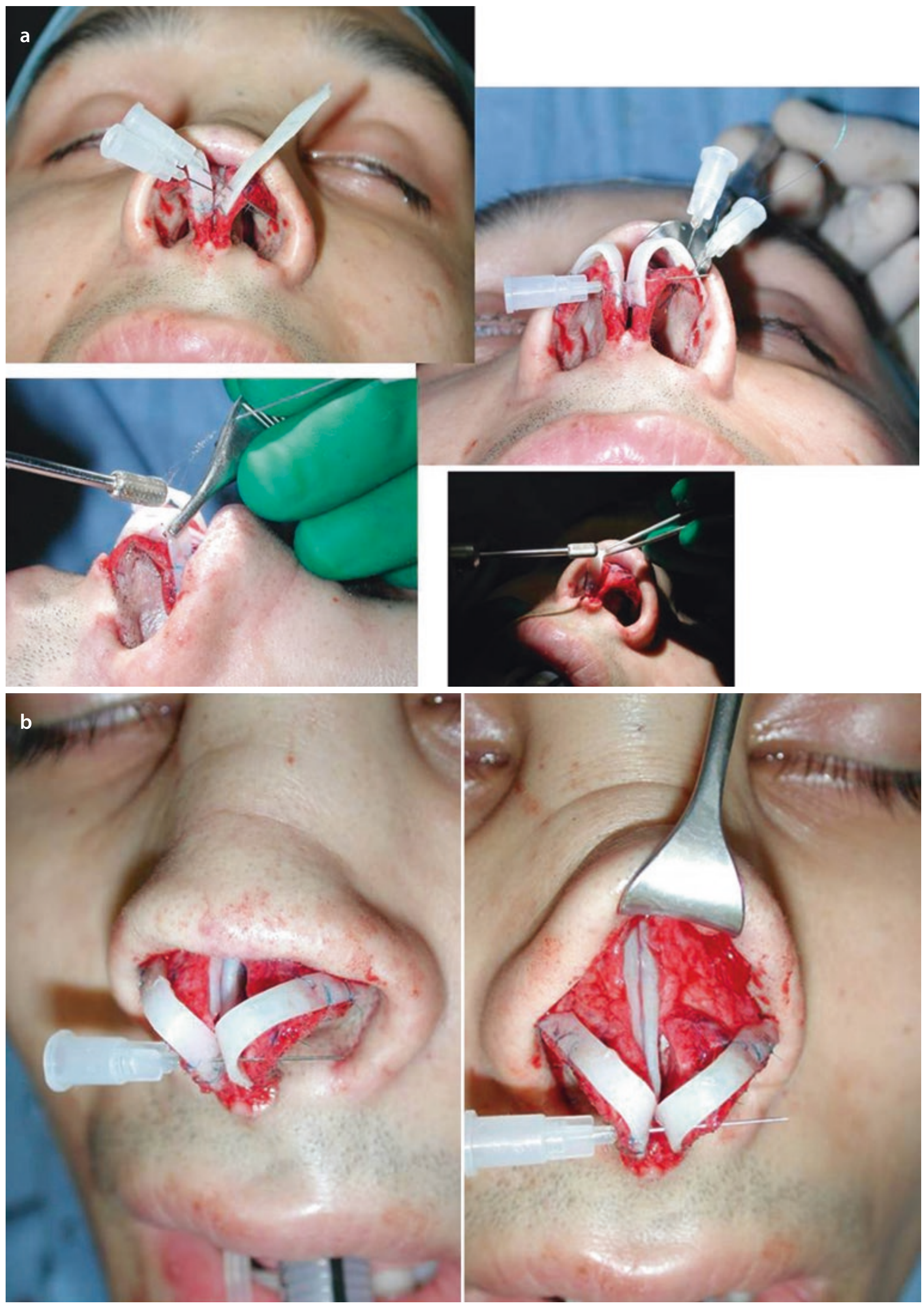


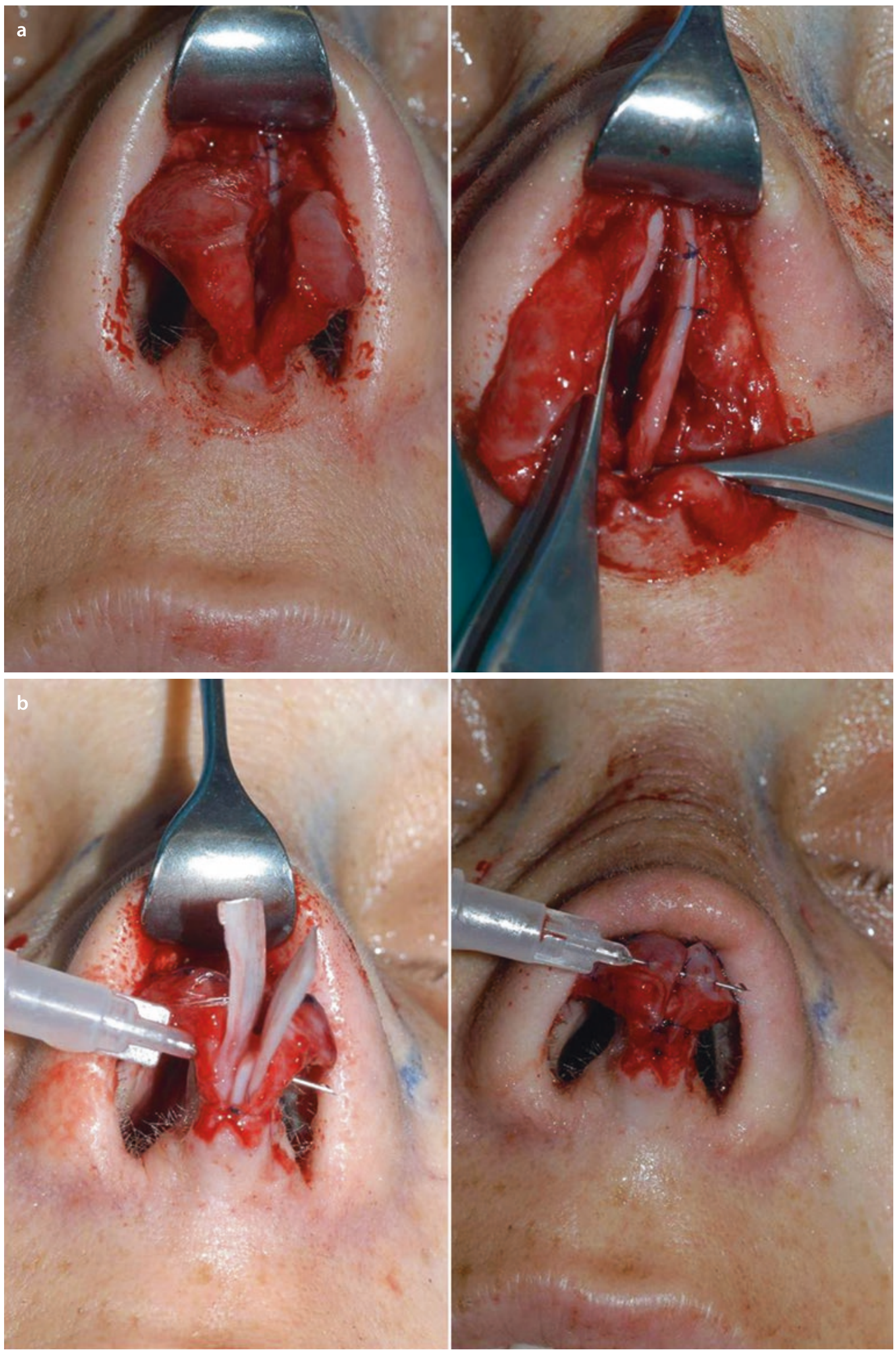
Fig. 12.14 (**a**–**c**) Reconstruction of the overresected LLCs with septal cartilage using bending technique. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 12.14 (continued)

Fig. 12.14 (continued)

12.2.9 Case 9: Reconstruction of the Lower Framework with Septum via Bending Technique

A 31-year-old female presented after two unsuccessful rhinoplasty procedures (◘ Fig. 12.15). The patient complained of a persistent dorsal hump and a wide underprojected nasal tip. Open rhinoplasty revealed bilateral alar cartilage malformations involving the lateral and intermediate crura on both sides. Dorsal reduction was performed using the spreader flap technique to straighten and widen the dorsum, widen the internal valves, and improve the dorsal aesthetic lines. Thin battens of septal cartilage were used as onlay grafts to replace the nasal domes and to smooth the lateral crura. Tip sutures were then used to contour the domal replacement grafts and to conceal intermediate crural asymmetry. A well-defined and narrow tip with better projection was achieved.



◘ **Fig. 12.15** (**a**–**c**) Reconstruction of the overresected LLCs with septal cartilage using bending technique. (**d**–**f**) Front view, profile view, base view pre-op/post-op

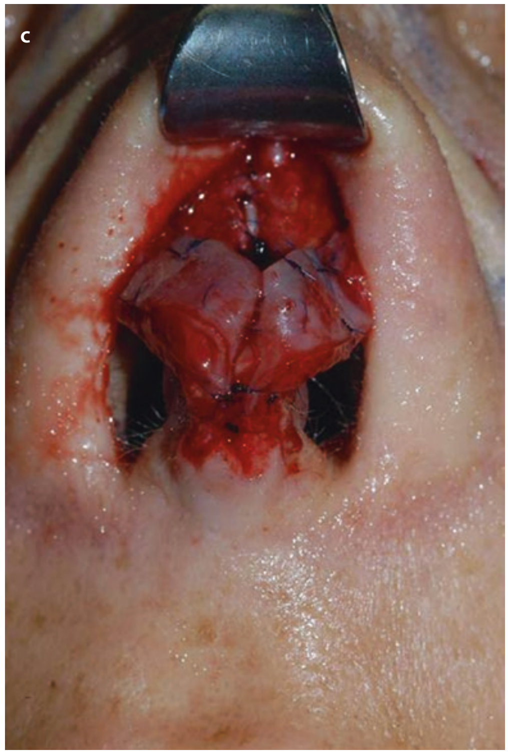


Fig. 12.15 (continued)

Fig. 12.15 (continued)

12.2.10 Case 10: Reconstruction of the Lower Framework with Septum via Bending Technique

A 27-year-old female presented with fullness of the supratip after previous rhinoplasty (Fig. 12.16). The dorsum revealed irregularities, and she complained about deviation of the bony pyramid. Scars resulting from previous alar base resections were also quite obvious.

Surgical exploration using the open approach revealed total resection of both the lateral crura and the right intermediate crus. A large septal cartilage graft was harvested leaving a 15-mm L-strut. The nasal axis was straightened with osteotomies and placement of spreader grafts. The medial crural footpods were resected to narrow the columellar pedestal, and a columellar strut was placed for tip support. On the right side, the intermediate and lateral crura were reconstructed using a long cartilaginous strip fashioned from donor septal cartilage. The graft was thinned with a scalpel at the dome for easier bending. On the left side, a cartilage graft was fixed to the remnant intermediate crus and thinned at the dome; both domes were then formed using a transdomal suture. For better contour, a shield graft was sewn to the infratip, and because of thin nasal tip, skin allogenic fascia lata was used to cover the tip construct.

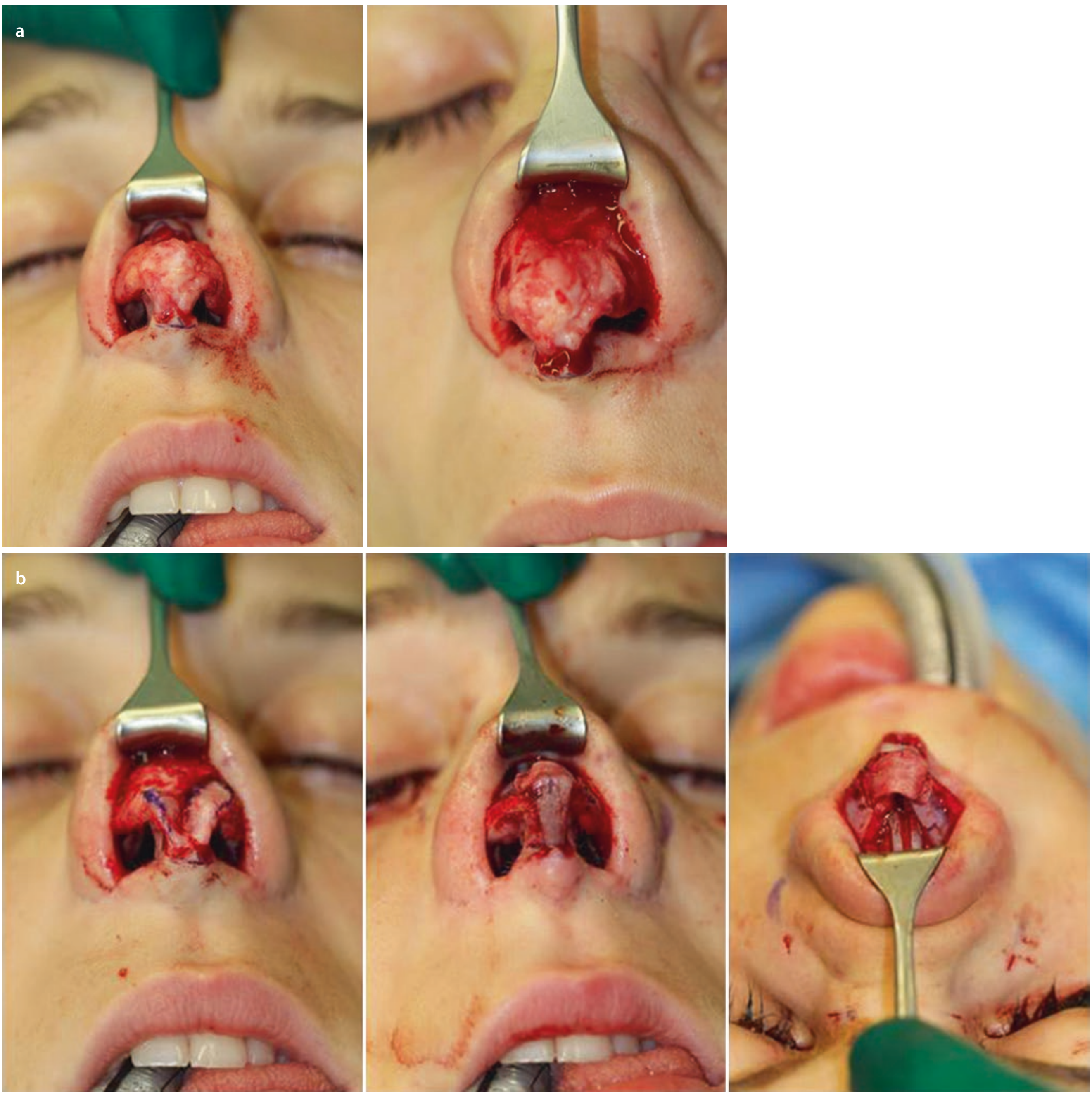


Fig. 12.16 (a–b) Reconstruction of the overresected LLCs with septal cartilage using bending technique, additional shield graft, covered with allogenic fascia. (c–e) Front view, profile view, base view pre-op/post-op

Fig. 12.16 (continued)

Fig. 12.16 (continued)

12.2.11 Case 11: Reconstruction of the Lower Framework with Septum via Bending Technique

A 29-year-old female presented after previous rhinoplasty with a wide and droopy nasal tip, pinched alae, a pseudo-hump deformity, and deviation of the nasal axis (Fig. 12.17).

Using the open approach, surgical exploration revealed previous resection of both lateral crura and a dislocated shield graft. A large piece of septal cartilage was harvested for graft fabrication while preserving a strong residual L-strut. After straightening and narrowing the bony pyramid with parasagittal medial osteotomies combined with percutaneous low-to-low lateral and transverse osteotomies, spreader grafts were placed for dorsal stabilization. The tip was also reconstructed using septal cartilage to create a double-layered columellar strut graft and lateral crural replacement grafts, which were sculpted with both transdomal and spanning sutures. A tragal graft was used to create a shield graft, which was covered with intercrural soft tissue. The original malpositioned shield graft was divided longitudinally and used to create bilateral rim grafts. To improve surface contour, the tip and dorsum were then draped in a layer of allogenic fascia lata.

■ **Fig. 12.17** (**a**–**d**) Reconstruction of the overresected LLCs with septal cartilage using bending technique. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 12.17 (continued)

Fig. 12.17 (continued)

12.2.12 Case 12: Reconstruction of the Lower Framework with Septum via Bending Technique

A 23-year-old female presented after two previous rhinoplasties with a slight nasal deviation resulting from a deformed dorsal septum in an asymmetric face (◘ Fig. 12.18). Additionally, a conspicuous tip asymmetry with bossae formation was also observed. The sharp tip edges mimicked a poorly shaped tip graft protruding through the extremely thin nasal skin. Supratip fullness was also observed on profile examination.

Using an open surgical approach, exploration revealed severe overresection of both lateral crural cartilages. On the left side, the lateral crus must have been malpositioned because the remnants remained asymmetrical. Additionally, no reconstruction of the internal valve had been performed, and both valves were now exceedingly narrow. Treatment began by harvesting spreader grafts and two long thin cartilage strips for LLC reconstruction from the quadrangular septum. The paired tip grafts were then sutured to the medial crura, bent to create new domes, and secured with a transdomal suture. The lateral segments of the tip grafts were then sewn directly to the scarred vestibular skin to complete the LLC reconstruction. Final contouring of the reconstructed tip framework was achieved using spanning sutures in combination with a tip suspension suture with a posterior sling. To conceal the tip grafts, a layer of allogenic fascia lata was used to cover the reconstructed tip.

Straightening of the nasal axis was accomplished using paired spreader grafts to straighten the dorsal septum (and open the nasal valves), coupled with parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies of the bony vault. Because of facial asymmetry, the axis of the nose could not be exactly vertical.

Fig. 12.18 (**a**–**c**) Different grafts from the septum: spreader grafts combined with reconstruction of the overresected LLCs using bending technique. (**d**–**f**) Front view, profile view, base view pre-op/post-op

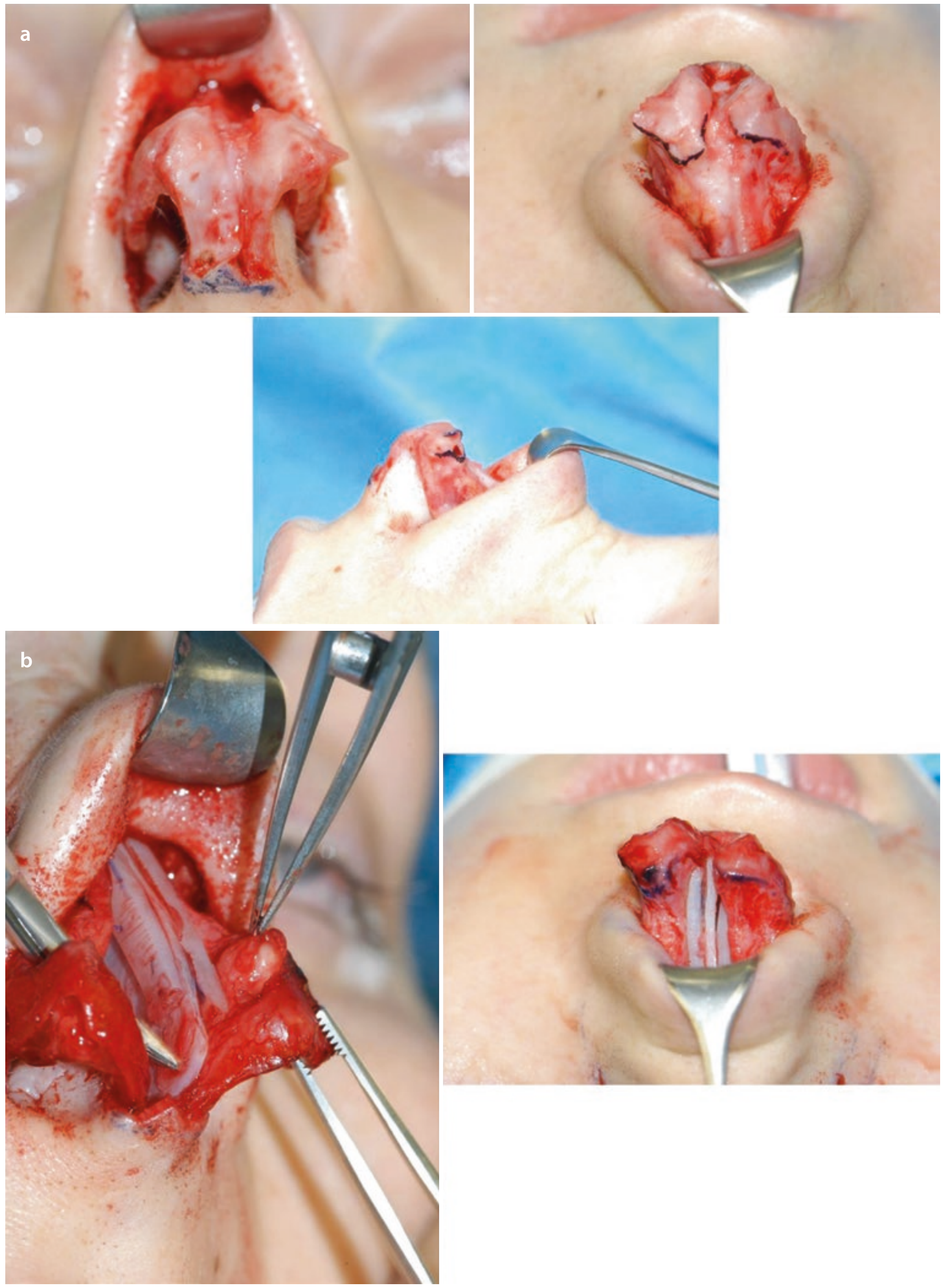


Fig. 12.18 (continued)

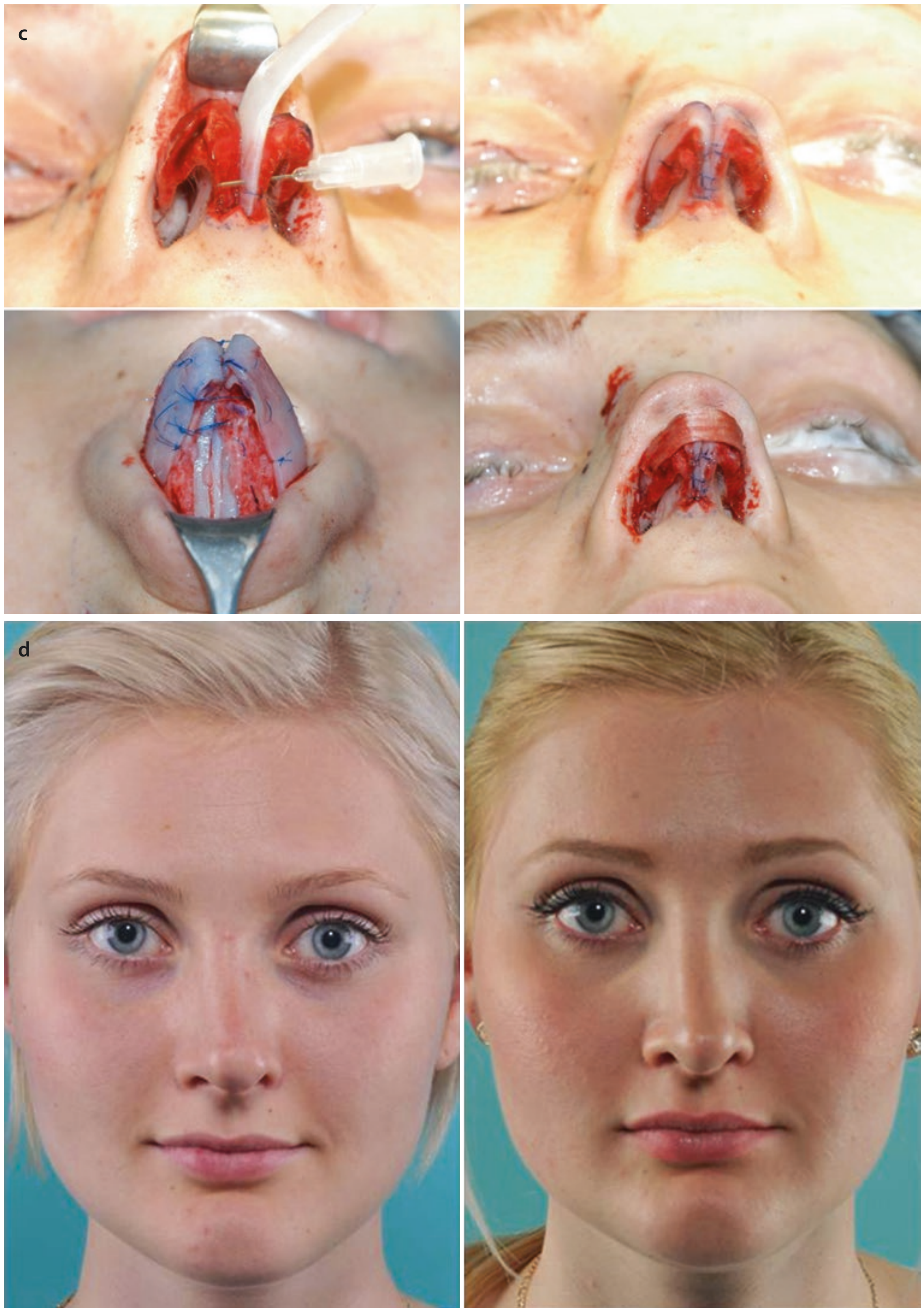


Fig. 12.18 (continued)

12.2.13 Case 13: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 31-year-old female presented after two prior cosmetic rhinoplasties with a conspicuous polly-beak deformity (Fig. 12.19). Surgical exploration with the open approach revealed complete absence of the right lateral crus and malpositioning of the intermediate crural remnant. Reconstruction included columellar strut placement followed by replacement of the missing right lateral crus with a batten graft fashioned from septal cartilage. A shield graft with carefully beveled edges was also placed to enhance tip contour and projection. Allogenic fascia lata was then used to camouflage the tip reconstruction.

Fig. 12.19 (**a**–**c**) Reconstruction of the overresected LLC using batten graft, columellar strut, and shield graft, covered with allogenic fascia lata. (**d**–**e**) Front view, profile view pre-op/post-op

■ **Fig. 12.19** (continued)

12.2.14 Case 14: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 39-year-old female presented 10 years after previous rhinoplasty (elsewhere) (Fig. 12.20). Examination revealed a wide, amorphous, and asymmetrical tip, bilateral alar retraction, and an inverted-V deformity of the middle vault. External rhinoplasty revealed total destruction of both lower lateral cartilages. Tip reconstruction was performed using a columellar strut and bilateral crural batten grafts fashioned from septal cartilage. Spanning sutures were then added for tip contouring, and spreader grafts were used to eliminate the inverted-V deformity. Finally, a cap graft fashioned from allogenic fascia lata was used to cushion the tip framework, and the dorsum was also camouflaged with a layer of allogenic fascia lata.

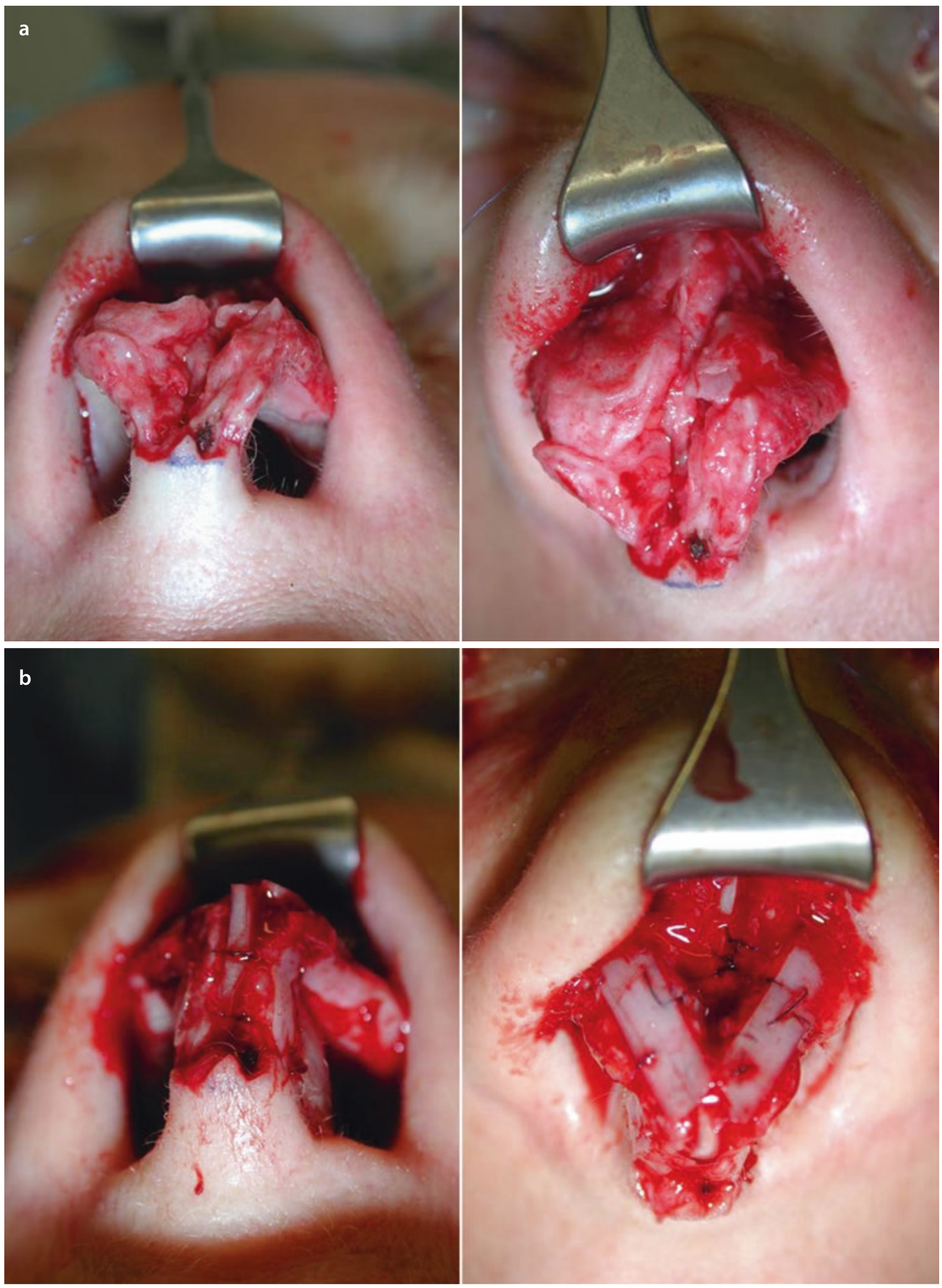


Fig. 12.20 (**a**–**b**) Reconstruction of the overresected LLCs using batten grafts and columellar strut. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.20** (continued)

■ **Fig. 12.20** (continued)

12.2.15 Case 15: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 26-year-old male presented after unsuccessful rhinoplasty (elsewhere) (Fig. 12.21). The patient complained of a wide and droopy nasal tip. Open rhinoplasty revealed overresection of both lateral crura and missing portions of the left intermediate crus. In contrast, the cartilaginous dorsum showed no indication of previous surgical intervention. Septal cartilage replacement grafts were used to reconstruct the damaged nasal domes using a motorized drill to permit folding of the domes. After integration of the grafts into the residual tip cartilage, a shield graft was sutured to the infratip so that it extended above the reconstructed tip framework. This served to stretch the scarred and noncompliant tip skin for better tip definition. The dorsum was also lowered conservatively to create a straight dorsal profile.

Fig. 12.21 (**a**–**d**) Reconstruction of the overresected LLCs using batten grafts and shield graft. (**e**–**g**) Front view, profile view, base view pre-op/post-op

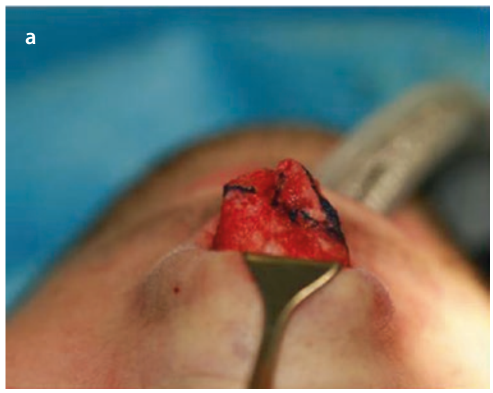


Fig. 12.21 (continued)

Fig. 12.21 (continued)

Fig. 12.21 (continued)

12.2.16 Case 16: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

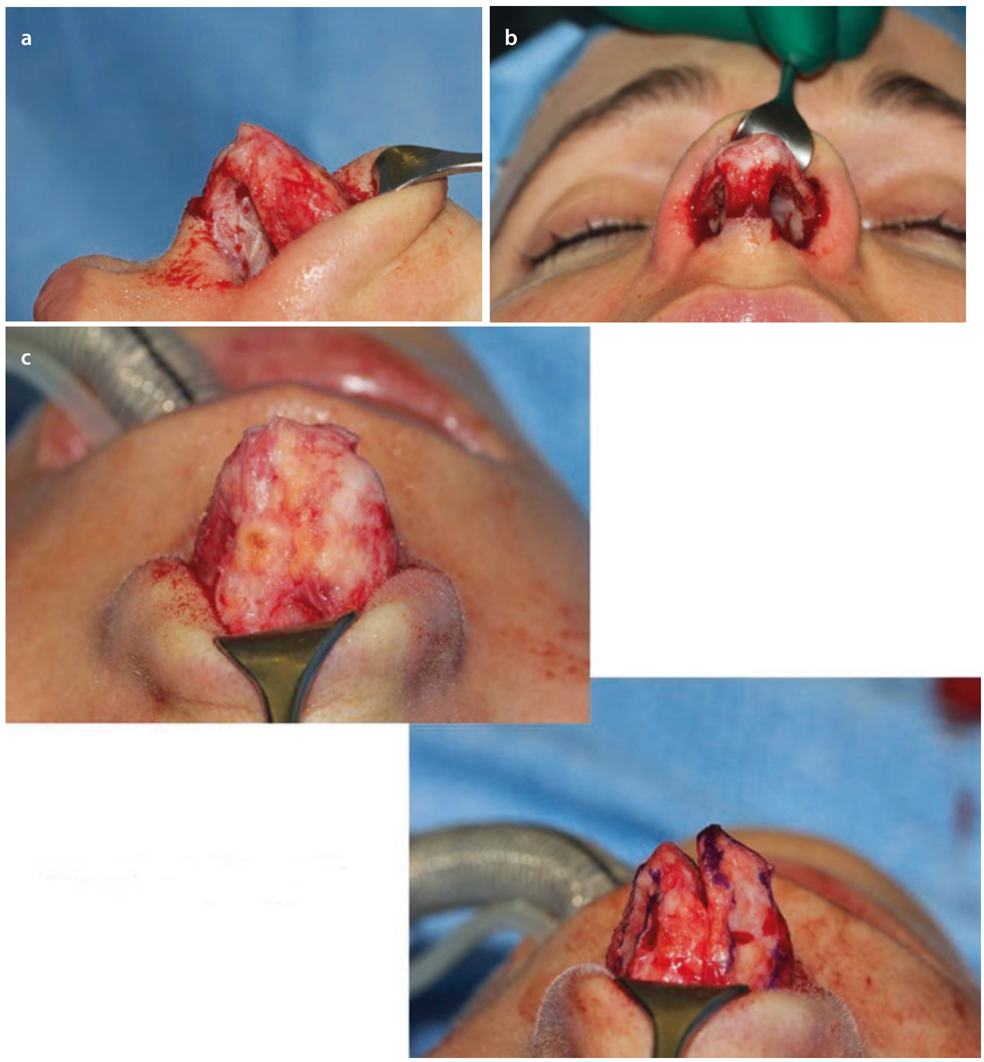
A 25-year-old female presented for revision rhinoplasty after treatment elsewhere (Fig. 12.22). Examination revealed a wide and amorphous tip, a polly-beak profile deformity, and a conspicuous inverted-V deformity. External rhinoplasty revealed prior resection of the lateral aspect of both lateral crura. Septal cartilage was used to create batten grafts to reconstruct the surgically weakened lateral crura. Spanning sutures were then used to contour the now rigid lateral crura. Tip projection was increased using a precisely shaped cap graft.

Fig. 12.22 (**a**) Reconstruction of the overresected LLCs using batten grafts and tip onlay graft from septal cartilage. (**b**–**d**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.22** (continued)

12.2.17 Case 17: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 36-year-old female presented with an overresected dorsum and a conspicuous contour of the tip after two closed rhinoplasties (◘ Fig. 12.23). After opening up the nose, we found a concavity of both weak lateral crura and destructed intermediate crura. A big cartilage graft from the central septum was harvested for a columellar strut and three batten grafts. The columellar strut was fixed to the caudal septum, and the medial crura were sutured to the graft. Two small batten grafts were placed on top of the weak right lateral crus, a wide one on top of the left one. A transdomal suture contoured the tip, and a tip suspension suture with an anterior sling guaranteed the tip position. The dorsum was augmented with three layers of allogenic fascia at the radix and two at the keystone area and the cartilaginous dorsum.



◘ **Fig. 12.23** (**a**–**d**) Reconstruction of the overresected LLCs using batten grafts and dorsal augmentation with three layers of allogenic fascia lata. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 12.23 (continued)

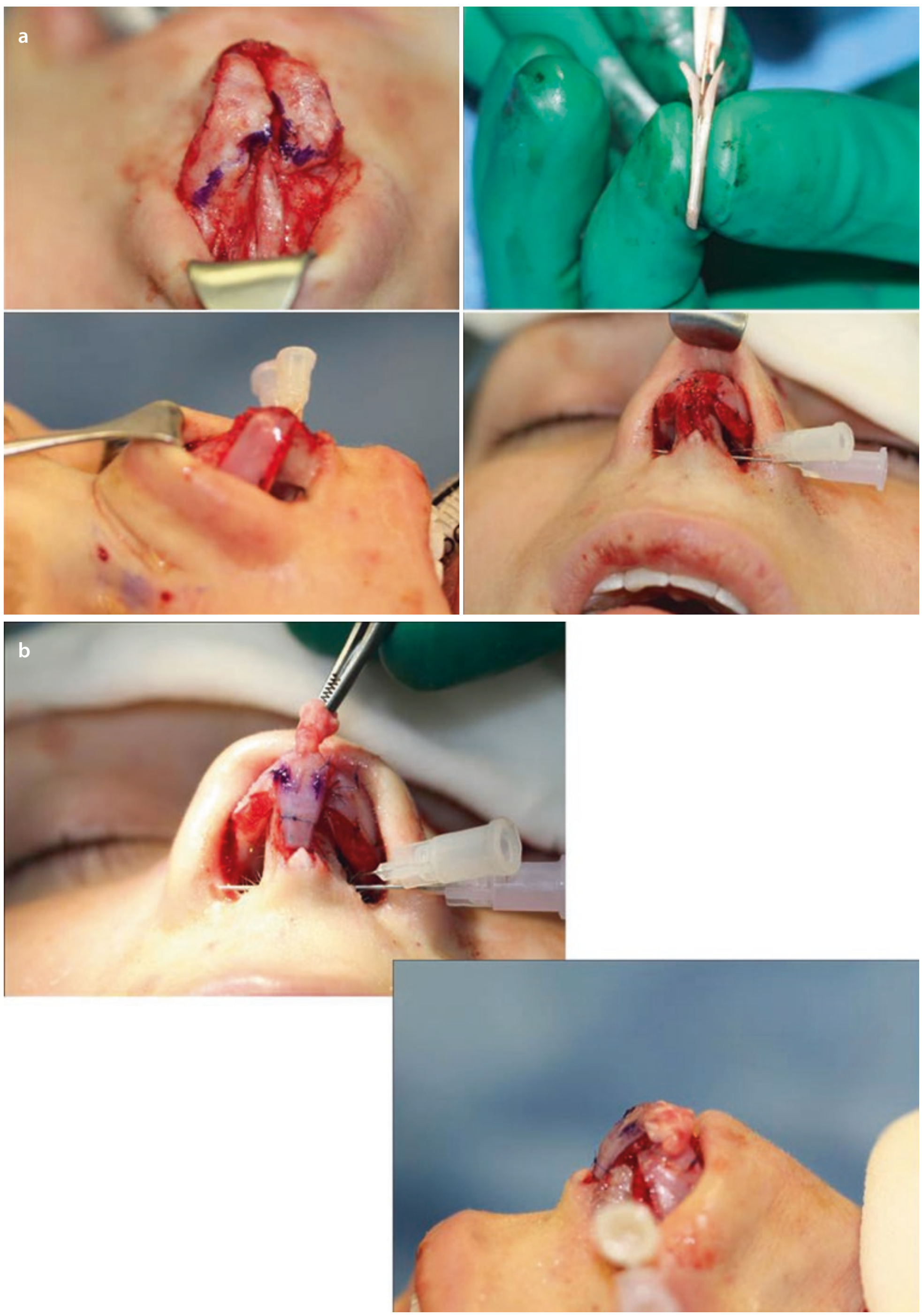
Fig. 12.23 (continued)

12.2.18 Case 18: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 24-year-old female presented with a severe polly-beak deformity after previous rhinoplasty (◘ Fig. 12.24). The radix was also very low, and the columella was deviated with asymmetrical nostrils. The bony pyramid was wide, and the dorsum was overprojected.

Surgical exploration using the open approach revealed total resection of both lateral crura and partial resection of the right intermediate crus. After lowering the dorsum by trimming the septum and rasping the bony hump, the nasal pyramid was narrowed using parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies. A large piece of septal cartilage was then harvested before the excess upper later cartilages (ULCs) were used to create spreader flaps. The caudal septum was trimmed, and a strong columellar strut graft was placed. A thick piece of septal cartilage was split longitudinally into a Y-shaped tip graft so that the paired ends could be bent and used as replacement grafts for the missing crural segments. For improved contour, a shield graft was fixed sewn to the infratip, and the entire tip and dorsum were covered with a single layer of allogenic fascia lata. The left footpod was also resected to correct a residual columellar asymmetry.

◘ **Fig. 12.24** (**a**) Overresected LLC, creating bended batten grafts by splitting thick septal cartilage. (**b**) Covering a shield graft with soft tissue graft. (**c**) Smoothing the tip with allogenic fascia. (**d**–**f**) Front view, profile view, base view pre-op/post-op



■ **Fig. 12.24** (continued)

c

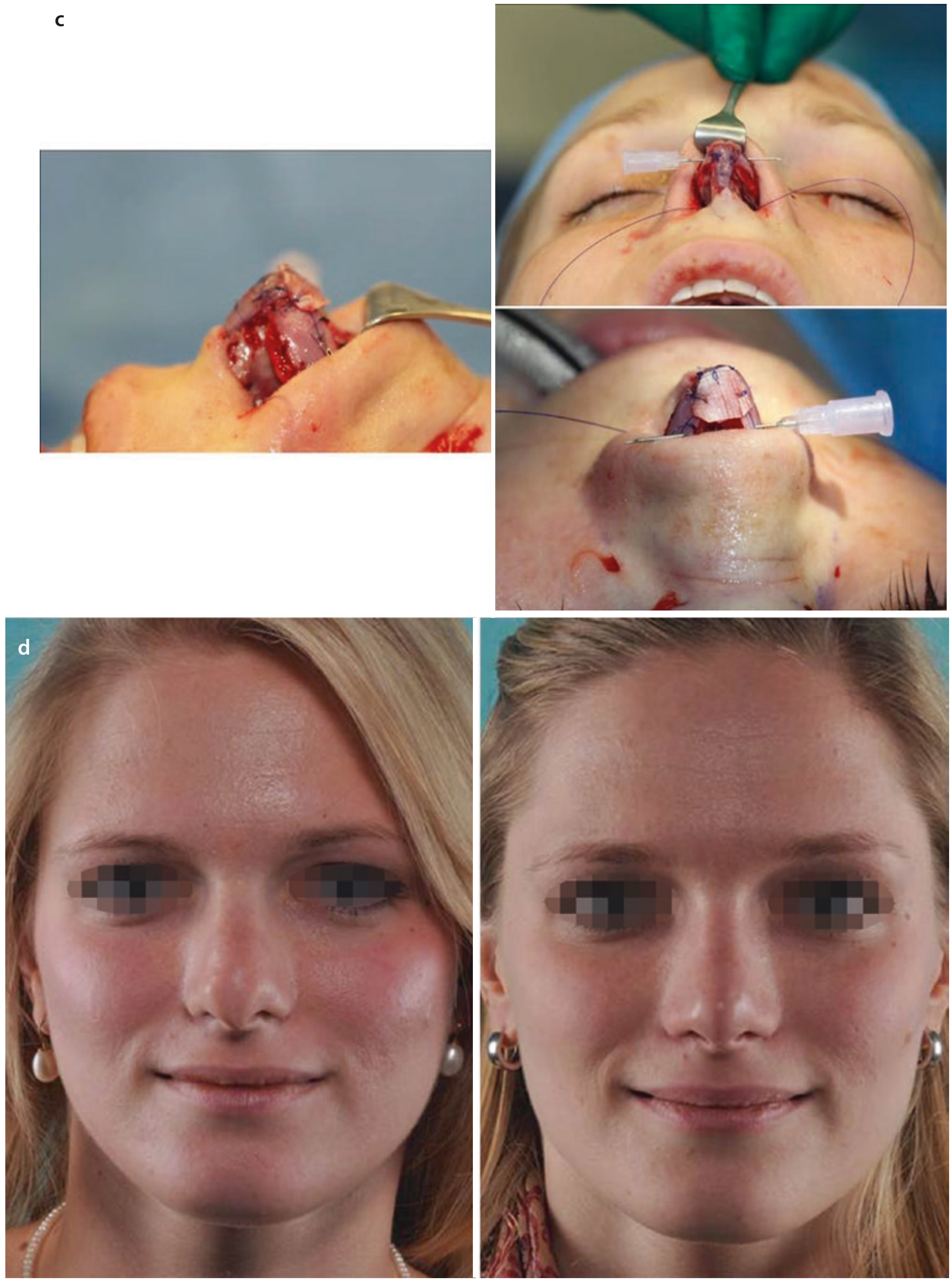


Fig. 12.24 (continued)

12.2.19 Case 19: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 27-year-old female presented after two previous rhinoplasties with a round, pinched, and amorphous nasal tip, asymmetrical nostrils that showed collapse during forced inspiration, and a wide nasal pyramid (Fig. 12.25).

During surgical exploration using the open approach, we observed severe overresection of the LLCs. For reconstruction, we harvested a large piece of septal cartilage and cut five strips from the specimen. One strip was used as columellar strut graft, two strips were used as spreader grafts to widen the narrow internal valves, and the remaining two strips were used for reconstruction of the LLC framework. After fixing the columellar strut graft, paired cartilage strips were sutured to it. They were then bent to reform the missing domes and sutured to the lateral crural remnants and the vestibular skin. To facilitate bending of the grafts, the domes were first thinned with an electric cylindrical drill. The new framework was then molded with spanning sutures combined with a tip suspension suture and a posterior sling to stabilize tip position. After narrowing the nasal pyramid with our standard osteotomy technique, the dorsum was covered with one layer of allogenic fascia lata.

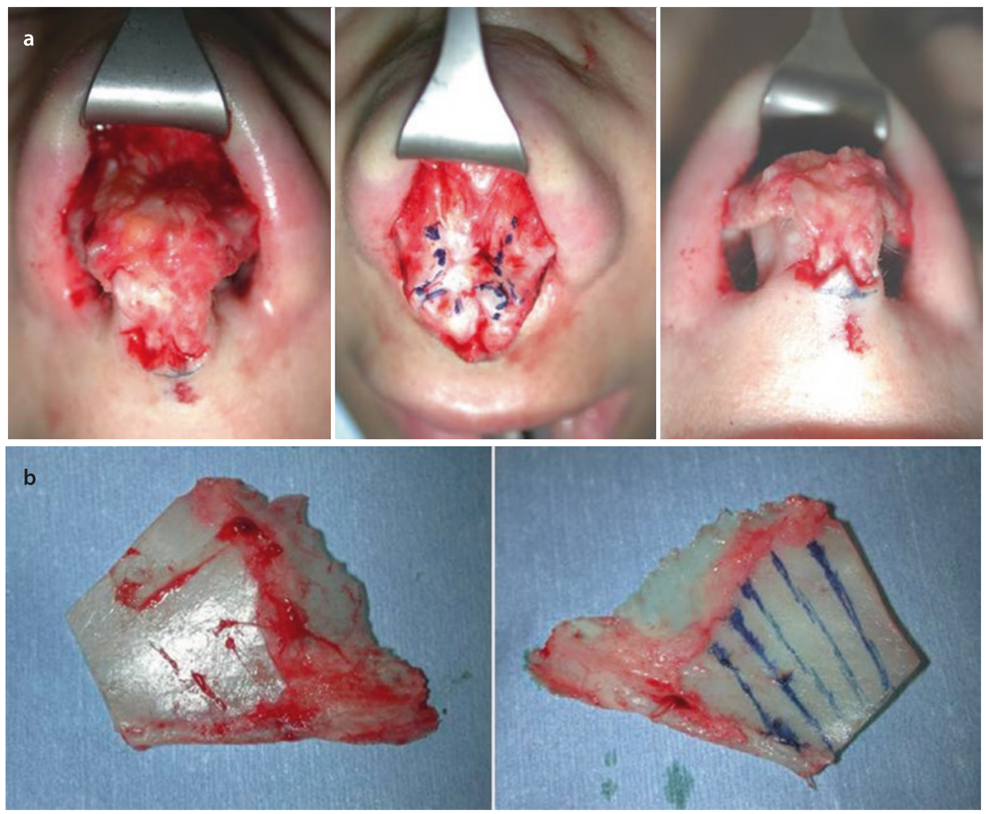


Fig. 12.25 (**a**–**d**) Reconstruction of the overresected LLCs with septal cartilage using bending technique and columellar strut. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 12.25 (continued)

Fig. 12.25 (continued)

12.2.20 Case 20: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 34-year-old female presented after previous rhinoplasty with a polly-beak deformity combined with an overresected dorsum (Fig. 12.26). Tip ptosis and a hyperacute nasolabial angle (less than 90°) were also observed. Finally, the columella had a conspicuous transcolumellar scar from the previous rhinoplasty incision, and the columellar pedestal was overly wide and asymmetrical.

Using the open approach, copious scars were resected before an analysis was possible. The lateral crura were overresected, and the remnants were collapsed medially. After lowering the cartilaginous dorsum, a large septal cartilage graft was harvested and used for spreader grafts. Septal cartilage was also used to create a columellar strut graft and to support the lateral crura with bilateral batten grafts. The bony vault was then straightened and narrowed using parasagittal medial osteotomies combined with percutaneous low-to-low lateral and percutaneous transverse osteotomies. Following partial resection of the depressor septi muscle, the columellar strut graft was sutured to the caudal septum, and the medial crura were sutured to the strut graft. Rim grafts were placed to eliminate alar pinching, and the dorsum was augmented with two layers of allogenic fascia lata.

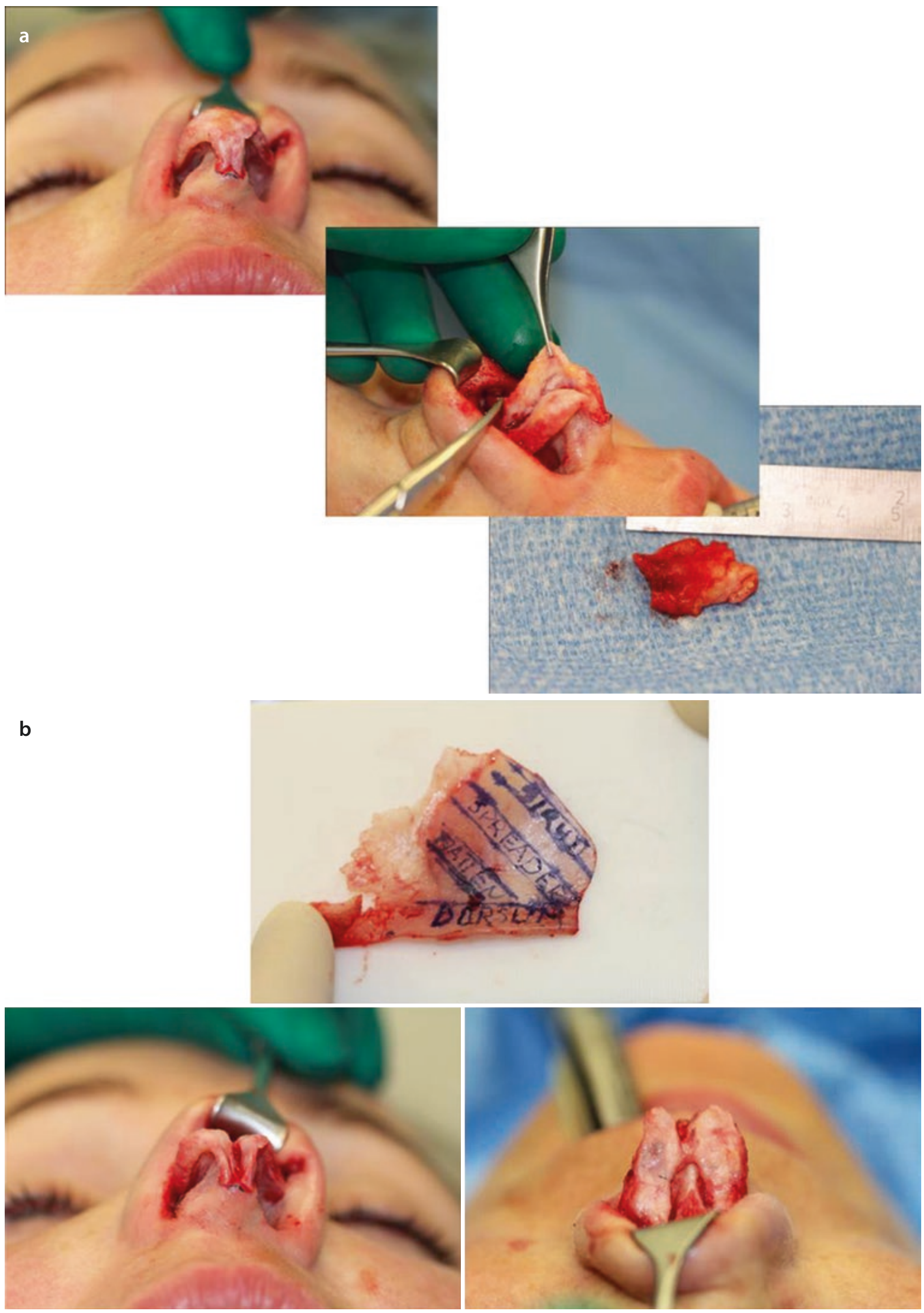


Fig. 12.26 (**a**–**c**) Reconstruction of the overresected LLCs with batten grafts. (**d**–**f**) Front view, profile view, base view pre-op/post-op

Fig. 12.26 (continued)

c

d

■ **Fig. 12.26** (continued)

12.2.21 Case 21: Correcting the Lower Framework with Septum via Batten Graft Technique

A 36-year-old female patient presented after previous rhinoplasty with a quadrangular-shaped nasal tip, asymmetrical tip-defining points, and nostril asymmetry (Fig. 12.27). On profile view, a residual dorsal hump was evident, and extremely thin and shiny skin was also observed.

Using the open rhinoplasty approach, we encountered a double-layered cartilage graft serving as a left lateral crural batten graft. After lowering the dorsal septum with the component technique, the oversized ULCs were folded inward as spreader flaps. Transdomal sutures were then placed for tip contouring after a lateral crural strut graft was placed on the right side for tip symmetry. Minor tip irregularities were camouflaged with free diced cartilage, and the dorsum was smoothed with a layer of allogenic fascia lata.

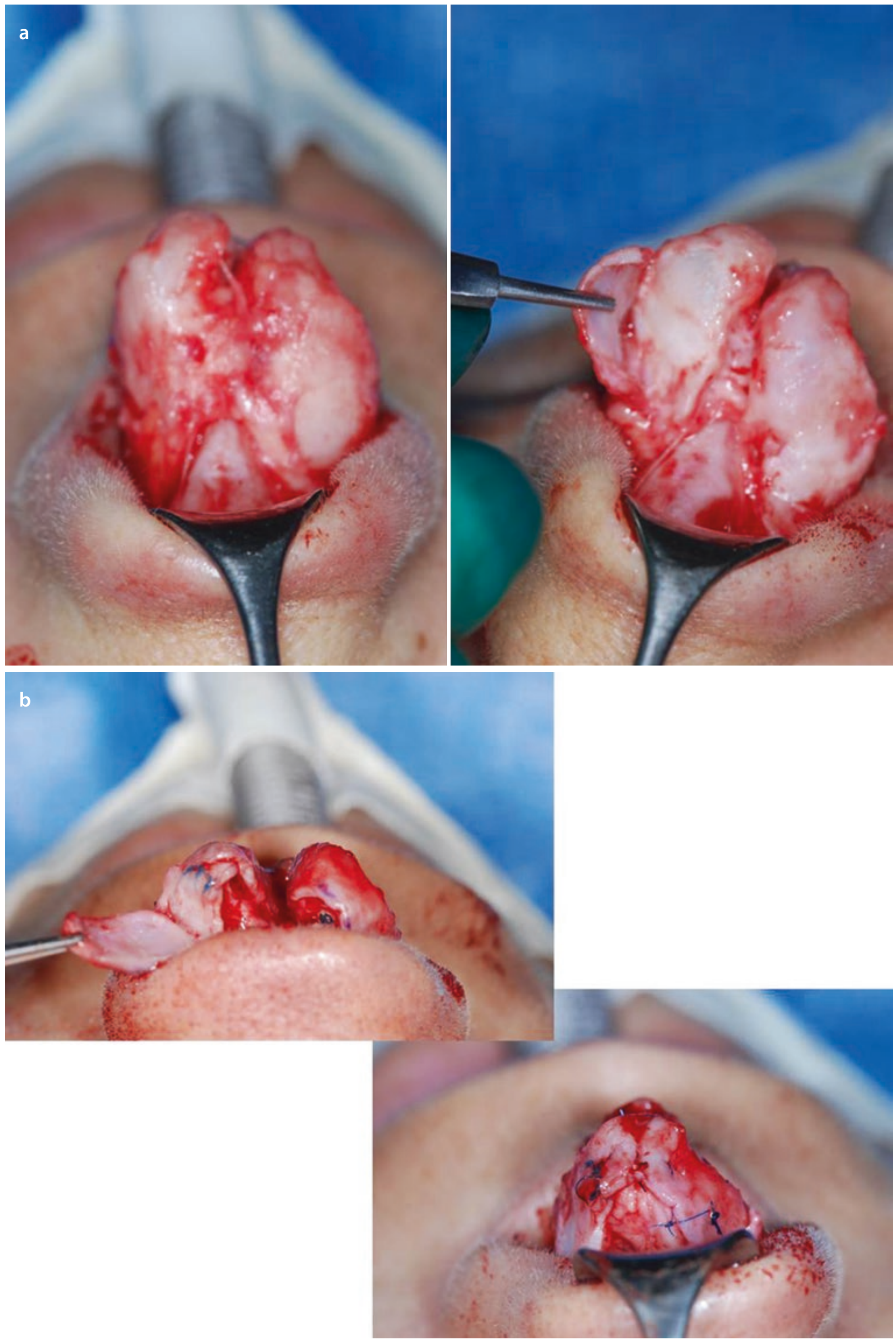
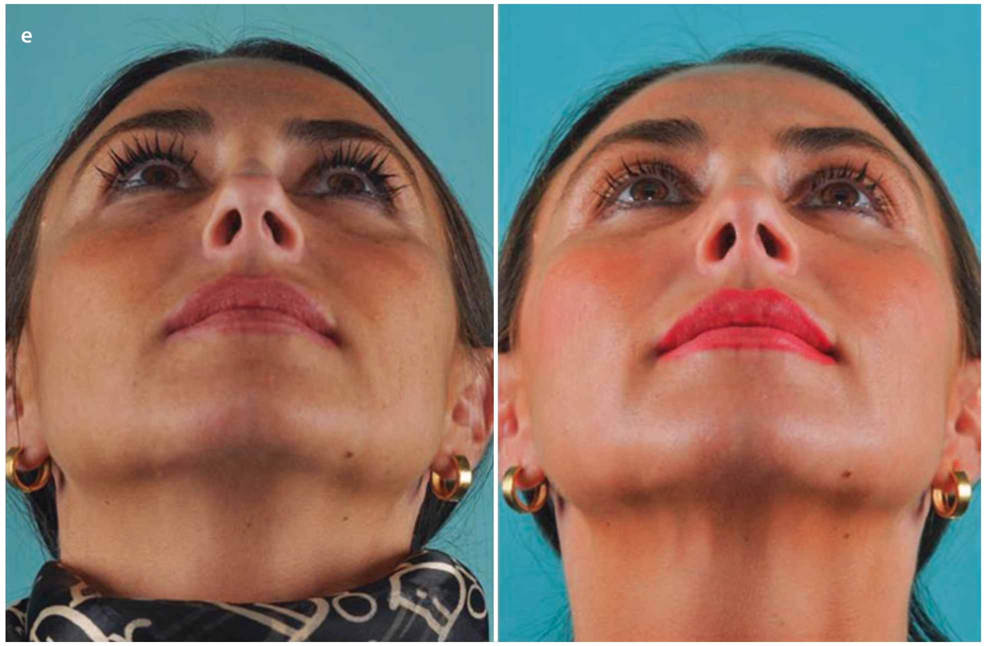


Fig. 12.27 (**a**–**b**) Correcting the lower framework by unilateral batten graft, molding the tip with transdomal sutures. (**c**–**e**) Front view, profile view, base view pre-op/post-op

12

Fig. 12.27 (continued)

■ **Fig. 12.27** (continued)



12.2.22 Case 22: Reconstruction of the Lower Framework with Septum via Batten Graft Technique

A 41-year-old female presented for revision nasal surgery; she complained about nasal airway obstruction and a poor cosmetic outcome (Fig. 12.28). Examination revealed a foreshortened nose from overresection of the anterior septum coupled with saddle-nose collapse of the middle vault. Left alar retraction and hypoplasia of the maxilla were also observed.

Surgical exploration via the open approach revealed complete absence of both lateral crura as well as most of both intermediate crura. The anterior septal remnant was deviated superiorly, creating a high septal deformity blocking the left nasal airway, and deformity of the central septum was also seen. The overresected dorsal septum was also buried beneath deformed ULCs, and both inferior conchal bones were enlarged.

Partial submucosal resection of the enlarged inferior turbinate bones was performed for airway enhancement, and the angulated high septal deviation was also resected. However, the already overresected cartilaginous dorsum became weak and unstable with additional cartilage removal. Consequently, paired 1.5-mm-thick extended spreader grafts fashioned from autologous rib cartilage were used to augment and strengthen the middle vault. These were also used to support a septal extension graft harvested from the posterior septum as suggested by Davis to stabilize the tip upon nasal lengthening. Thin 1.0-mm strips of rib cartilage were also used to fabricate LLC replacement grafts, which were contoured with transdomal and spanning sutures combined with a tip suspension suture. A double-layered caudal septal replacement graft was also fabricated from conchal cartilage, and two diced (rib) cartilage-fascia grafts were used to augment the premaxilla and nasal dorsum. The tip was then camouflaged with a layer of perichondrium, and finely diced cartilage was injected beneath the skin to hide minor contour irregularities.

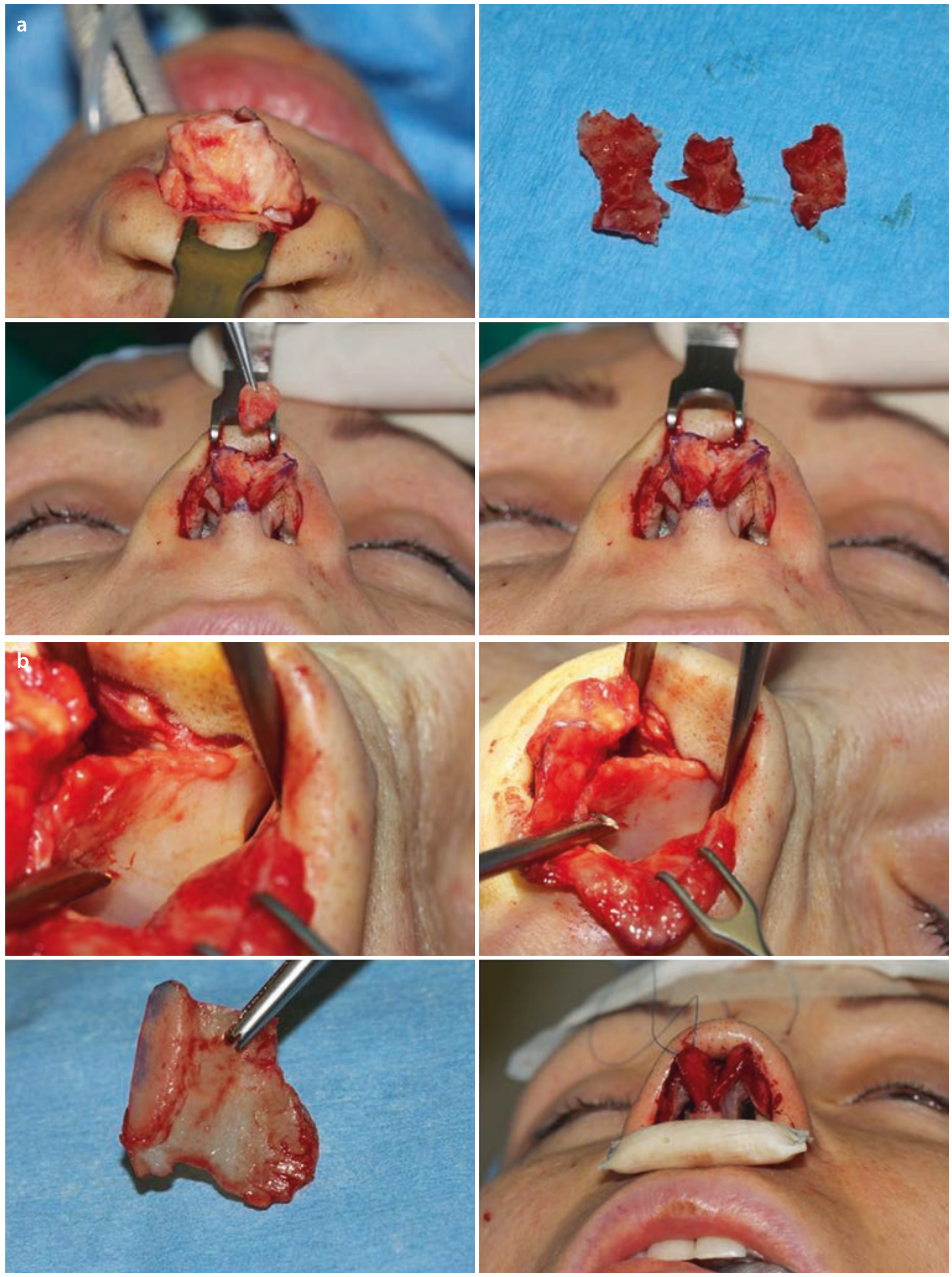


Fig. 12.28 (**a**) Scar removal from tip, submucous resection of turbinate bone. (**b**) Extracorporeal septal reconstruction, DCF graft for maxillary augmentation. (**c**) Strips from rib cartilage for reconstruction of the lateral crura. (**d**) Reconstruction of the lower framework. (**e**) Dorsal reconstruction with DCF graft. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 12.28 (continued)

Fig. 12.28 (continued)

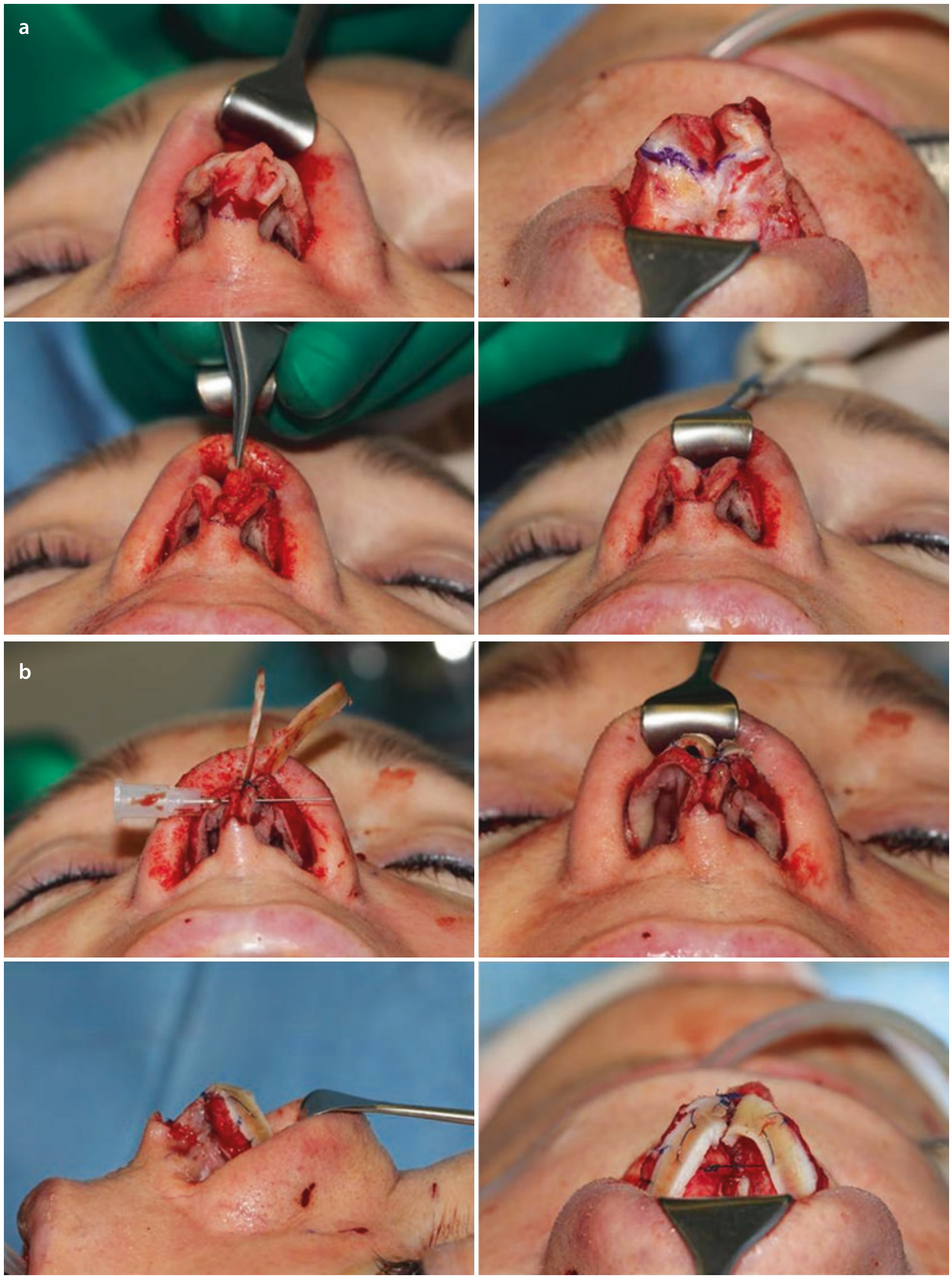
Fig. 12.28 (continued)

12.2.23 Case 23: Reconstruction of the Lower Framework with Rib Grafts

A 45-year-old female presented with a classic polly-beak deformity after previous rhinoplasty (Fig. 12.29). In addition, the bony dorsum had been overresected, and the nasal skin was extremely thick.

Using an open approach, severe scars were found covering overresected LLCs. Only the stumps of the intermediate crura and medial crura could be identified. In this patient, overresection of the tip cartilage had been used in a misguided attempt to reduce nasal tip width but resulted only in loss of essential tip support and excessive scar formation.

We elected to augment the overresected bony dorsum by first lowering the cartilaginous dorsum to create a dorsal bed in order to accommodate a full-length dorsal onlay graft. Since there was not enough septal cartilage to construct the onlay graft, the 11th rib was harvested from the right chest wall, from which four long strips of cartilage were cut. Two were used as spreader grafts, and the other two were used for reconstruction of the LLCs. For tip reconstruction, the grafts were shaved to a thickness of 1.0 mm and then sutured to the medial crura. The grafts were thinned further in the area of the domes to allow bending and formation of new domes, which were created with transdomal sutures. The lateral ends of both grafts were then sutured to the vestibular skin. The previously inserted columellar strut graft was very weak, and it was replaced with a strut graft fashioned from rib cartilage. Rib perichondrium was used to augment the atrophic septal mucosa (after previous harvest of septal cartilage) and to cover the reconstructed tip framework. For augmentation of the dorsum, a DC-F graft was fashioned from autologous deep temporalis fascia and diced rib cartilage. However, the volume of residual rib cartilage was insufficient, and the right concha was also harvested to construct the DC-F graft.



■ **Fig. 12.29** (**a**–**b**) Reconstruction of the overresected LLCs using bending technique in rib cartilage grafts. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.29** (continued)

Fig. 12.29 (continued)

12.2.24 Case 24: Reconstruction of the Lower Framework with Rib Grafts

A 47-year-old male presented after nasal trauma and previous rhinoplasty with a narrow middle vault, a deviated nose, and an underprojected nasal tip (◘ Fig. 12.30). Endonasal examination revealed a residual septal deviation and obstruction of both nasal passages. Using the external approach, surgical exploration revealed partial loss of the right intermediate crus. The right lateral crus was also displaced and deformed. On the left side, the intermediate crus was divided from the lateral crus, and portions of the left LLC had been resected. The septum revealed a severe C-shaped deformity, and the deformed segments were resected leaving stable L-strut. The bony pyramid was straightened using parasagittal medial osteotomies made with a Lindemann burr and percutaneous low-to-low and transverse osteotomies. For widening of the narrow internal valves, the right concha cymba was harvested and split in the midline to create paired spreader grafts. Spreader graft placement served not only to reconstruct the internal valves but also to straighten the septum and to keep the nasal bones in proper position. A rib graft was then harvested to create a columellar strut graft, and the medial crura were sutured to the graft. Because of weakness of the residual left lateral crus, it was removed and replaced by a batten graft fashioned from rib. A reciprocal batten graft was then placed on the right. For fine-tuning of the outer contour, the residual donor cartilage was diced into a fine paste-like consistency and injected over the dorsum and into the soft-tissue facets beneath the partially closed skin flap.

Fig. 12.30 (**a**–**b**) Reconstruction of the overresected LLCs using rib grafts as batten grafts, fine-tuning with free diced cartilage. (**c**–**e**) Front view, profile view, base view pre-op/post-op

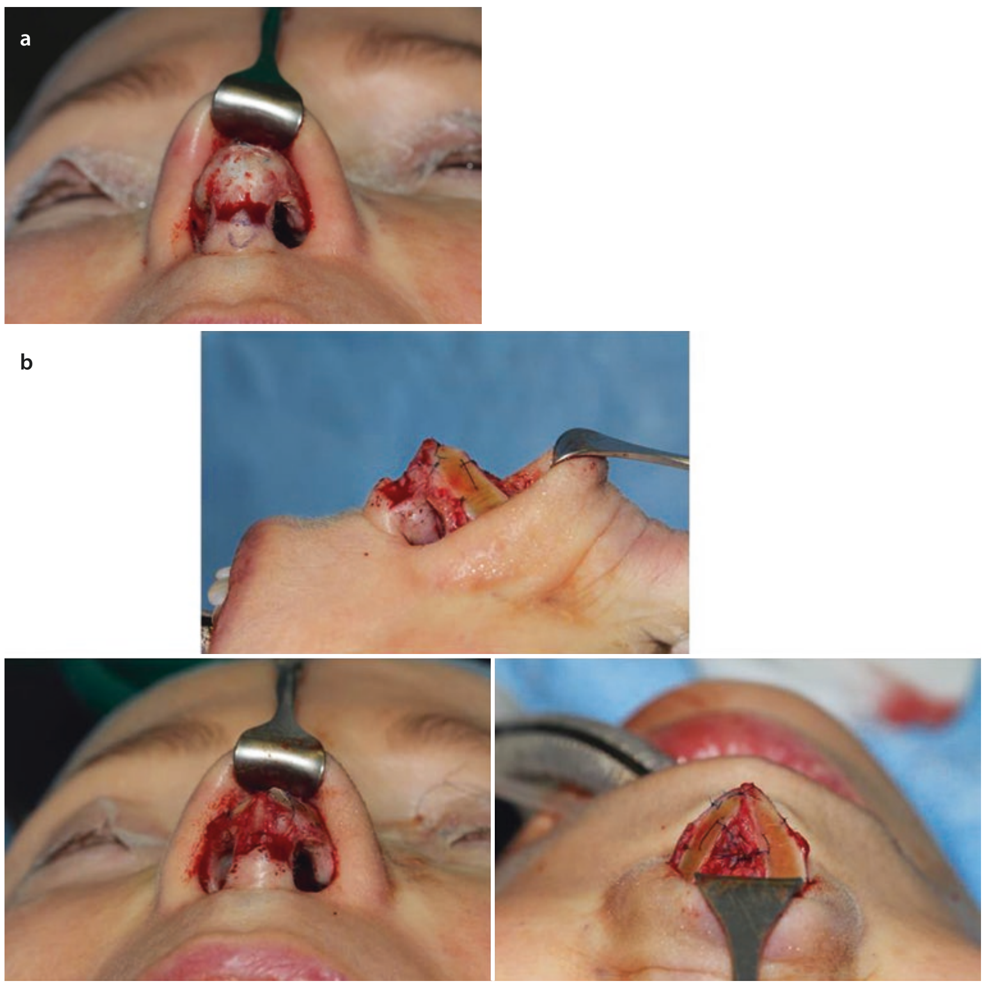
Fig. 12.30 (continued)

Fig. 12.30 (continued)

12.2.25 Case 25: Reconstruction of the Lower Framework with Rib Grafts

A 66-year-old female presented after three rhinoplasties complaining of inadequate tip projection and an overprojected dorsum (◘ Fig. 12.31). Examination also revealed pinching of the right ala with asymmetrical nostrils and a collapsed left nasal side wall. The nasal skin was very thin and atrophic. Endonasal examination revealed a 5.0-mm septal perforation and a residual deviation of the septum.

Using an open approach, the soft-tissue dissection was challenging because of extensive scarring and extremely thin nasal skin. After lowering and smoothing the dorsum, the ULCs were divided from the septum, and the residual septal cartilage was harvested for graft material. A thickened portion of septal cartilage was then split into thin wafers and interposed between the mucosal flaps in the area of perforation repair. A columellar strut was fashioned from septal cartilage and used to support the medial crura. After removal of scar tissue from the lateral crura, only weak and insufficient residual cartilage was found. Consequently, the 11th rib was harvested and cut into small strips to create lateral crural batten grafts. The dorsum was then augmented using a thin DC-F graft constructed from rib cartilage and deep temporalis fascia. Pinching of the right ala was corrected with a tragal cartilage graft. Temporalis fascia was also used to cover the newly reconstructed tip framework.



◘ **Fig. 12.31** **(a–b)** Reconstruction of the overresected LLCs using rib grafts as batten grafts. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.31 (continued)

Fig. 12.31 (continued)

12.2.26 Case 26: Reconstruction of the Lower Framework with Rib Grafts

A 42-year-old female presented after previous rhinoplasty with a round and bulbous nasal tip and retraction of the left soft-tissue facet and alar rims (Fig. 12.32). The dorsum was also overly wide.

Ignoring the unusually high scar placement of the previous transcolumellar incision, we used a new inverted-V-shaped incision at the narrowest part of the columella. Extensive subcutaneous scarring was encountered covering the overresected LLCs. After removing the scar tissue, only small remnants of the medial crura remained. Additionally, the caudal septum was also overresected, necessitating rib graft harvest for reconstruction. After harvesting an 8.0-cm segment of the tenth rib, it was split longitudinally into 1.5-mm-thick strips. Two strips were sutured to the medial crural remnants, and by thinning the grafts at the domes with a cylindrical electric drill, they were folded at the domes. Although the right rib graft fractured with folding, an acceptable tip architecture was achieved using transdomal sutures for stabilization. Spanning sutures were then placed for further contour enhancement, and a tip suspension suture with a posterior sling stabilized the reconstructed framework in the desired position. A DC-F graft fashioned from finely diced rib cartilage wrapped in allogenic fascia lata was used as an augmentation graft for the underprojected dorsum. The retracted soft-tissue facet was filled with free diced cartilage.

At a visit 1 year later, the reconstructed tip seemed overprojected, and the infratip lobule was deficient. Therefore, the rib grafts used for reconstruction of the tip framework were shortened, and an additional shield graft from the concha was used to counterrotate the nose and augment the infratip lobule.

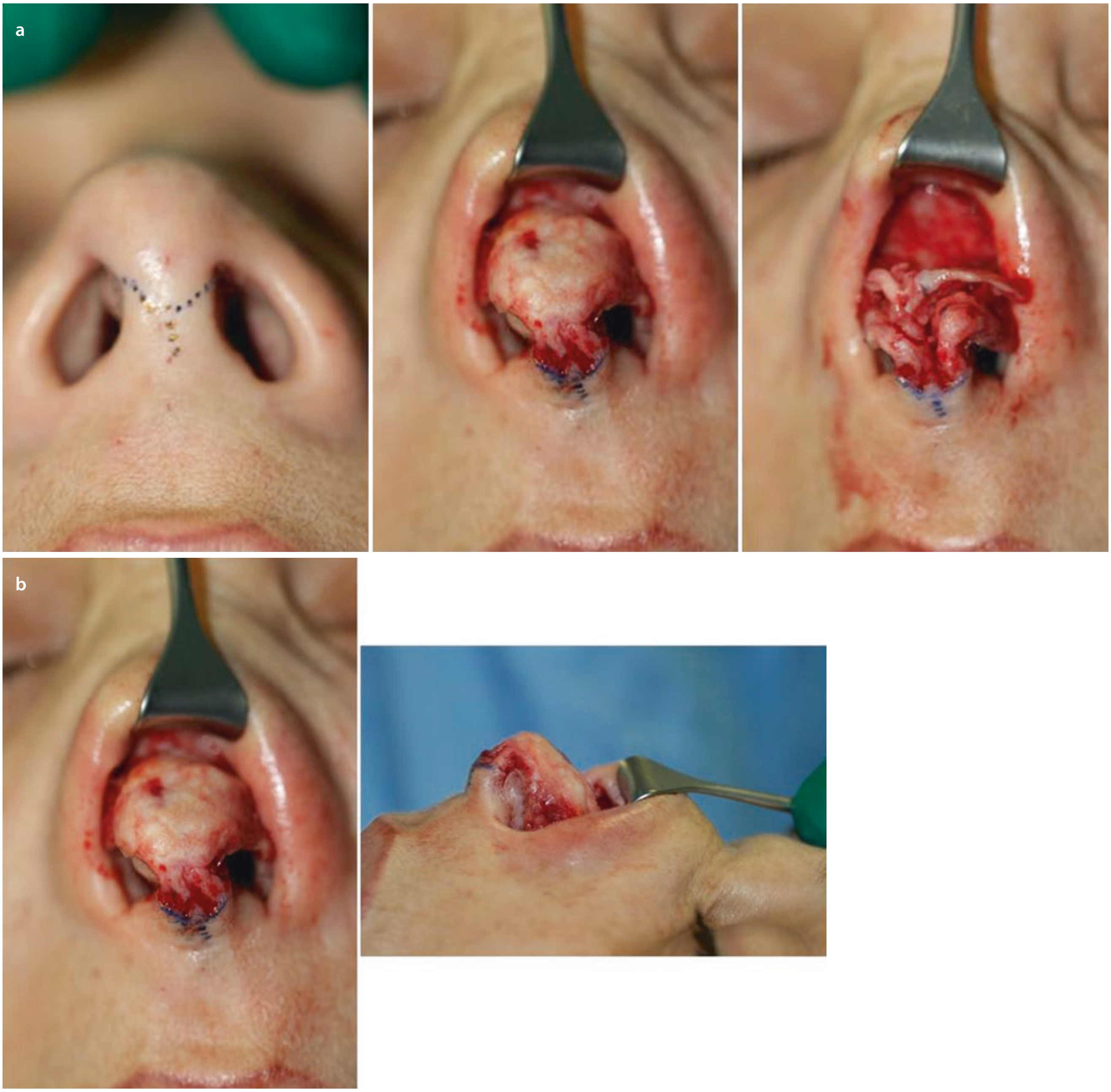
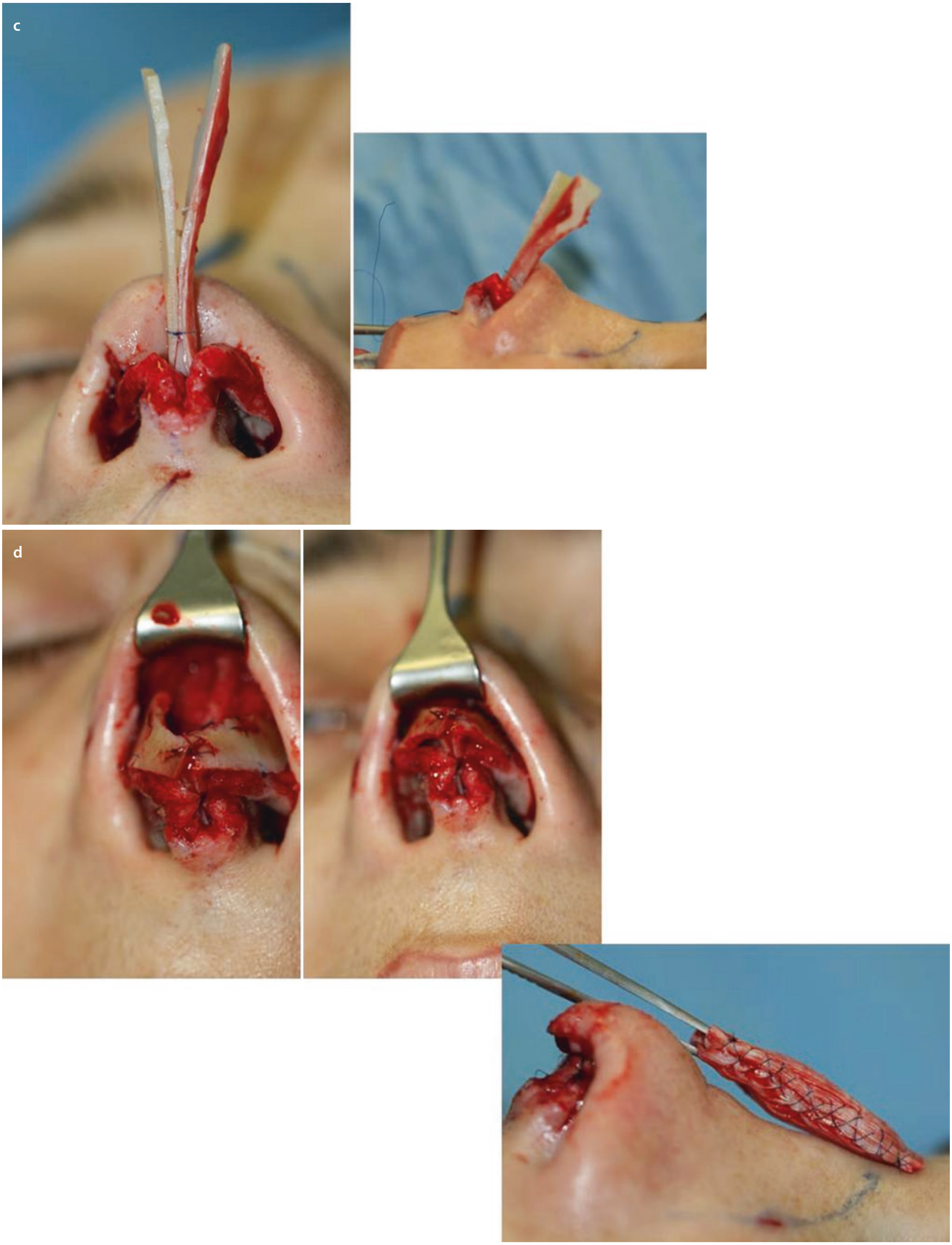


Fig. 12.32 (**a**–**d**) Severe scars after overresection of the LLCs. Reconstruction of the overresected LLCs using batten grafts from rib cartilage, dorsal augmentation with DC-F. (**e**–**g**) Front view, profile view, base view pre-op/post-op



■ **Fig. 12.32** (continued)

■ **Fig. 12.32** (continued)

Fig. 12.32 (continued)

12.2.27 Case 27: Reconstruction of Tip Projection by Sandwich Graft, Combined with Lateral Crural Steal Technique

A 42-year-old male presented after gender-reassignment surgery for revision rhinoplasty after a failed dorsal augmentation with a silicone dorsal implant (Fig. 12.33). Columellar retraction and tip ptosis resulted from infection and extrusion of the silicone implant. The radix was also quite low.

Using the open approach, the tip was reconstructed using a double-layered sandwich graft constructed from conchal cartilage, which was sutured to the caudal septum. Using a lateral crural steal technique, tip projection and rotation were increased. Additionally, an onlay graft was sutured on top of the sandwich graft in order to provide even more tip projection. The wide bony pyramid was narrowed with parasagittal medial osteotomies and percutaneous low-to-low lateral and transverse osteotomies. The low nasal bridge was augmented with solid conchal cartilage from the opposite ear.

Fig. 12.33 (**a**–**b**) Increasing tip projection by sandwich graft combined with lateral crural steal technique. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.33 (continued)

Fig. 12.33 (continued)

12.2.28 Case 28: Increasing Projection by Grafting

A 20-year-old male presented with a severely underprojected tip after previous rhinoplasty (Fig. 12.34). Additionally, the dorsum was overprojected, and the bony vault was overly wide. Endonasal examination revealed deviation of the septum to the left side and narrow internal nasal valves.

Using the external rhinoplasty approach with an inverted-V transcolumellar incision, surgical exploration revealed diffuse scarring of the LLCs and overresection of the left cephalic margin. After dismantling the cartilaginous dorsum using the component technique, the dorsal septum was trimmed with a straight scissors, and the bony dorsum was lowered with a cylindrical power drill bit. The bony pyramid was then straightened and narrowed using parasagittal medial, percutaneous low-to-low lateral, and percutaneous transverse osteotomies. The overprojected ULCs were also invaginated and used as spreader flaps. For increased tip projection, a nonintegrated shield graft and a buttress graft were covered with a soft-tissue wrap fashioned from scar tissue. To complete the procedure, alar rim grafts were placed bilaterally, and the dorsum was covered with a layer of allogenic fascia lata.

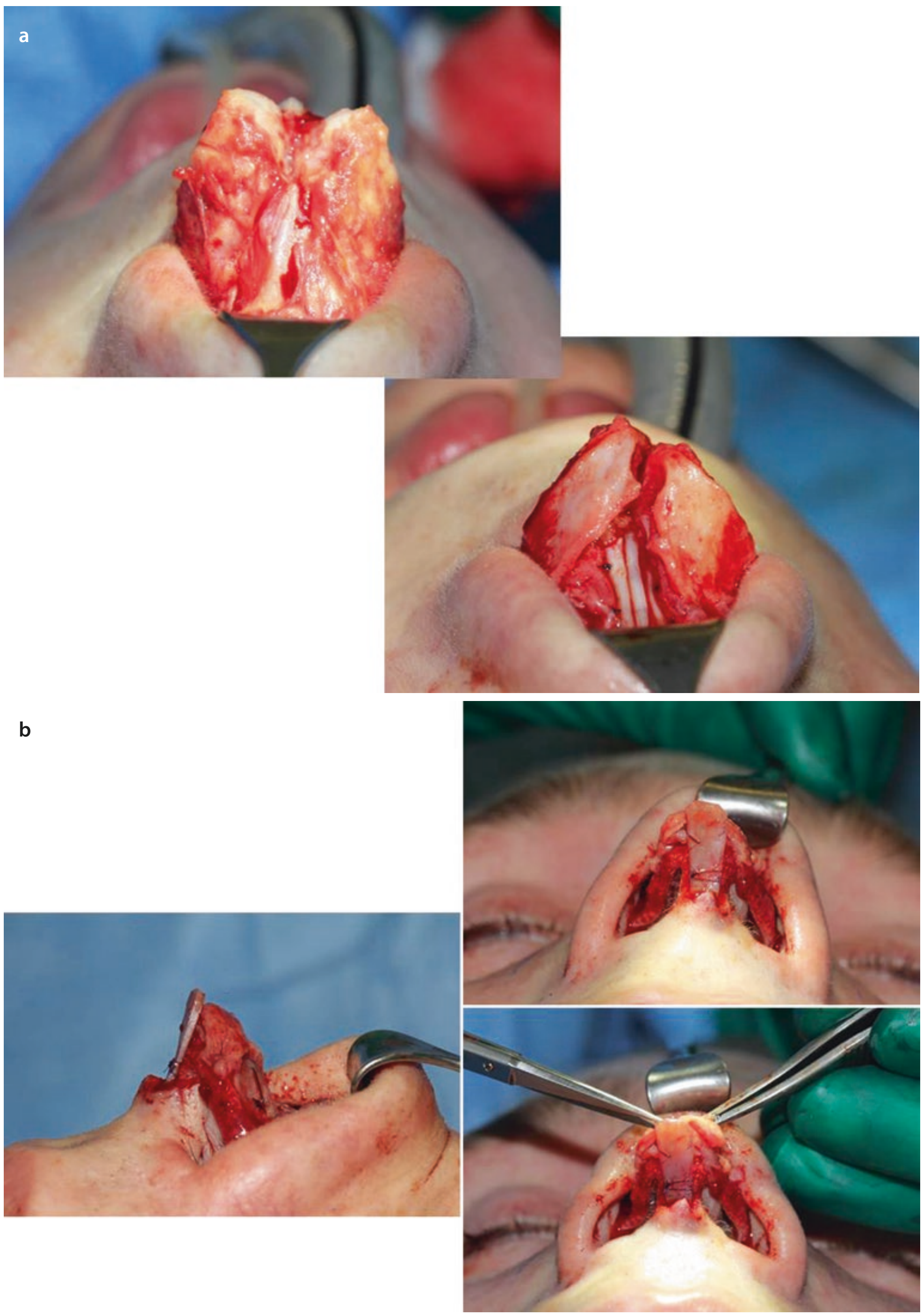


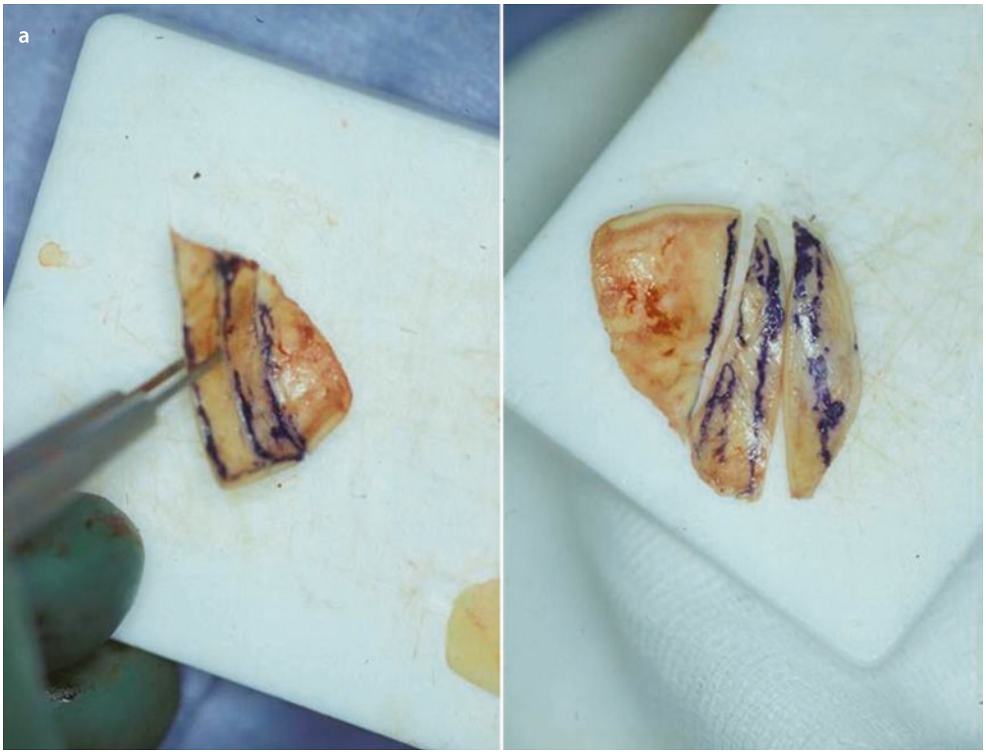
Fig. 12.34 (**a**–**b**) Increasing projection by nonintegrated shield graft. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.34 (continued)

Fig. 12.34 (continued)

12.2.29 Case 29: Reconstruction of Tip Support with Conchal Graft (Sandwich)

A 67-year-old female was seen following unsuccessful septorhinoplasty (Fig. 12.35). Examination revealed a wide and overprojected bony dorsum, tip ptosis from an overresected anterior septum, and a septal perforation. Treatment involved reduction of the bony dorsum and reprojection of the tip using a double-layered columellar strut graft fashioned from septal cartilage.



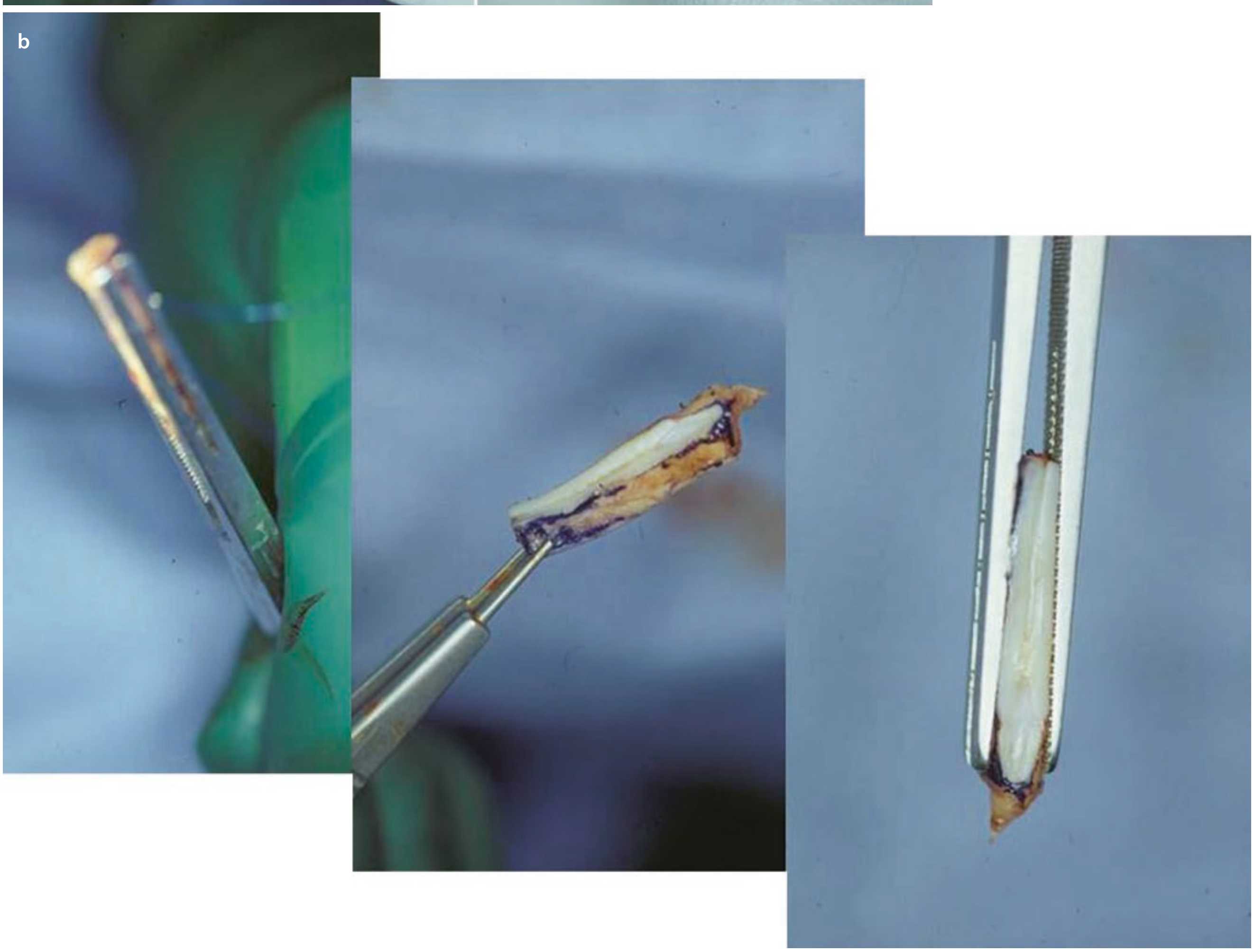


Fig. 12.35 (**a**–**b**) Increasing projection and rotation with conchal graft (sandwich graft). (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.35 (continued)

Fig. 12.35 (continued)

12.2.30 Case 30: Deprojection with Simultaneous Correction of Dysplastic LLCs by Medial Crural Overlap (Medial Sliding)

A 27-year-old female presented after previous rhinoplasty elsewhere (Fig. 12.36). Examination revealed an overprojected and overrotated tip with an obtuse nasolabial angle and a wide infratip lobule. External rhinoplasty revealed buckling of the intermediate crura at the junction of the medial crura. Consequently, we used the medial crural overlap technique to simultaneously deproject, counterrotate, and straighten the nasal tip cartilages.

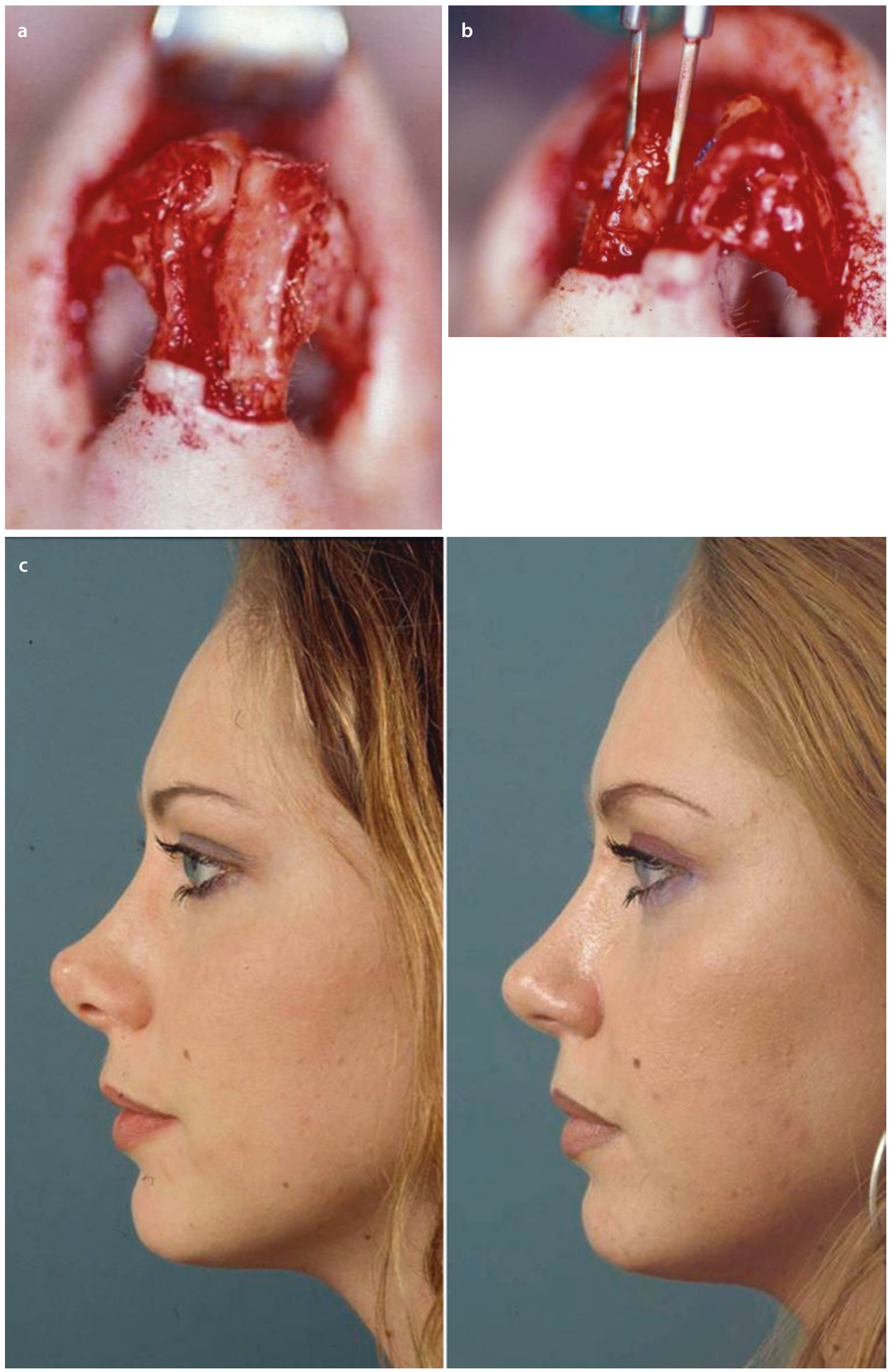
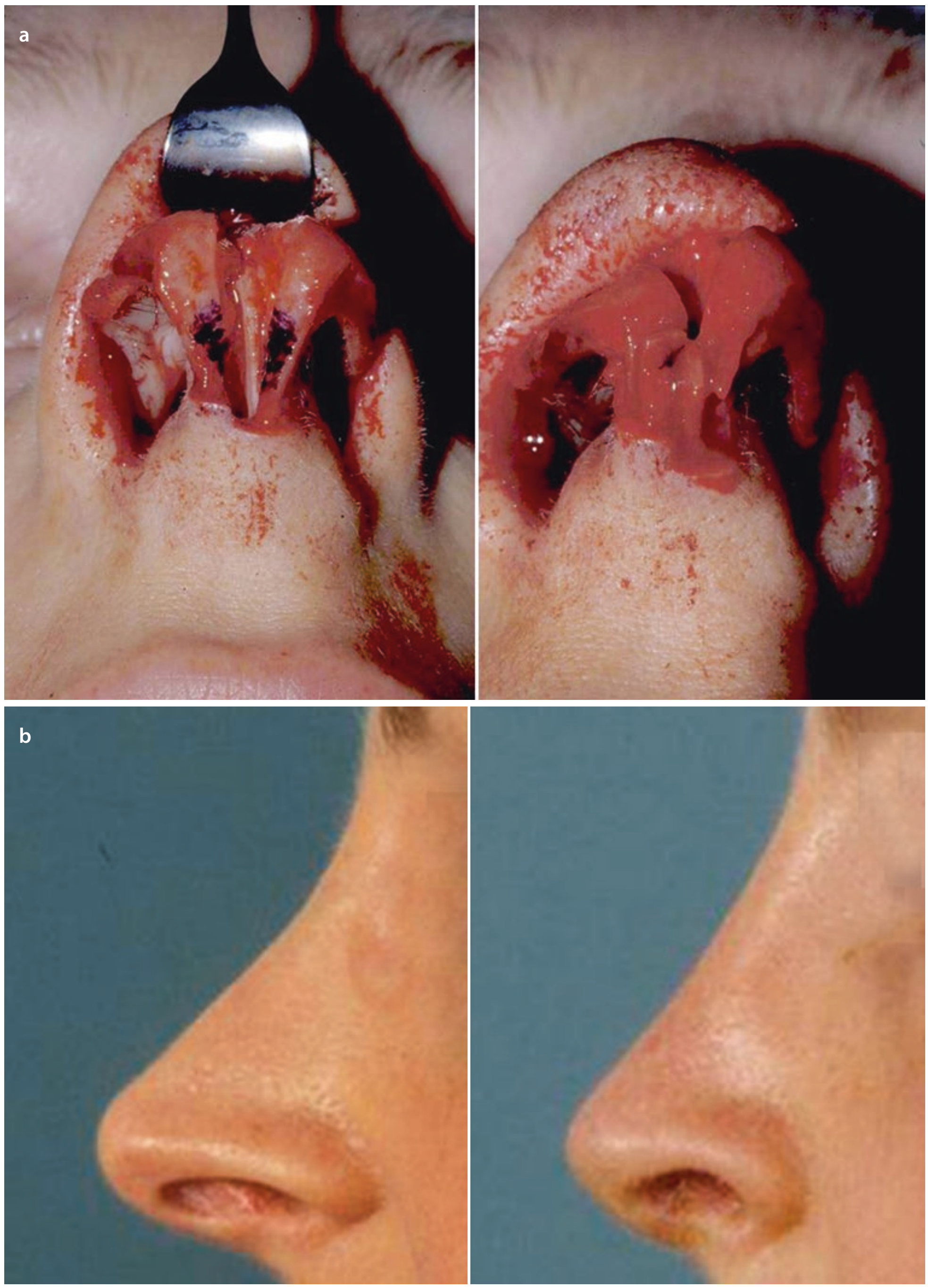


Fig. 12.36 (a–c) Deprojection by medial crural overlap (medial sliding)

12.2.31 Case 31: Deprojection by Medial Crural Overlap (Medial Sliding)

A 40-year-old female presented after failed rhinoplasty elsewhere (◘ Fig. 12.37). According to the patient, she had had a large dorsal hump prior to her first surgery, but she presented for treatment of an overprojected tip, indicating that she initially suffered from rhinomegaly. Apparently, her previous surgeon failed to recognize and to treat the entire rhinomegalic deformity. Deprojection of the tip was then performed using a medial crural overlap technique, and once tip projection was normalized, the dorsum was again able to complement the new tip contour.



◘ **Fig. 12.37** (**a**, **b**) Deprojection by medial crural overlap (medial sliding)

12.2.32 Case 32: Deprojection by Medial Crural Overlap (Medial Sliding)

A 44-year-old female presented after multiple prior episodes of nasal trauma and an unsuccessful septorhinoplasty elsewhere (Fig. 12.38). Examination revealed a short and overprojected nose (rhinomegaly) with a pronounced C-shaped curvature of the nasal dorsum. Treatment with the open approach included dorsal reduction followed by spreader flap placement to support and straighten the middle vault. Lateral crural strut grafts were then used to strengthen weak lateral crura, and tip deprojection was accomplished using the medial crural overlap technique. This simultaneously deprojected and lengthened the nose.

Fig. 12.38 (**a**) Deprojection by medial crural overlap (medial sliding). (**b**–**d**) Front view, profile view, base view pre-op/post-op

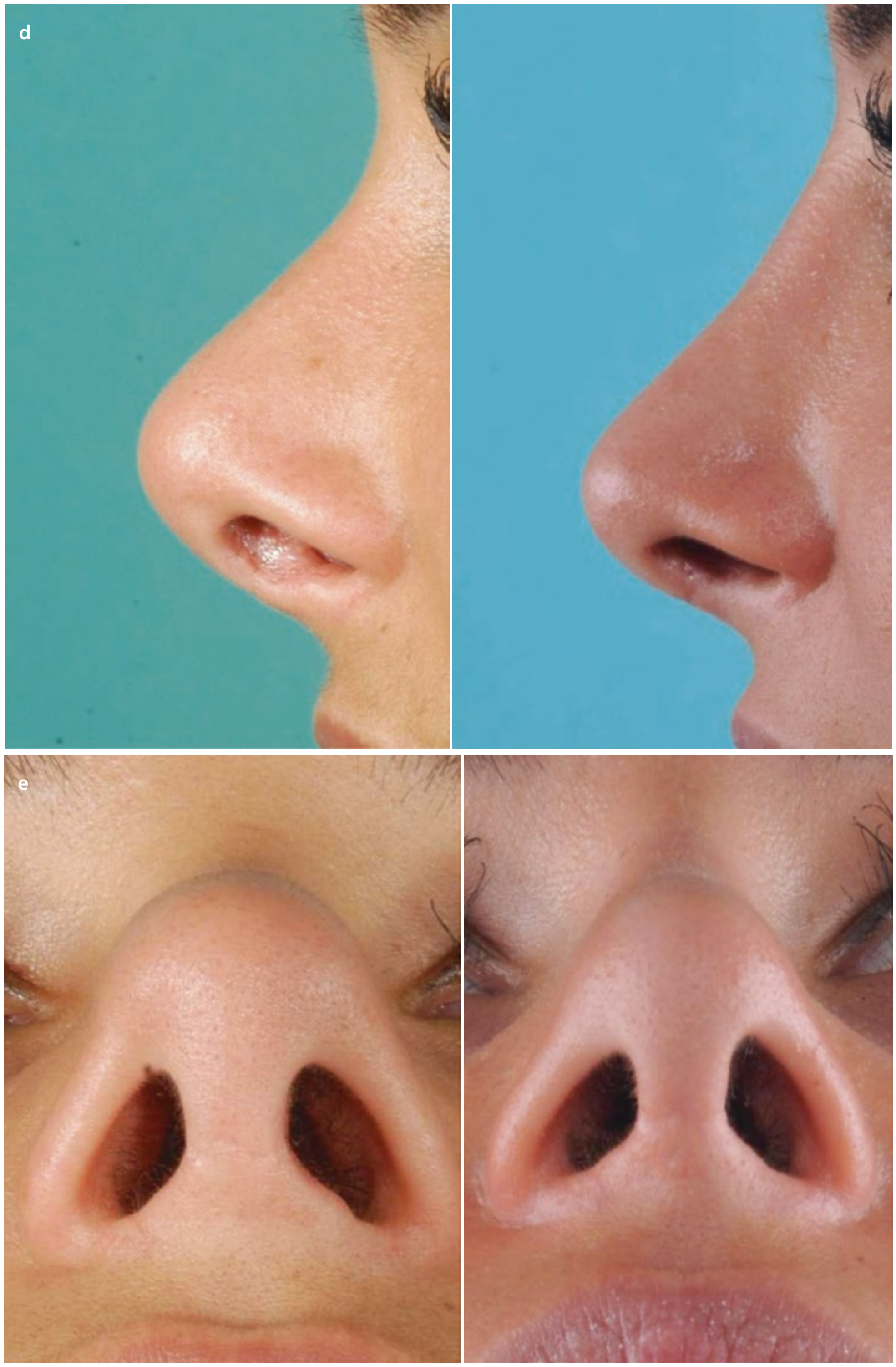
■ **Fig. 12.38** (continued)

12.2.33 Case 33: Deprojection by Medial Crural Overlap (Medial Sliding)

An 18-year-old female presented with a need for revision rhinoplasty (Fig. 12.39). Examination revealed an overly short nose with an overprojected nasal tip. The surgical plan was to physically lengthen the nose by counterrotating the tip with a medial crural overlap technique and to visually lengthen it by raising the nasal "starting point" with dorsal augmentation. Consequently, after lowering the overprojected cartilaginous dorsum, the bony vault was augmented with an onlay graft of allogenic fascia lata. The tip was also counterrotated by overlapping the medial crura.

Fig. 12.39 (**a**–**b**) Deprojection by medial crural overlap (medial sliding) combined with allogenic fascia for dorsal augmentation. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.39 (continued)



12.2.34 Case 34: Deprojection by Medial Crural Overlap (Medial Sliding)

A 29-year-old female presented with a severely overprojected tip combined with a polly-beak deformity from an overprojected cartilaginous dorsum (◘ Fig. 12.40). The bony pyramid was overly narrow and deviated to the left side, and numerous small contour irregularities were present throughout the nasal bridge.

Surgical exploration using the open approach revealed displacement of the ANS to the left of midline by 6.0 mm, resulting in deviation of the caudal septum. Additionally, the anterior septal angle was overresected. The displaced nasal spine was partially resected on the left side using a cylindrical drill bit, leaving a small remnant that was repositioned in the midline using a greenstick fracture pedicled to the soft tissue. The septum was then shortened at its base and then sutured to the ANS in the midline using osseous drill holes. After dividing the ULCs from the dorsal septum, the cartilaginous dorsum was lowered, and the bony pyramid was mobilized and straightened using parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies. Spreader grafts were placed for widening of the narrow dorsum.

Dissection of the tip revealed kinking of the left LLC. To eliminate this deformity and simultaneously correct the overprojected tip, a lateral crural overlap procedure (lateral sliding technique) was performed. The crural cartilage was transected at the level of the kink, and an 8.0-mm overlap was performed bilaterally. For additional stabilization of the malformed left LLC, an additional thin underlying batten graft was also placed. A columellar strut was then placed using a guiding suture. To further contour the tip, an integrated shield graft was sutured to the infratip lobule. The final shape was achieved using spanning sutures combined with a tip suspension suture with a posterior sling. After partially closing the skin flap, the dorsum was smoothed by injecting finely diced cartilage beneath the nasal skin.

Fig. 12.40 (**a**–**b**) Overresected anterior septal angle. (**c**) Correction of tip deformity by lateral crural overlap. (**d**) Dorsal contouring with free diced cartilage. (**e**–**g**) Front view, profile view, base view pre-op/post-op

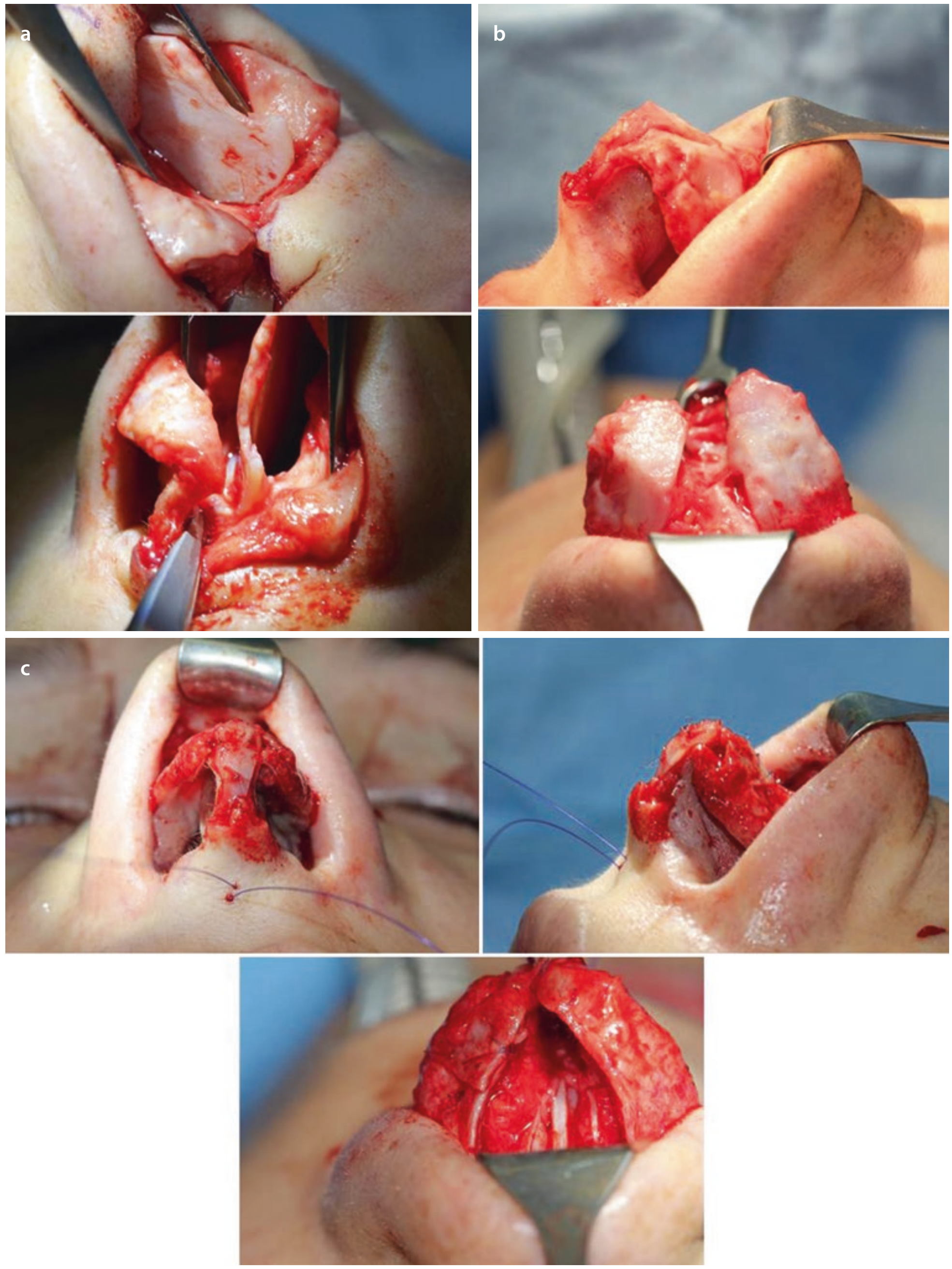


Fig. 12.40 (continued)

Fig. 12.40 (continued)

12.2.35 Case 35: Deprojection by Lateral Crural Overlap (Lateral Sliding)

A 25-year-old female presented after failed cosmetic rhinoplasty elsewhere (Fig. 12.41). Examination revealed an overprojected and scoliotic nose with an open roof deformity from previous resection of the bony dorsum. The left external valve was obstructed as a result of leftward deviation of the caudal septum and dislocation from the nasal spine. Using the external approach, the deviated caudal septum was excised and replaced with a septal extension graft fashioned from a posterior segment of the quadrangular septum. The tip was deprojected and counterrotated using the medial crural overlap technique, which resulted in a desired increase in nasal length. The nasion was then augmented, using the original caudal septum after it was lightly morselized in order to raise the nasal starting point.

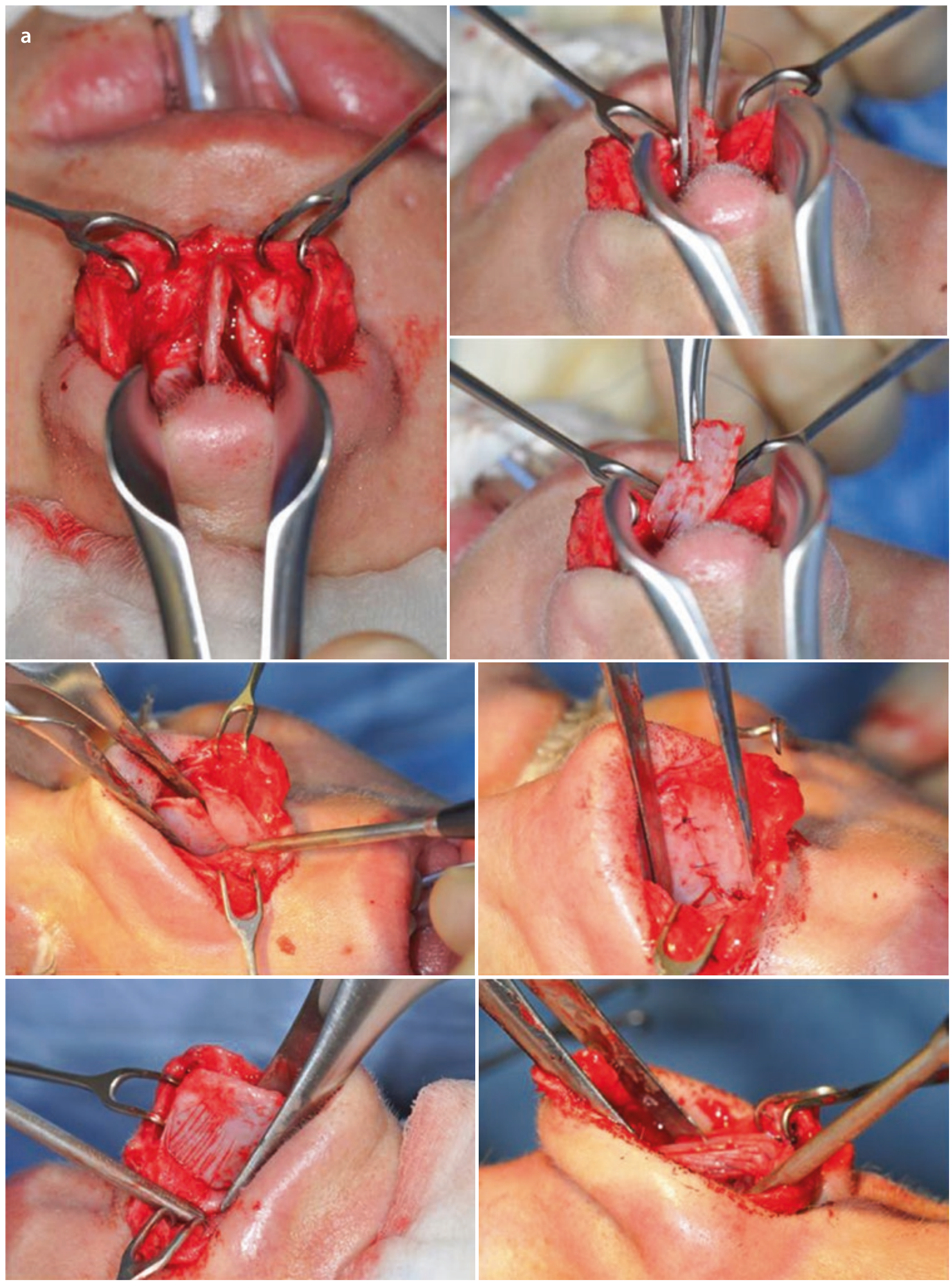


Fig. 12.41 (**a**–**b**) Replacement of the deformed anterior septum by septal extension graft, kept in position by extended spreader grafts, deprojection by medial crural overlap. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.41 (continued)

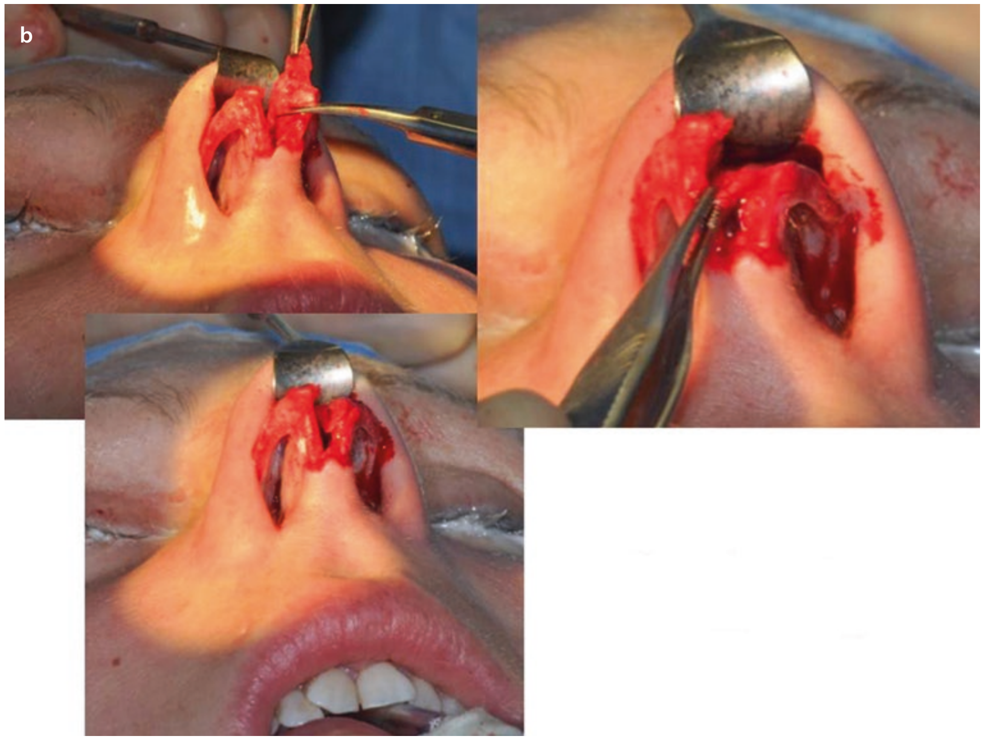
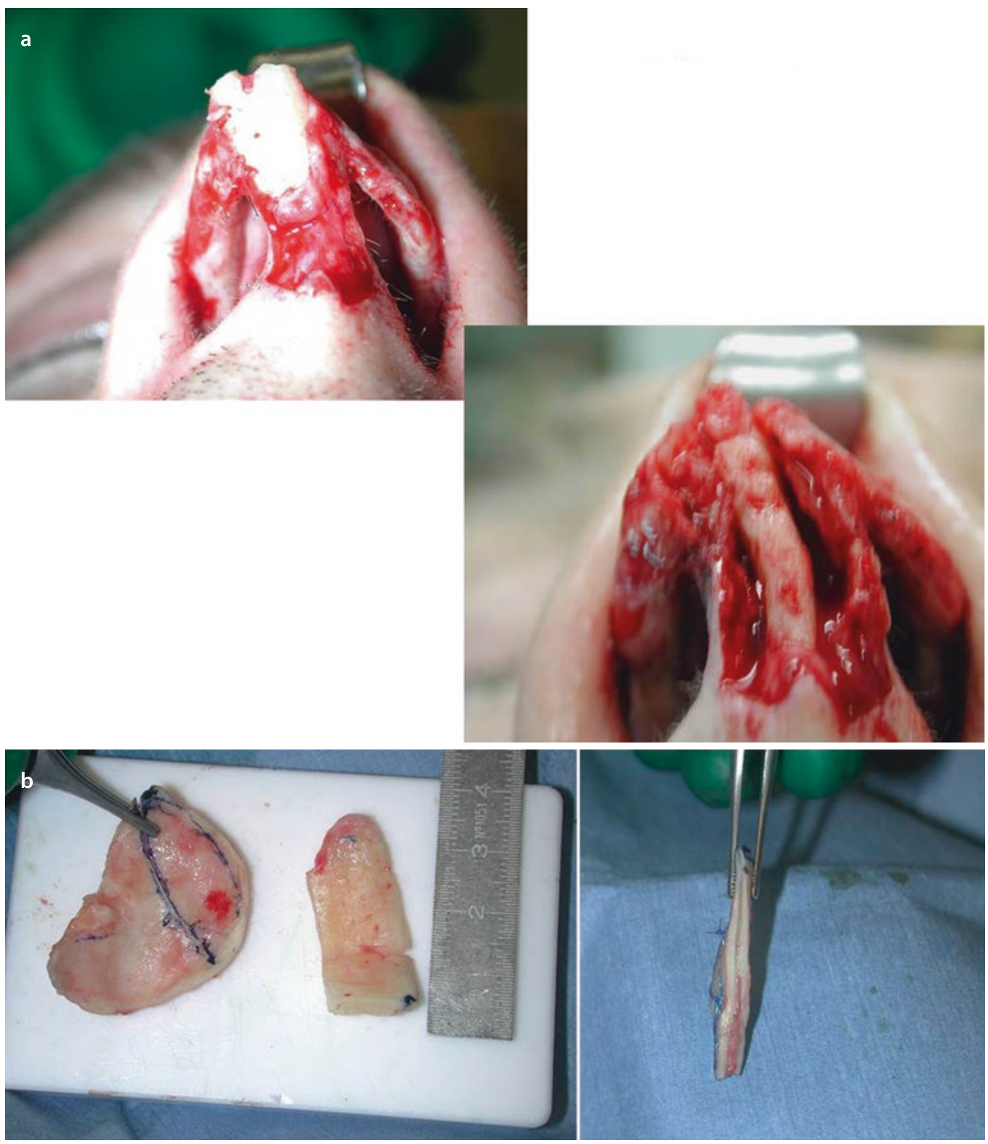


Fig. 12.41 (continued)

12.2.36 Case 36: Complex Tip Reconstruction with Deprojection and Lengthening by Sandwich Graft, Combined with Push Down, Reconstruction of the Missing Dome with Ear Cartilage

A 39-year-old male presented for revision surgery after four previous rhinoplasty procedures (■ Fig. 12.42). Examination revealed an overly short nose with an overprojected tip, an obtuse nasolabial angle, and nostril asymmetry from columellar deviation. Irregularities of the dorsum were also noted. Exploration of the nose via the open approach revealed warped rib cartilage used as a columellar strut graft. The rib cartilage was then replaced with a double-layered strut graft fashioned from conchal cartilage. On the left side, the medial crus was intact and could be sutured to the columellar strut. However, the right intermediate crus was missing, and a conchal cartilage graft was needed to reconstruct the dome. The lateral crura were then contoured with spanning sutures, and a double-layered shield graft was used to counterrotate the tip and improve contour. The dorsum was augmented with two layers of allogenic fascia lata. The result was improved tip symmetry and better alar contour with increased nasal length and a more acute nasolabial angle.



■ **Fig. 12.42** (**a**–**d**) Reconstruction of the overresected dome using conchal cartilage, double-layered conchal cartilage as columellar strut, onlay graft from soft tissue, spanning sutures. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 12.42 (continued)

Fig. 12.42 (continued)

Fig. 12.42 (continued)

12.2.37 Case 37: Deprojection by Lateral Crural Overlap (Lateral Sliding) and Setback by Septal Extension Graft

A 24-year-old female presented after previous rhinoplasty with a long and deviated nose and drooping of an overprojected tip resulting in an overly acute nasolabial angle and a retracted columella (◘ Fig. 12.43). Using the open approach, exploration revealed intact LLCs, but the caudal septum was damaged and displaced to the right side. The deformed caudal septum was then removed, and a septal extension graft was fashioned from quadrangular cartilage and placed with the aid of a guiding suture. After suture fixation of the septal extension graft, the overprojected and ptotic nasal tip was repositioned using the lateral crural overlap technique (i.e., the lateral crural sliding technique) to allow precise tip deprojection and simultaneous tip rotation. Additionally, a tongue-in-groove technique was used to fix the medial crura anterior to the caudal border of the septal extension graft for correction of the retracted columella. Both soft triangles were then augmented with allogenic fascia lata.

◘ **Fig. 12.43** (**a**) Deprojection by lateral crural overlap (lateral sliding), setback by septal extension graft. (**b**–**d**) Front view, profile view, base view pre-op/post-op

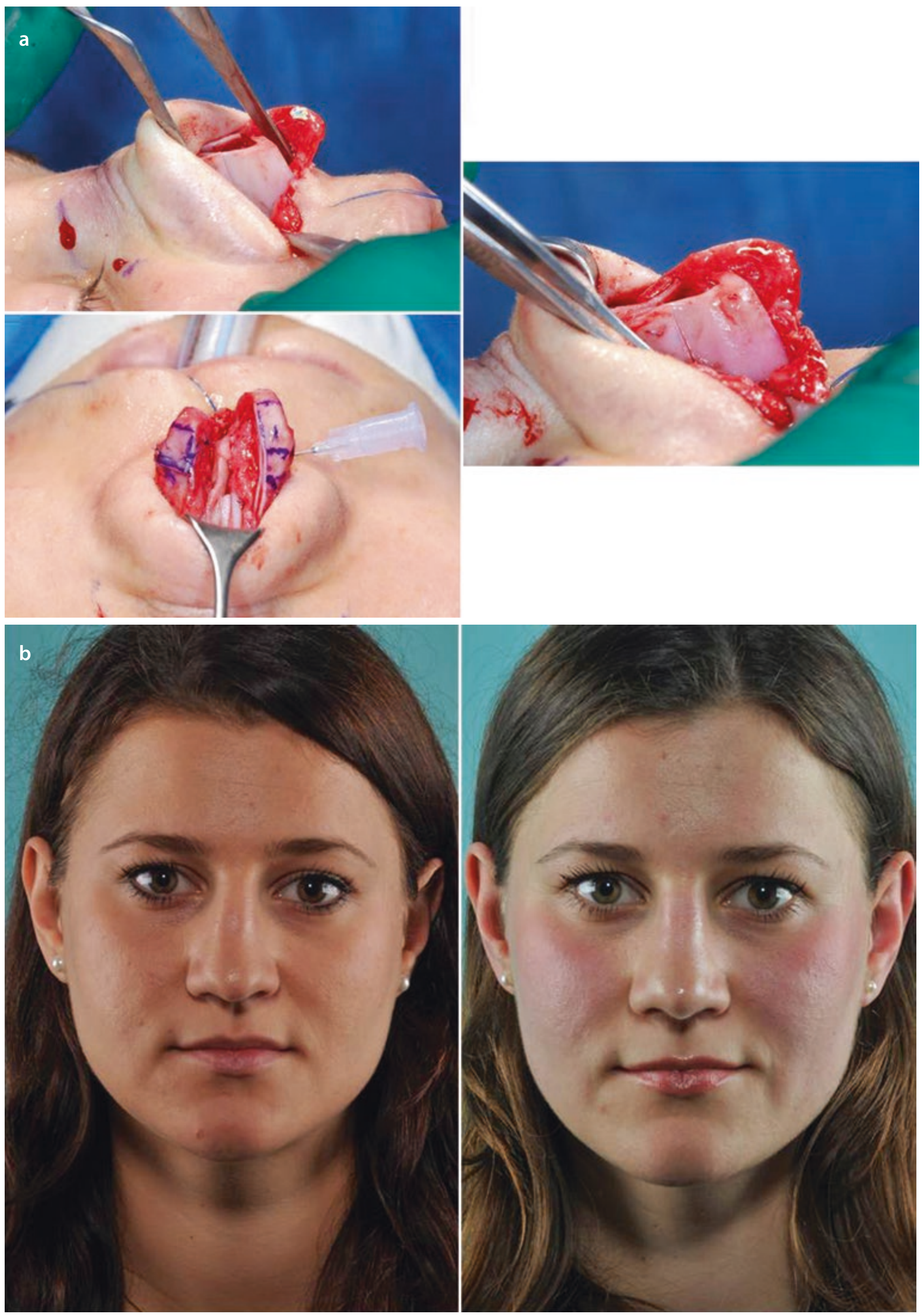


Fig. 12.43 (continued)

12.2.38 Case 38: Deprojection Combined with Cranial Rotation by Septal Extension Graft

A 38-year-old male presented after aesthetic rhinoplasty performed elsewhere (Fig. 12.44). The patient disliked his “Greek” profile, which had a poorly defined nasofrontal angle, and he also complained of an overly short nose with excessive nostril visibility. On surgical exploration, the lateral crura and the left nasal dome were missing. The resulting lack of skeletal support led to overrotation of the nasal tip, which was exacerbated by overresection of the caudal septum. Although very little septal cartilage was available for cartilage grafting, conchal cartilage was unavailable as a result of prior otoplasty. Consequently, the remaining quadrangular cartilage was harvested, leaving only a 10-mm dorsal strut (after dorsal reduction). The L-strut was then reconstituted using a columellar strut graft held in place with bilateral extended spreader grafts. The remaining septal cartilage was used to replace the missing lateral crura and the left nasal dome and to create a nonintegrated shield graft, which was covered with soft tissue. Transdomal sutures were also used for tip refinement.

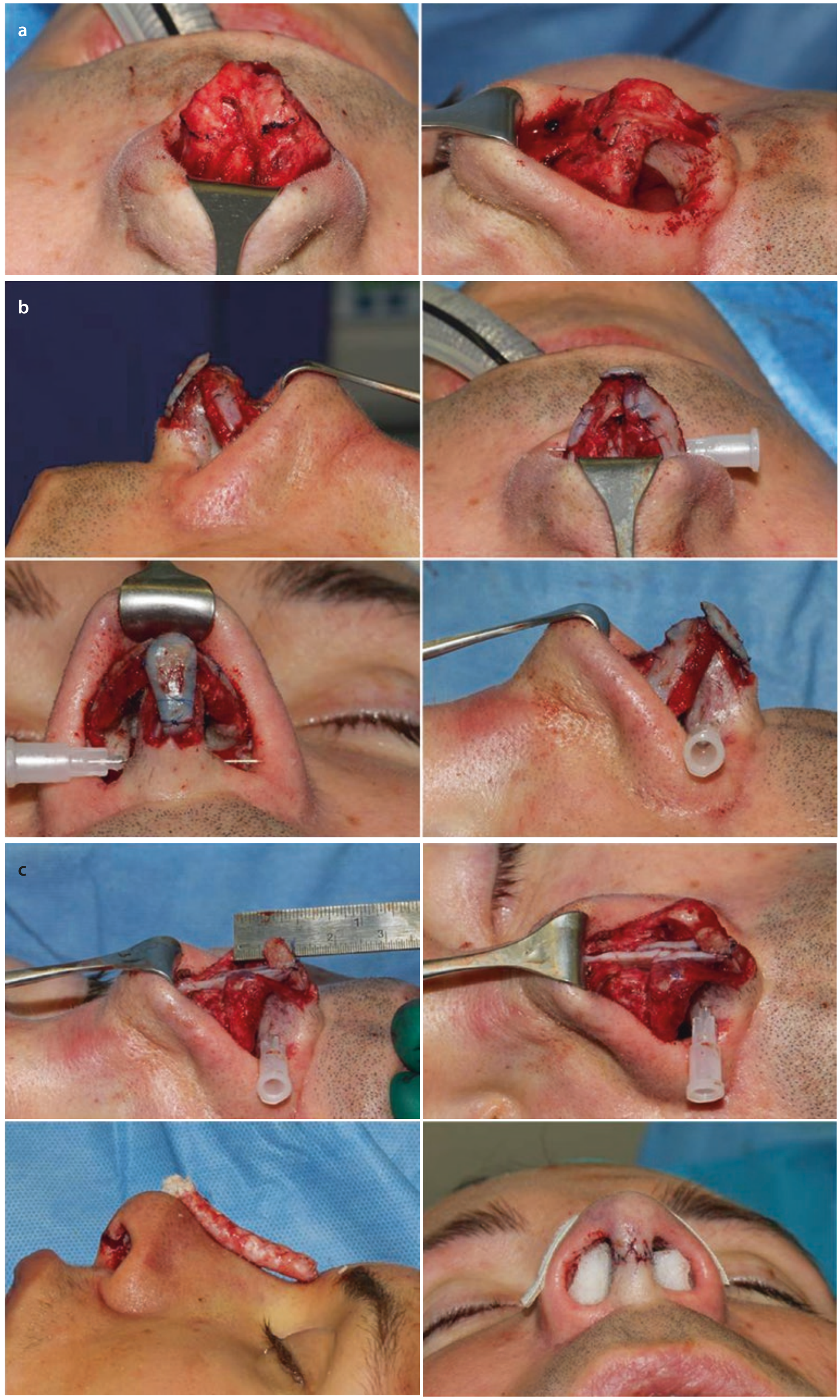


Fig. 12.44 (**a**–**d**) Derotation and lengthening by columellar strut combined with extended spreader grafts and shield graft, reconstruction of the overresected LLCs using batten grafts, DC-F. (**e**–**g**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.44** (continued)

Fig. 12.44 (continued)

12.2.39 Case 39: Deprojection Combined with Cranial Rotation and Total Reconstruction of the Lower Framework

A 47-year-old patient presented for revision rhinoplasty after severe nasal trauma and four previous nasal surgeries (Fig. 12.45). Examination revealed a widened nose with a C-shaped dorsal curvature, a plunging tip, and a retracted columella. The skin was overly thin and scarred, and both nasal side walls revealed numerous contour irregularities with malpositioned (overly high) osteotomy lines.

Using the open approach, dissection was difficult because of the scarred, thin, and tethered skin envelope. The residual septum was deformed, floppy, and dislocated from the midline. After parasagittal osteotomies were created using the Lindemann burr, extended spreader grafts (fabricated from the tenth rib) were used to straighten and stabilize the cartilaginous dorsum. Transverse osseous drill holes were then placed in the ANS, and the caudal septum was trimmed at its base and sutured in the midline. Percutaneous low-to-low lateral and transverse osteotomies were then used to straighten and narrow the bony vault.

Severe tip ptosis was corrected using the tongue-in-groove technique, in which the medial crura were sutured to the caudal septum in order to increase (cranial) tip rotation. A 1.5-mm strip of rib cartilage was first used to reinforce the flimsy caudal septum. Upon achieving adequate tip rotation, overprojection of the tip complex became evident. This was corrected using the lateral crural overlay technique to shorten the lateral crura. A shield graft of allogenic fascia lata was used to camouflage the tip complex, and free diced cartilage was used to smooth the nasal dorsum.

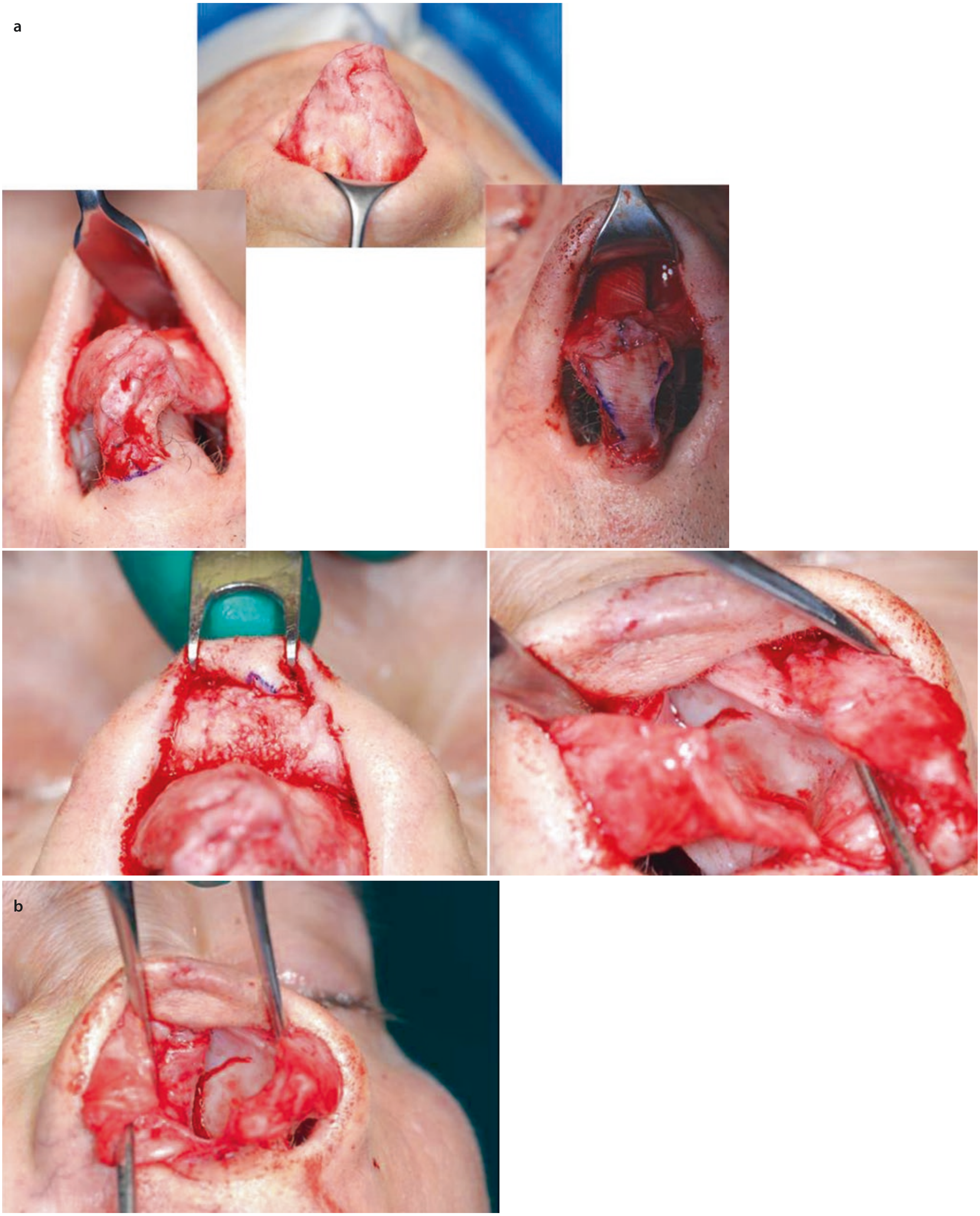


Fig. 12.45 (**a**) Totally deformed and scarred tip complex. (**b**) Severly deformed septum. (**c**) Straightening the septum with extended spreader grafts, deprojection by lateral sliding (overlap) technique. (**d**–**f**) Front view, profile view, base view pre-op/post-op

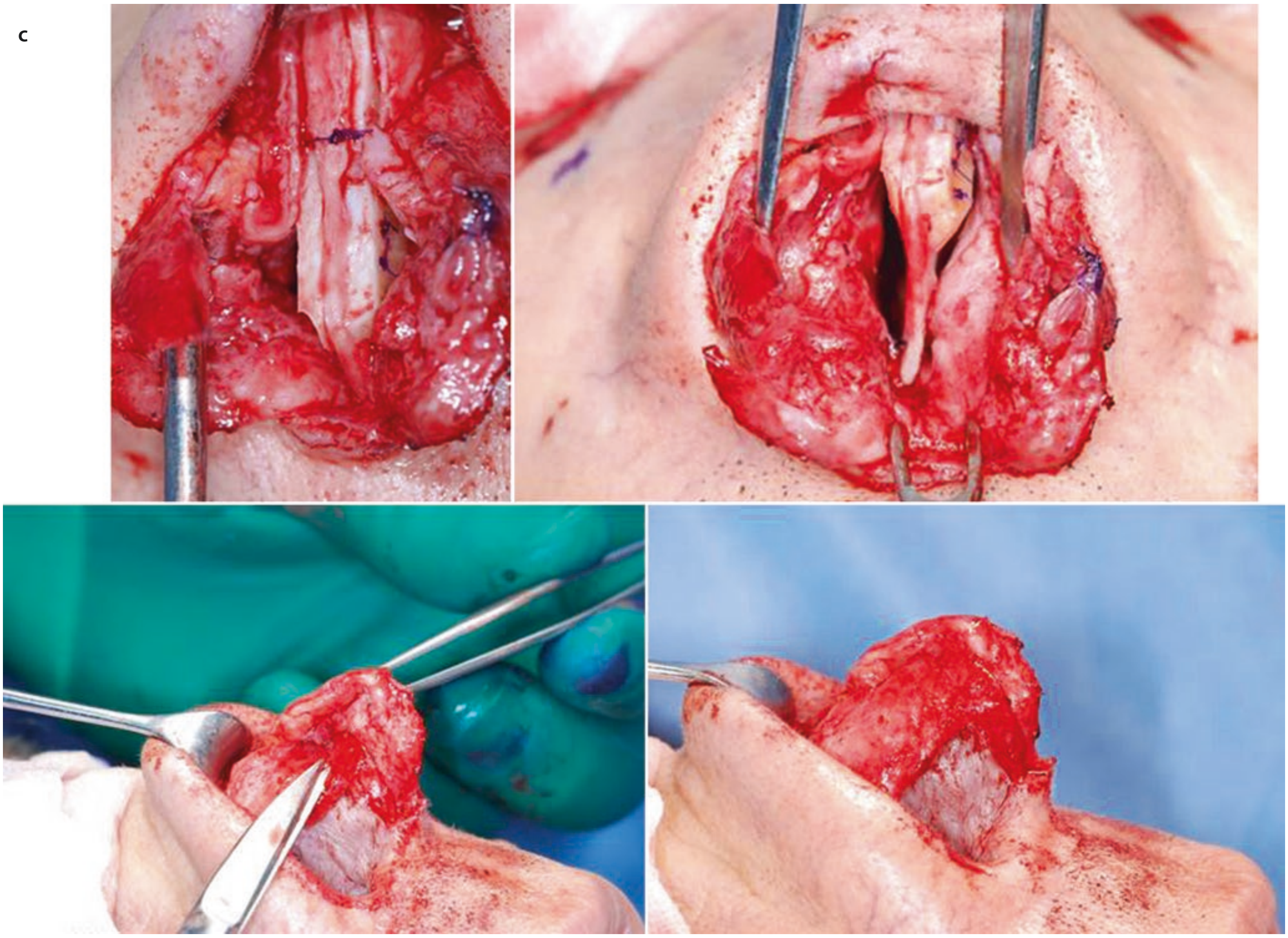


Fig. 12.45 (continued)

Fig. 12.45 (continued)

12.2.40 Case 40: Deprojection by Lateral Crural Overlap Combined with Sandwich Graft Working as a Septal Extension Graft

A 39-year-old female presented for revision rhinoplasty with a severe plunging tip deformity (Fig. 12.46). Examination revealed near total absence of the caudal septum and a wide and overprojected nasal dorsum. Endonasal examination revealed a persistent 8-mm septal perforation despite previous attempts at perforation closure.

Using an open rhinoplasty approach, the septal perforation was repaired using the four-flap technique. Conchal cartilage was then harvested from the right ear to create a sandwich graft, which was sutured to the septal remnant for improved tip support working as a septal extension graft. The bony hump was lowered with a rasp, and the nasal pyramid was narrowed using parasagittal medial osteotomies followed by percutaneous low-to-low lateral and transverse osteotomies. Overly long and overprojected LLCs were corrected using the lateral crural overlap (sliding) technique with a 6-mm overlap. The medial crura were sutured to the sandwich graft (modified tongue-in-groove technique), and the domes were contoured with transdomal sutures. An extended shield graft was placed in front of the domes, and spanning sutures were then used for tip refinement. A tip suspension suture was then used for tip immobilization. Allogenic fascia lata onlay grafts were used in an attempt to eliminate minor surface irregularities, but these grafts were replaced by finely diced cartilage, which led to a better result.

Additional functional improvement was later achieved by resecting the medial crural footpods and narrowing the columellar pedestal. Additionally, a Breathe (Karl Storz Co.; Tuttlingen, Germany) implant was inserted and sutured to both ULCs.

A Breathe implant is a saddle-shaped titanium device developed by Daniel à Wengen for spreading and stabilizing the internal nasal valve. It is placed on top of the middle vault to permit suture suspension of the ULCs for improved nasal valve patency.

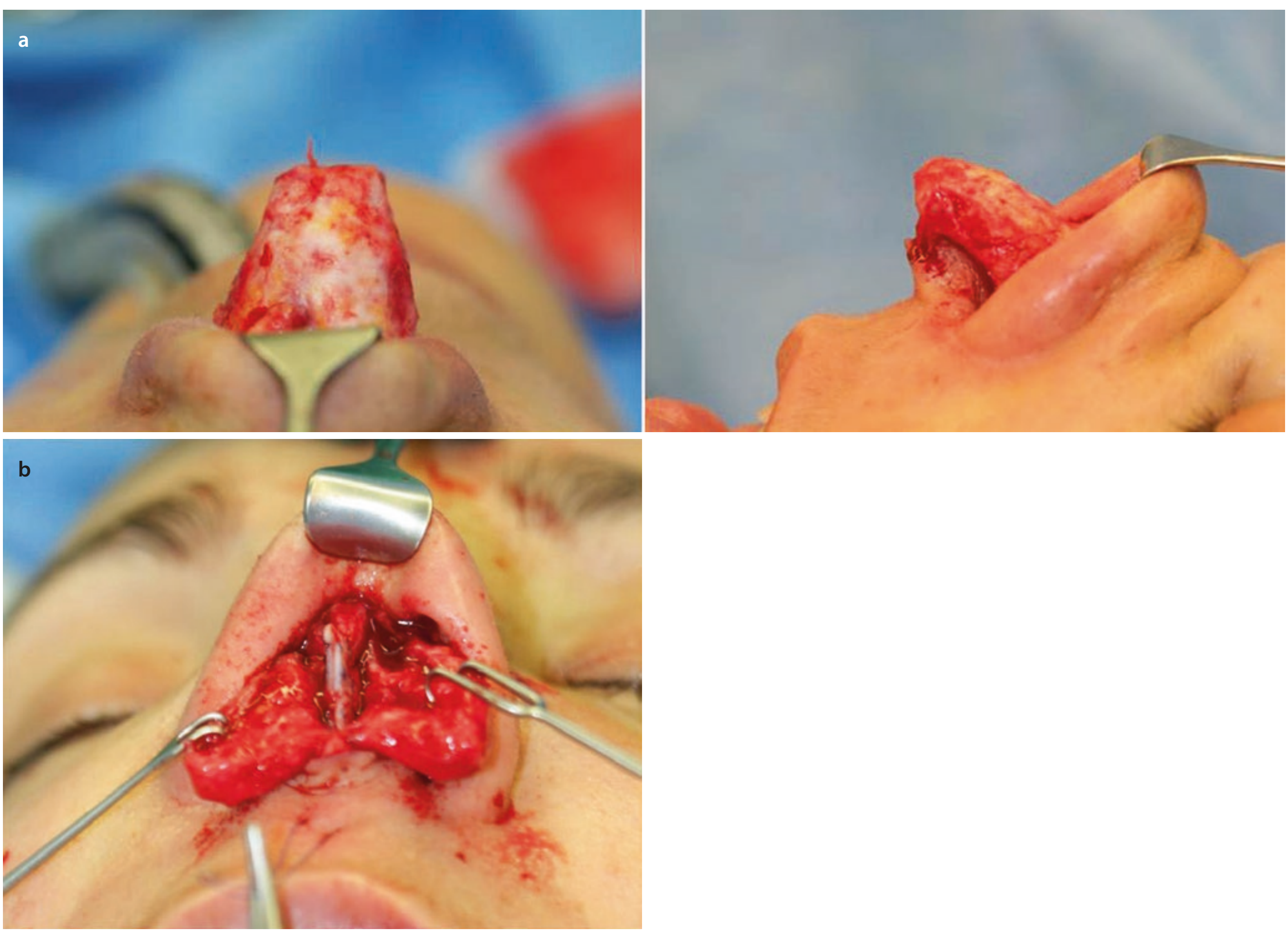


Fig. 12.46 (**a**–**c**) sandwich graft working as septal extension graft, deprojection by lateral crural overlay (lateral sliding). (**d**) Insertion of Breath implant. (**e**–**g**) Deprojection combined with increasing tip support. Front view, profile view, base view pre-op/post-op

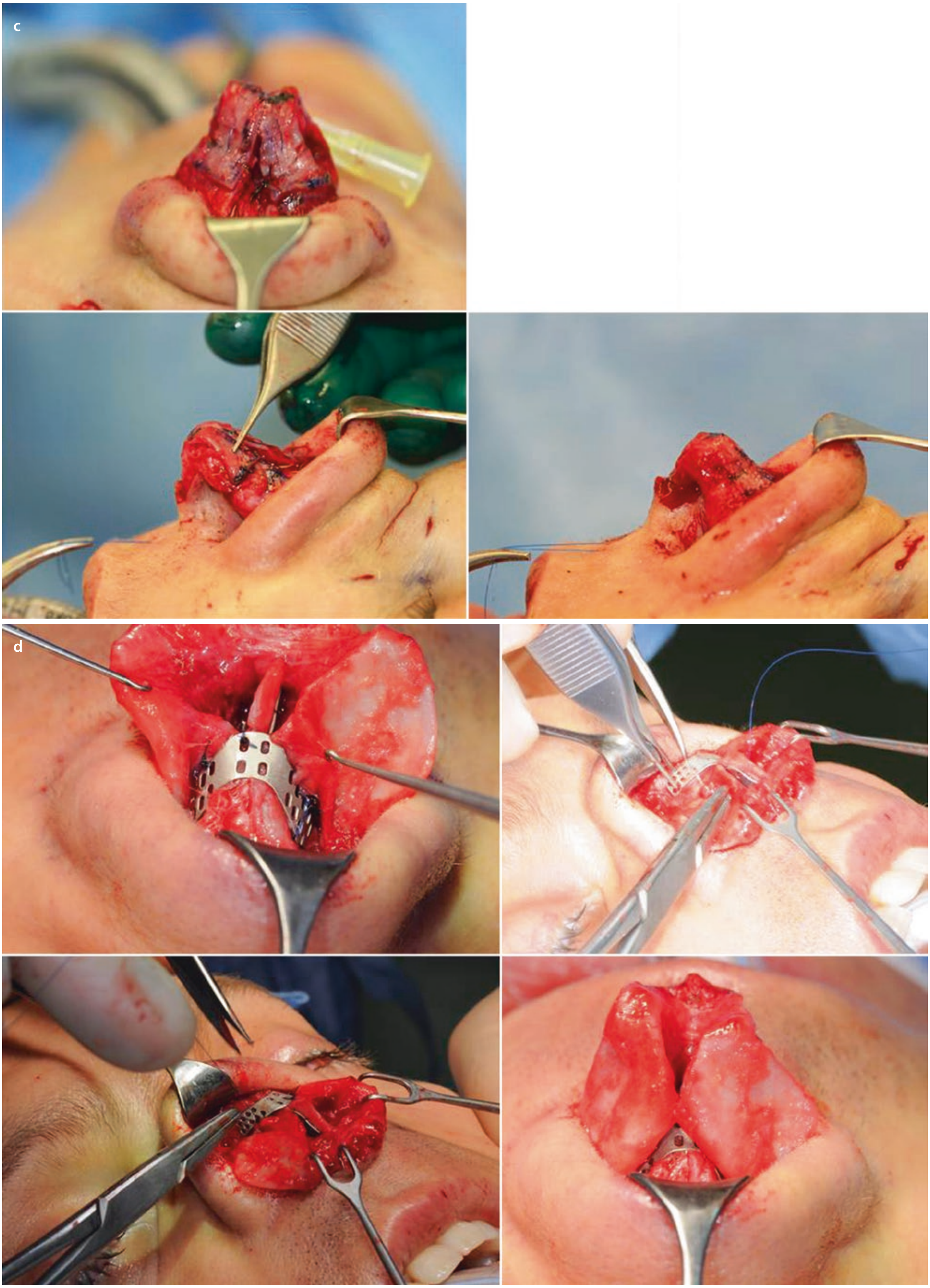


Fig. 12.46 (continued)

Fig. 12.46 (continued)

Fig. 12.46 (continued)

12.2.41 Case 41: Lengthening by Columellar Strut and Extended Spreader Grafts, Reconstruction of the Lower Framework with Septal Cartilage

A 54-year-old female presented after two previous cosmetic nasal surgeries performed elsewhere (Fig. 12.47). Examination revealed conspicuous overprojection of the nasal tip, pinching of the middle vault with internal valve collapse, and dislocation of the caudal septum into the left nasal vestibule. Surgical exploration with the external approach initially revealed only diffuse scarring of the nasal tip. However, after resection of the tip scar tissue, absence of both lateral crura and portions of the left intermediate crus were observed. Total tip framework reconstruction via the external approach was accomplished using septal cartilage graft material. Extended spreader grafts were used to widen the middle vault, lengthen the nose by 12 mm, and support the newly placed columellar strut graft. Additional strips of septal cartilage were then used to replace the missing segments of LLC and reconstruct the tip framework.

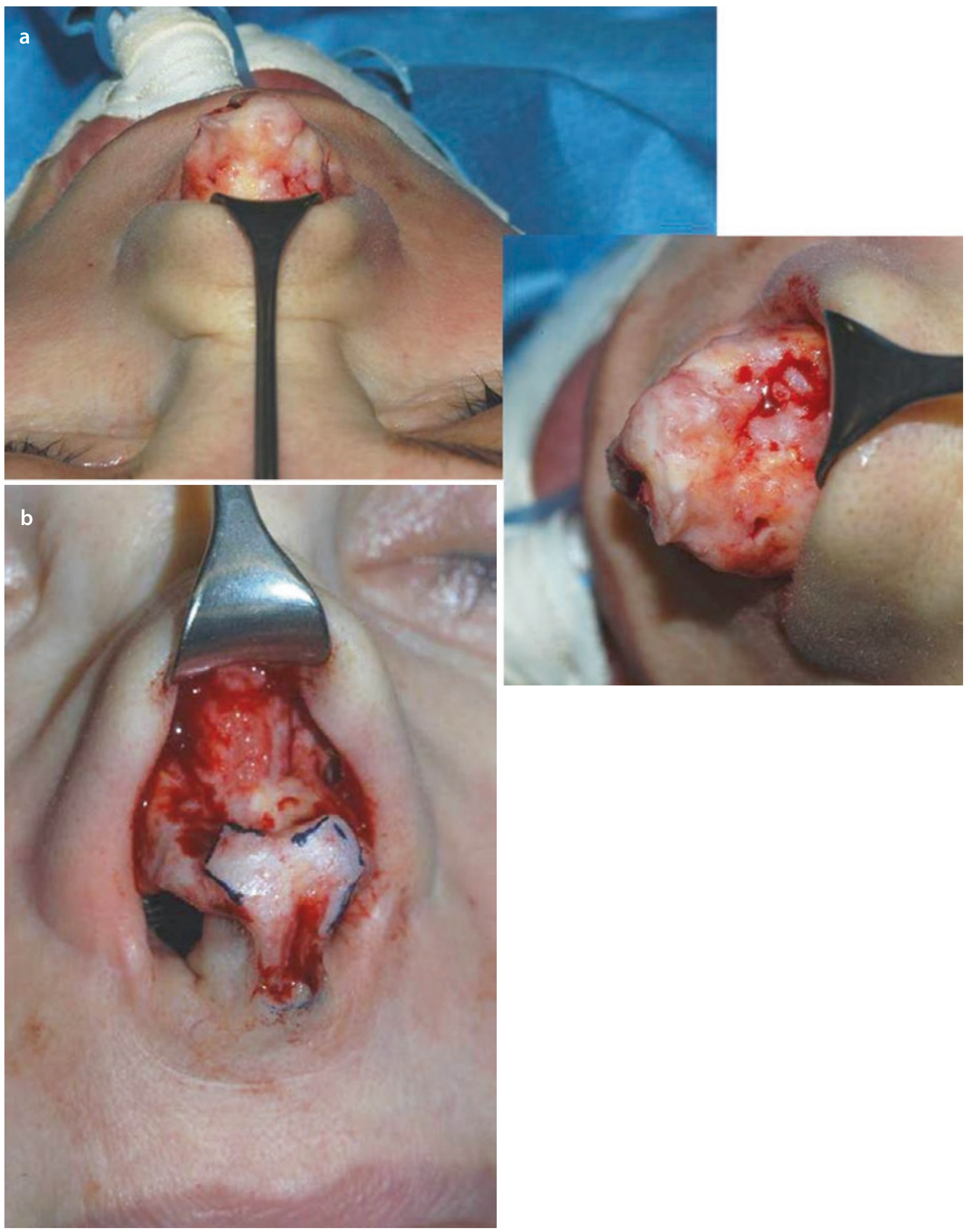


Fig. 12.47 (**a**–**d**) Lengthening by columellar strut and extended spreader grafts. (**e**) Batten grafts for framework reconstruction. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 12.47 (continued)

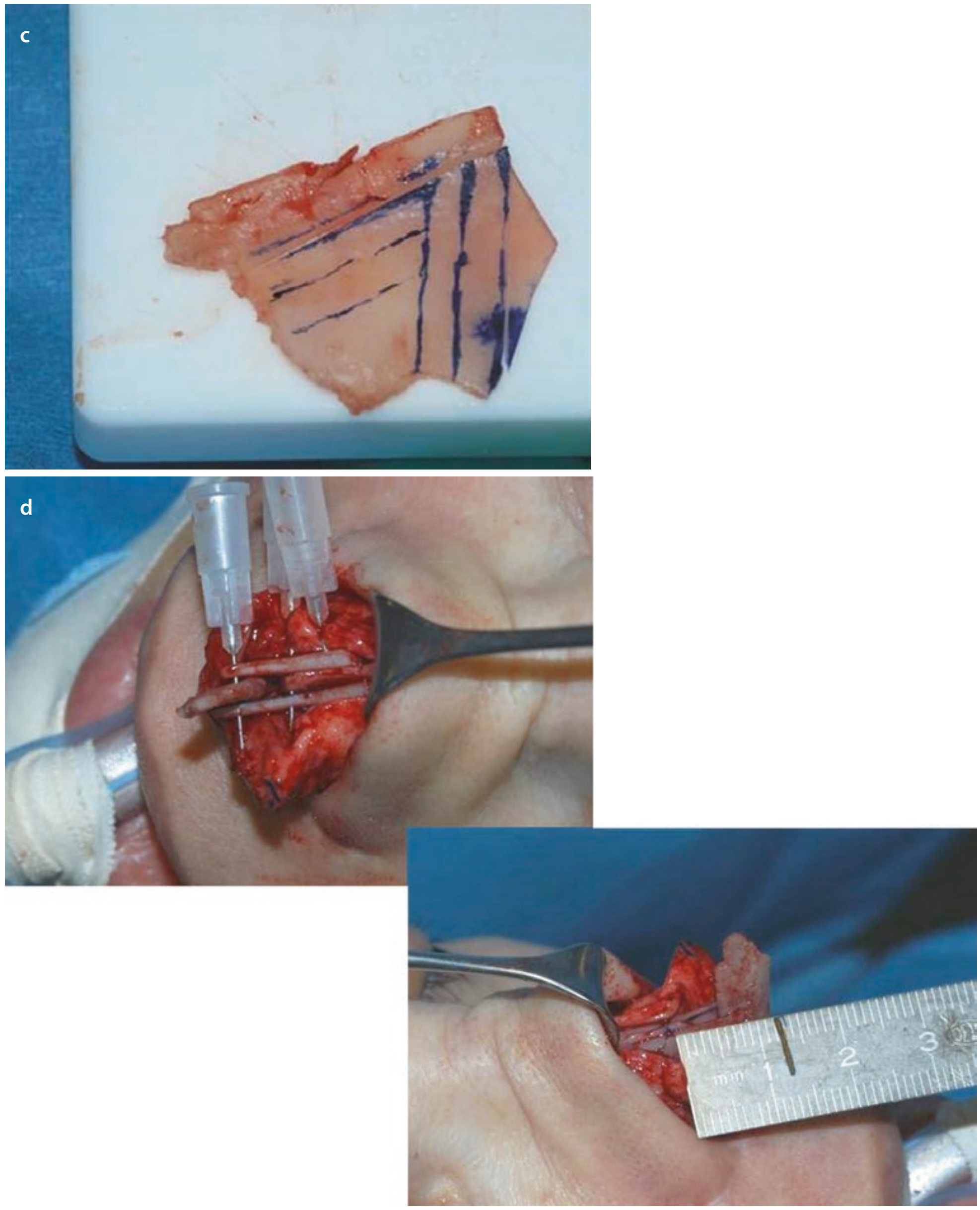


Fig. 12.47 (continued)

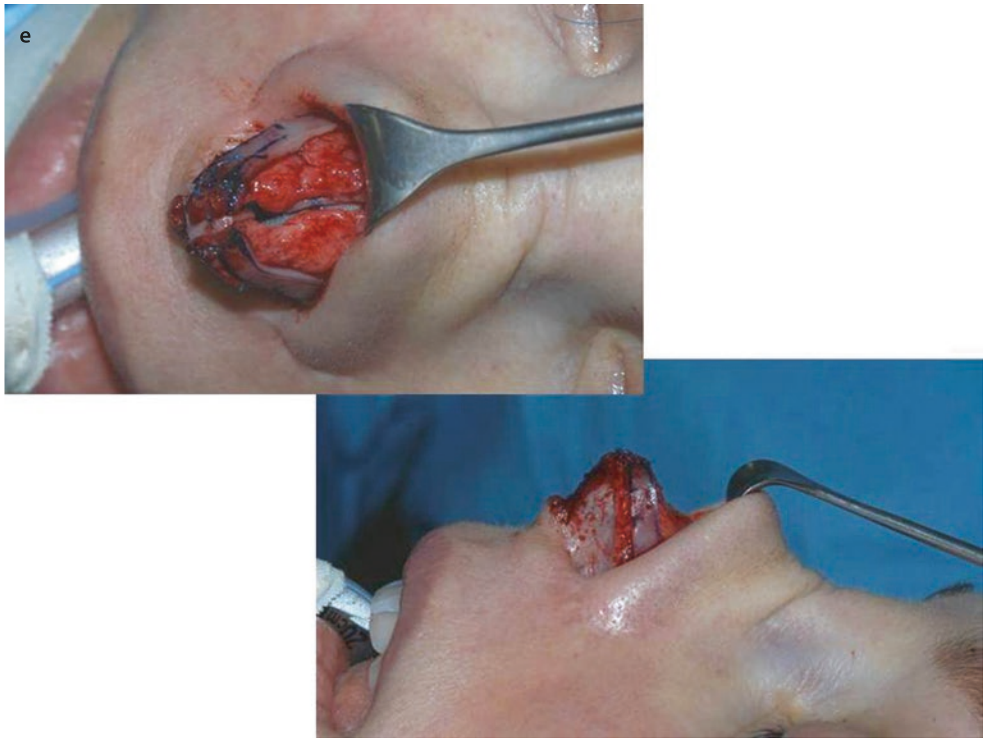


Fig. 12.47 (continued)

12.2.42 Case 42: Lengthening by Septal Extension Graft

A 30-year-old male patient presented after previous rhinoplasty with a severe pig's nose. The nose was overshortened, the nasolabial angle increased. Very obvious asymmetry of the nostrils was seen. The cartilaginous dorsum was not lowered sufficiently, and the nasal pyramid was deviated (Fig. 12.48).

Using an open approach, dome division on the left was revealed. The overshortened nose resulted from an overresected anterior septum. The caudal framework was destroyed. The scar formations between the LLCs and ULCs were cut through to the inner lining, so that the LLCs could be pushed caudally. After lowering the cartilages, a septal extension graft was harvested from the central septum and fixed to the right side, because the anterior border of the resected septum was slightly shifted to the left. The deviated nasal pyramid was straightened and narrowed with percutaneous low-to-low lateral and transverse osteotomies. From a harvested rib, cartilaginous strips were thinned with a sculpture board to 1.5 mm thickness. These spreader grafts were fixed to the dorsum of the septum. Tip reconstruction was achieved on the left side with lateral crural overlap. On the right side, a medial sliding was performed to bring the domes into a symmetric position. Only then, the crura medialia were fixed to the septal extension graft. Additionally, batten grafts were placed. Residual cartilage was diced and used as free diced cartilage for final smoothening and augmentation of both soft triangles.

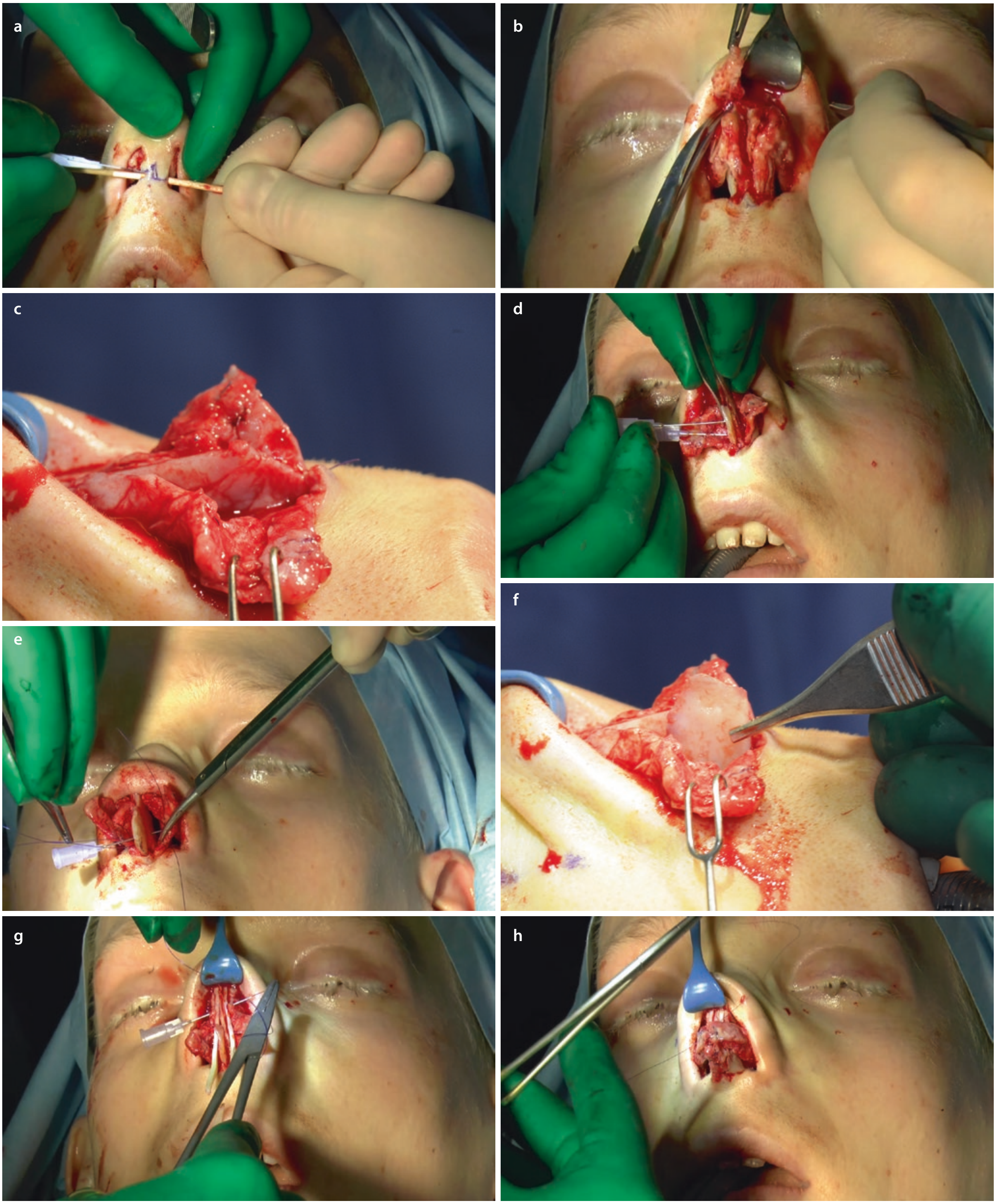
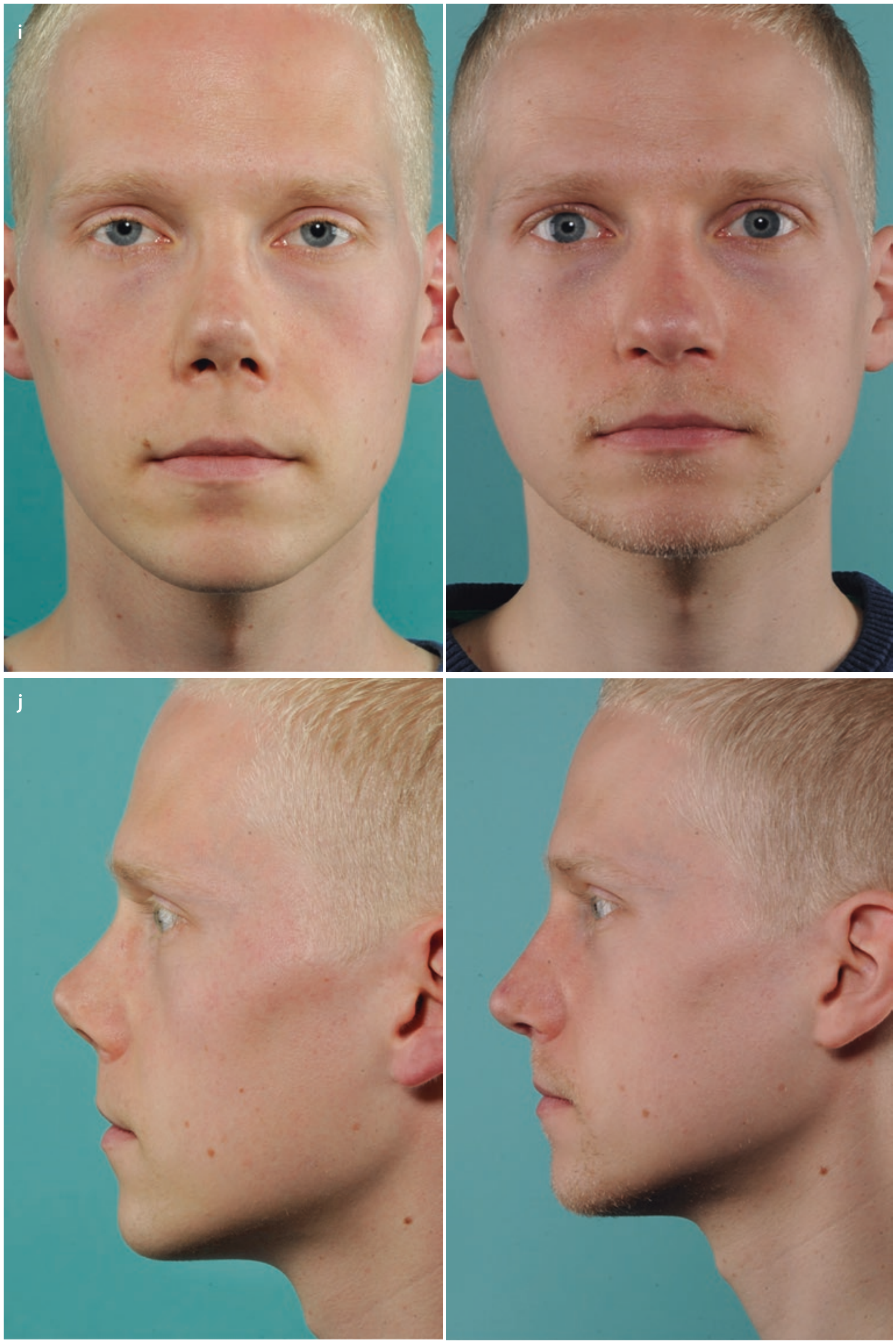


Fig. 12.48 (**a**) Open approach, using a cotton stick for protection of the medial crura. (**b**) Removal of scar tissue. (**c**) Overshorthened anterior septal border. (**d**–**f**) Placing a septal extension graft. (**g**) Fixing spreader grafts. (**h**) Tip reconstruction. (**i**–**k**) Front view, profile view, base view pre-op/post-op

Fig. 12.48 (continued)



■ **Fig. 12.48** (continued)

12.2.43 Case 43: Lengthening by Combination from Sandwich Graft and Septal Extension Graft

A 32-year-old female presented after two failed rhinoplasty surgeries (Fig. 12.49). The patient reported that the first rhinoplasty resulted in an overly short nose. Consequently, a second rhinoplasty was performed only 2 months later to increase nasal length using cartilage grafts. However, the patient remained dissatisfied with her nasal length and returned seeking a second revision surgery to elongate her nose. Using a double-layered conchal sandwich graft supported with bilateral extended spreader grafts, the nasal tip was counterrotated to the patient's satisfaction.

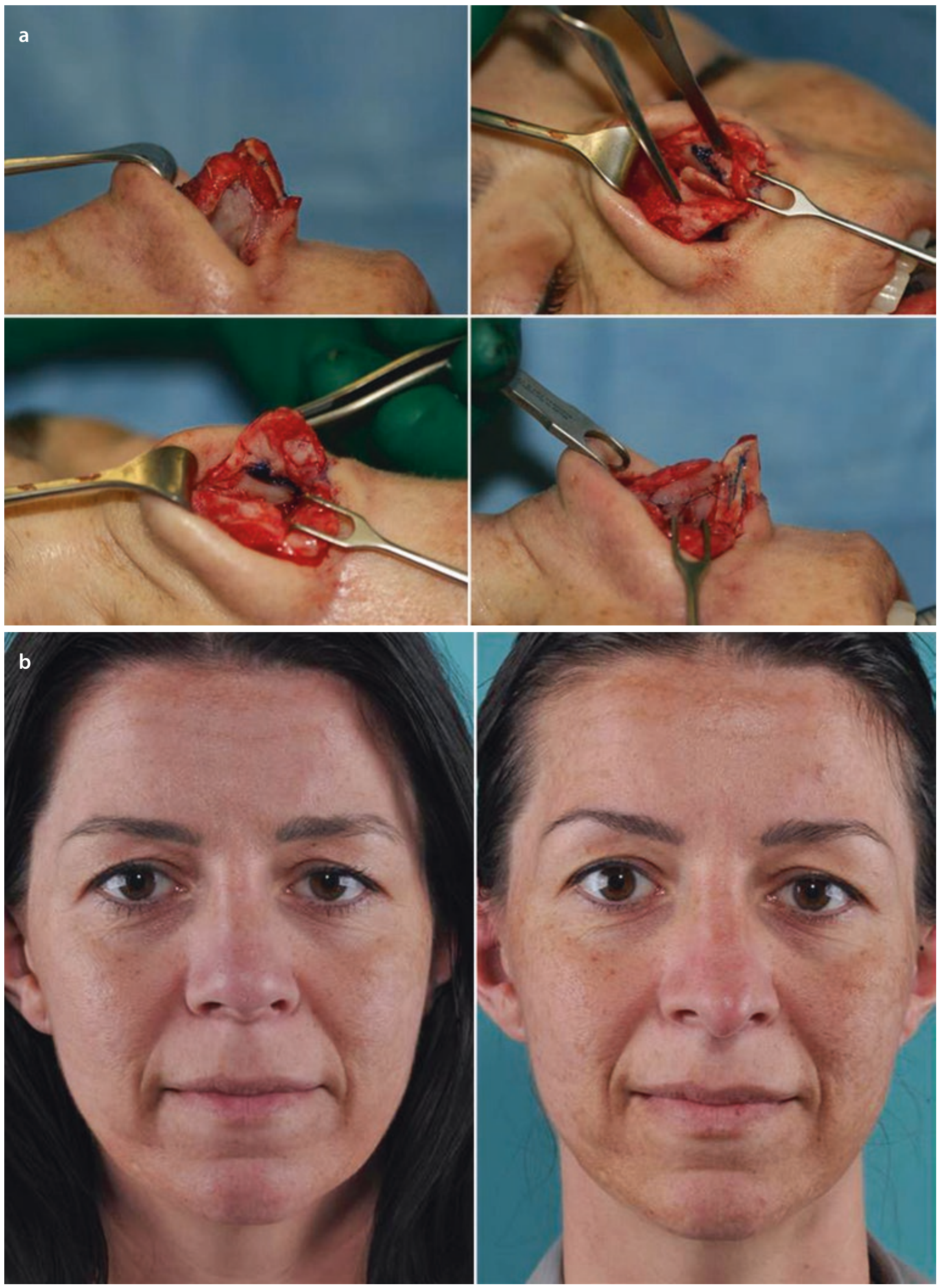


Fig. 12.49 (**a**) Lengthening by combination from sandwich graft and septal extension graft. (**b**–**d**) Front view, profile view, base view pre-op/post-op

Fig. 12.49 (continued)

12.2.44 Case 44: Lengthening by Two Doublelayered Sandwich Grafts from both Conchae

A 58-year-old female presented after multiple unsuccessful rhinoplasty procedures performed elsewhere (Fig. 12.50). Examination revealed a small and overly short nose with an overresected dorsum. Using the external approach, the lateral crura were found to be missing and only an L-strut remained of the quadrangular septum, leaving very little septal cartilage for graft harvest. To lengthen the nose and reproject the tip, a double-layered conchal strut graft was placed and supported from behind by a second double-layered strut graft sewn to the caudal septum. Septal batten grafts were then used to replace the missing lateral crura, and a nonintegrated shield graft fashioned from conchal cartilage was used to further increase tip projection. Additional conchal cartilage was crosshatched (while leaving the perichondrium intact) and used for dorsal augmentation. To straighten the nasal dorsum, the right nasal bone was in-fractured, and the left nasal bone was augmented with a thin cartilage onlay graft. Previous radix augmentation grafts were removed, and the nasion was lowered using a motorized drill. The dorsum was then smoothed with alloplastic fascia. One year postoperatively, minor irregularities were successfully camouflaged with microinjections of autologous fat.

Fig. 12.50 (**a**–**d**) Lengthening by two sandwich grafts and shield graft, covered with soft-tissue onlay graft, dorsal augmentation with crosshatched conchal graft, reconstruction of the overresected LLCs with batten grafts. (**e**–**h**) Front view, profile view, base view pre-op/post-op

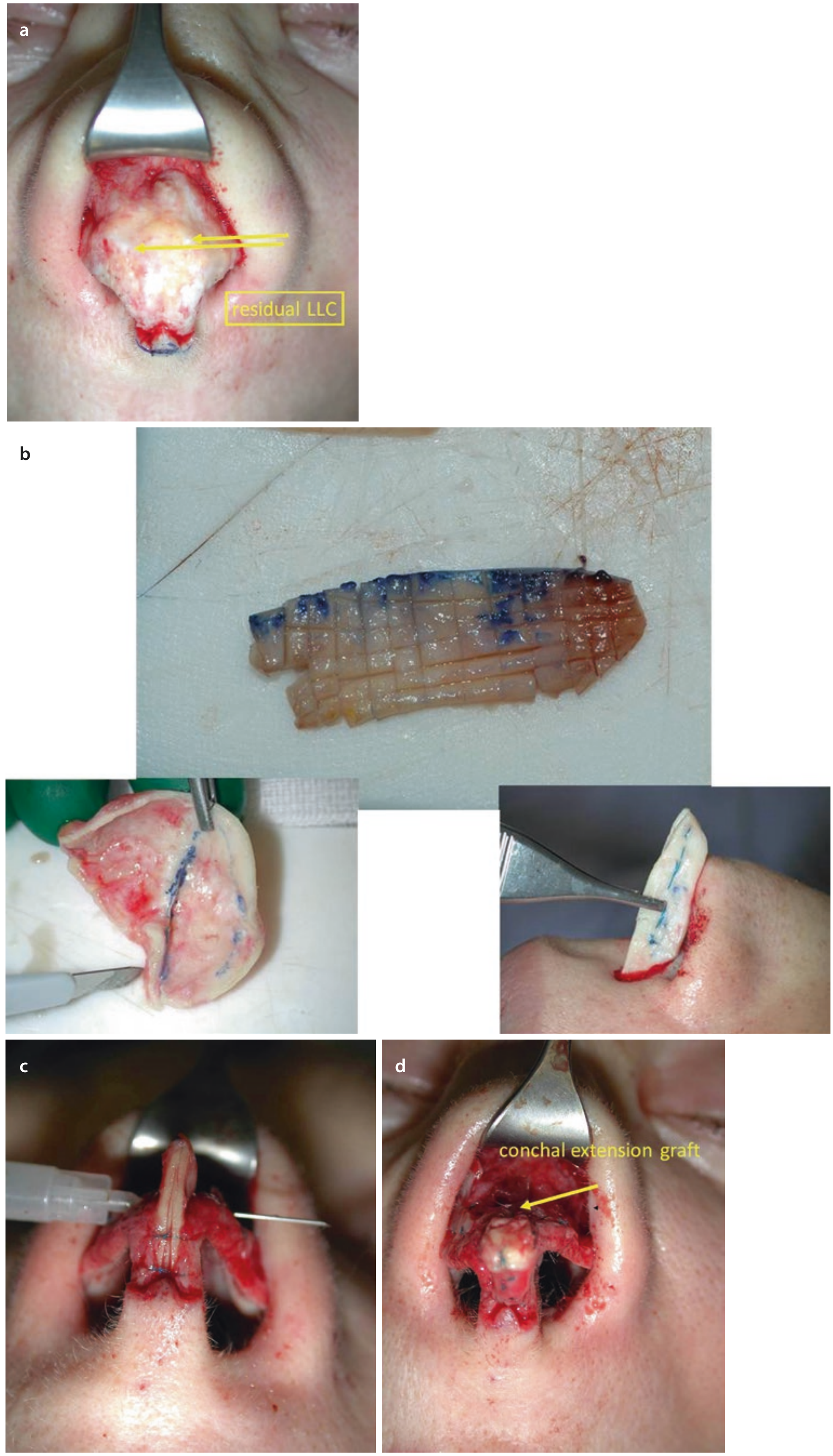


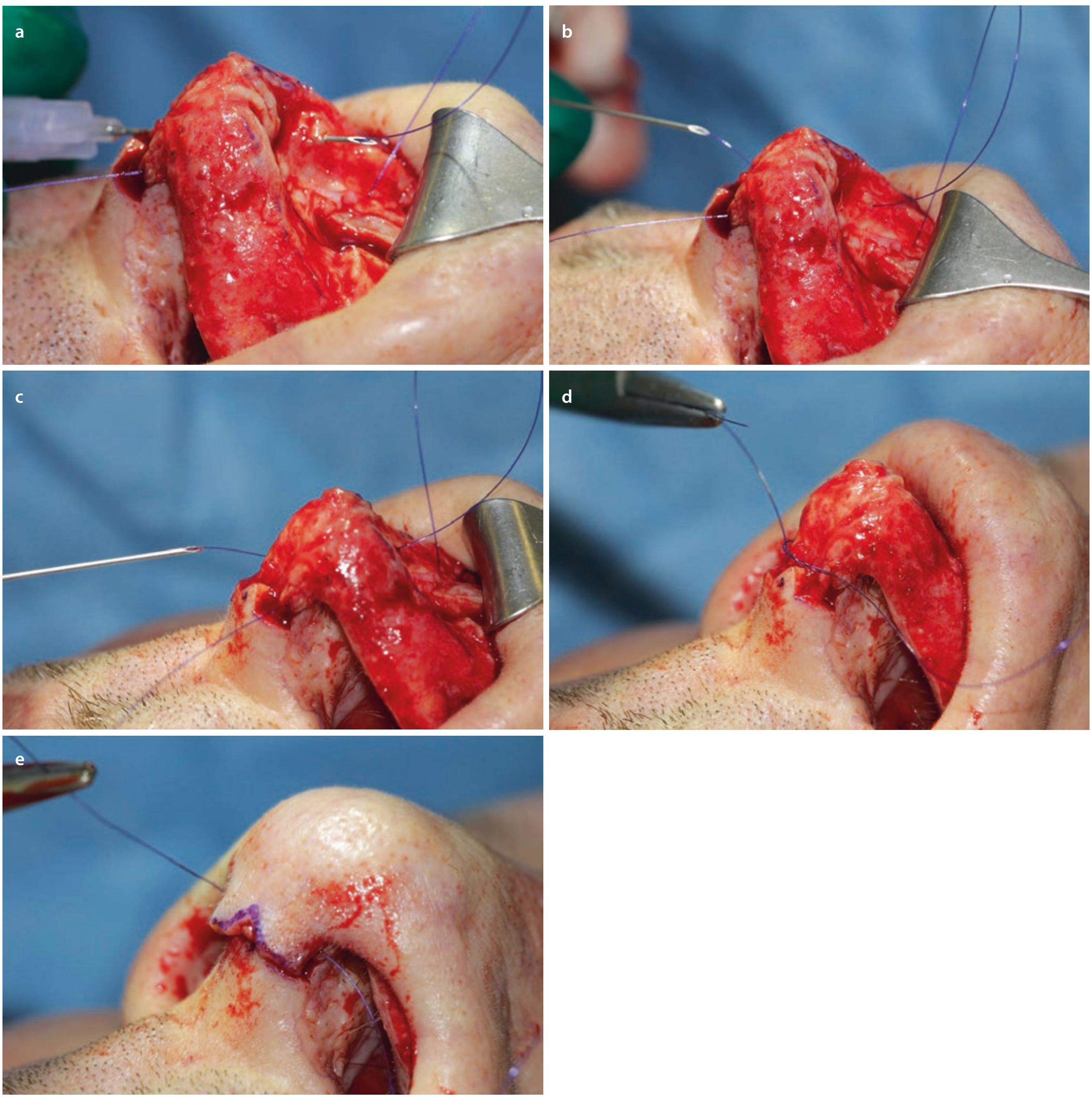
Fig. 12.50 (continued)

Fig. 12.50 (continued)

12.2.45 Case 45: Shortening by Tip Suspension Suture with Anterior Sling, Additionally Columella Shortening

A 47-year-old male presented after three previous rhinoplasties with a polly-beak deformity, tip ptosis, and a deficient infratip (▣ Fig. 12.51). A deep scar of the left ala (from previous laser treatment) was also observed.

Using an open rhinoplasty approach, subcutaneous scar tissue was excised, and tip ptosis was corrected using a suspension suture with an anterior sling. The suspension suture was placed as follows. After fixing a 4-0 resorbable polydioxanone suture to the dorsal septum, the suture tails were passed retrograde through small needles inserted beneath the columellar/vestibular skin at the desired point of tip suspension. A single loose throw was placed between both ends of the suture (with the knot in the midline of the infratip lobule), while the columellar skin flap was sewn closed. Once the flap was returned to its normal position, the final tightening and tying of the knot were completed. Using this method, long-lasting tip support was established. Prior to closure, the deep alar scar was augmented from beneath with a soft-tissue graft created from the previously excised fibrous scar of the nasal tip.



▣ **Fig. 12.51** (**a**–**e**) Shortening the nose by tip suspension suture and anterior sling combined with columella shortening. (**f**–**h**) Front view, profile view, base view pre-op/post-op

Fig. 12.51 (continued)

Fig. 12.51 (continued)

12.2.46 Case 46: Shortening by Sandwich Graft for Tip Support

A 22-year-old female presented after two previous rhinoplasties with an ultranarrow, crooked, and sharp-looking dorsum (Fig. 12.52). Presumably a reduction rhinoplasty had been performed previously for treatment of a tension-nose deformity. Examination revealed severe alar concavities bilaterally and ptosis of the nasal tip. A C-shaped dorsal curvature and saddle-nose deformity (arising from an underlying deformity of the septum) were also observed, and the bony dorsum remained overprojected.

Surgical exploration with the external approach revealed overresection of the caudal septum. This was reconstructed with a double-layered sandwich graft fabricated from conchal cartilage. Spreader grafts, also fabricated from conchal cartilage, were used to straighten the dorsal curvature. After rasping down the bony dorsum, the bony pyramid was straightened with percutaneous low-to-low lateral and transverse osteotomies. The cephalic portion of the LLCs was resected and used as batten onlay grafts to camouflage sharp edges of the domes and to fill the concavities of both lateral crura. Augmentation of the saddled dorsum was initially attempted using four layers of allogenic fascia lata, but the result was unsatisfactory. Consequently, two layers of allogenic fascia lata were used to create a fascial sleeve and then filled with diced cartilage to create a DC-F onlay graft. The remaining two layers of fascia lata were then used to cover the DC-F graft. A tragal graft was also used to correct a retracted left alar rim.

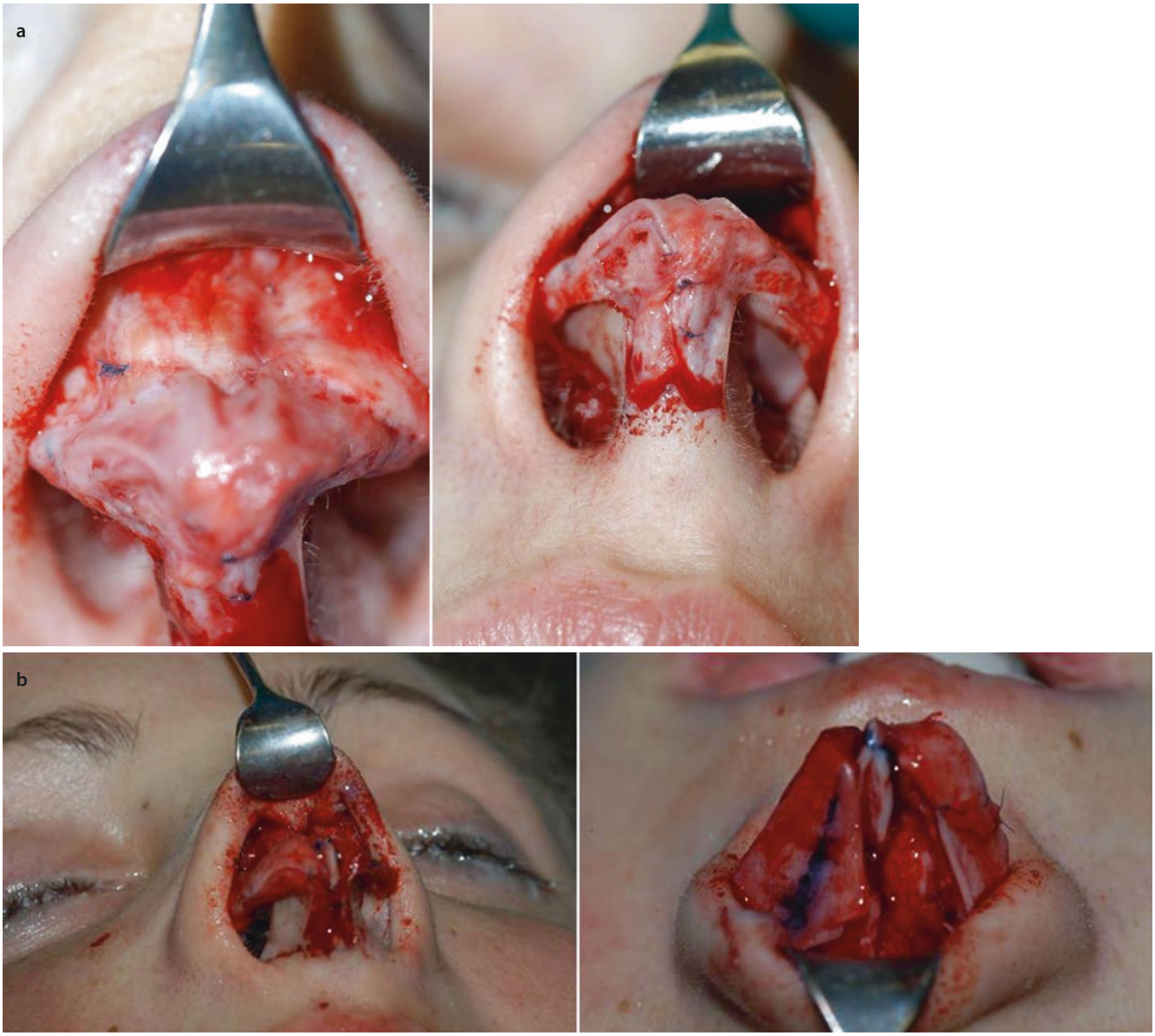


Fig. 12.52 (**a**) Severe scarring. (**b**) Placing a sandwich graft used as septal extension graft for fixing the medial crura with a tongue-in groove for shortening, correcting the concave lateral crura by batten grafts from the cephalic portion. (**c**–**e**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.52** (continued)

Fig. 12.52 (continued)

12.2.47 Case 47: Shortening by Combination of Different Techniques

A 57-year-old male presented after septorhinoplasty performed elsewhere (Fig. 12.53). Examination revealed an overly long nose with severe tip ptosis and a hyperacute nasolabial angle from overresection of the anterior septum. Using the external rhinoplasty approach, anterior septal support was reconstituted using a double-layered conchal graft. Previously divided domes were then repaired with sutures and sewn to the columellar strut graft. The tip complex was then resuspended using a suspension suture with a posterior sling. Because of the severity of tip ptosis, a full-thickness fusiform excision of the membranous septum, combined with a full-thickness radix skin excision (i.e., a rhino-lift procedure, also known as an "external nose lift" procedure), was also performed to eliminate redundant soft tissue and to consolidate tip support.

Fig. 12.53 (a–b) Shortening by combination of different techniques. (c–e) Front view, profile view, base view pre-op/post-op

Fig. 12.53 (continued)

Fig. 12.53 (continued)

12.2.48 Case 48: Shortening by Combination of Different Techniques

A 45-year-old male presented after severe nasal trauma and two previous unsuccessful nasal surgeries; he complained of nasal obstruction and an unattractive nose (Fig. 12.54). Examination revealed a wide bony pyramid and ptosis of an overprojected nasal tip. Overall, the nose was overly long, and the nasolabial angle was overly acute at 45° with a retracted columella. Despite thickened skin of the nasal dorsum, numerous irregularities were observed along the nasal bridge, and a retracted horizontal scar was present at the base of the glabella. Endonasal examination revealed a septal perforation measuring 12.0 mm.

Surgical exploration via the open approach revealed destruction of the anterior septum with a weak and insufficient caudal border. Both LLCs were deformed, with concavities of the lateral crura. After dissection of the septum, a residual dorsal L-strut measuring 6.0 mm was found, but it was not straight because of a high septal deviation. For reconstruction, we first performed a hydro-dissection of the endonasal mucosa, followed by careful dissection from beneath the ULCs and from the septum, including the nasal floor and the inferior turbinate, where the flap was cut horizontally. In this manner, successful closure of the perforation was performed using two cranially based septal advancement flaps and two transposition flaps based anteriorly and posteriorly at the nasal floor (i.e., the four-flap technique).

Two straight rib cartilage segments measuring approximately 7.0 cm in length were then harvested from the eighth and ninth ribs. These were then sectioned into multiple strips measuring 1.5 mm thick by using a sculpture board (Medicon; Tuttlingen, Germany). Two strips were used as extended spreader grafts after correcting the high septal deviation with parasagittal medial osteotomies using a Lindemann burr. By using the Lindemann burr to perform the medial osteotomies, parallel osteotomy cuts were positioned precisely on either side of the sagittal midline, and additional bone was removed to create space for the extended spreader grafts. These grafts were then fixed to the residual septum and used to stabilize a columellar strut graft that was sutured between the distal ends. The medial crura were then sutured to the columellar strut graft for tip support. Concavity of the lateral crus could not be fully corrected with a lateral crural fold-under flap because crural width was too narrow to permit a flap of adequate size. Therefore, lateral crural strut grafts fashioned from rib cartilage were used instead.

The nasal pyramid was then narrowed using percutaneous low-to-low lateral and transverse osteotomies. The nose was also shortened using the tongue-in-groove technique and by performing a fusiform skin excision to rotate the tip while simultaneously resecting the depressed glabellar scar. After partially closing the nasal skin flap, the dorsum was refined by injecting free diced cartilage paste created from residual rib cartilage.

Fig. 12.54 (**a**–**b**) Reconstruction of strong septal frame. (**c**–**d**) Reconstruction of the lower framework. (**e**–**f**) Direct nose lift ,smoothening the reconstructed dorsum with fdc. (**g**–**i**) Front view, profile view, base view pre-op/post-op

■ **Fig. 12.54** (continued)

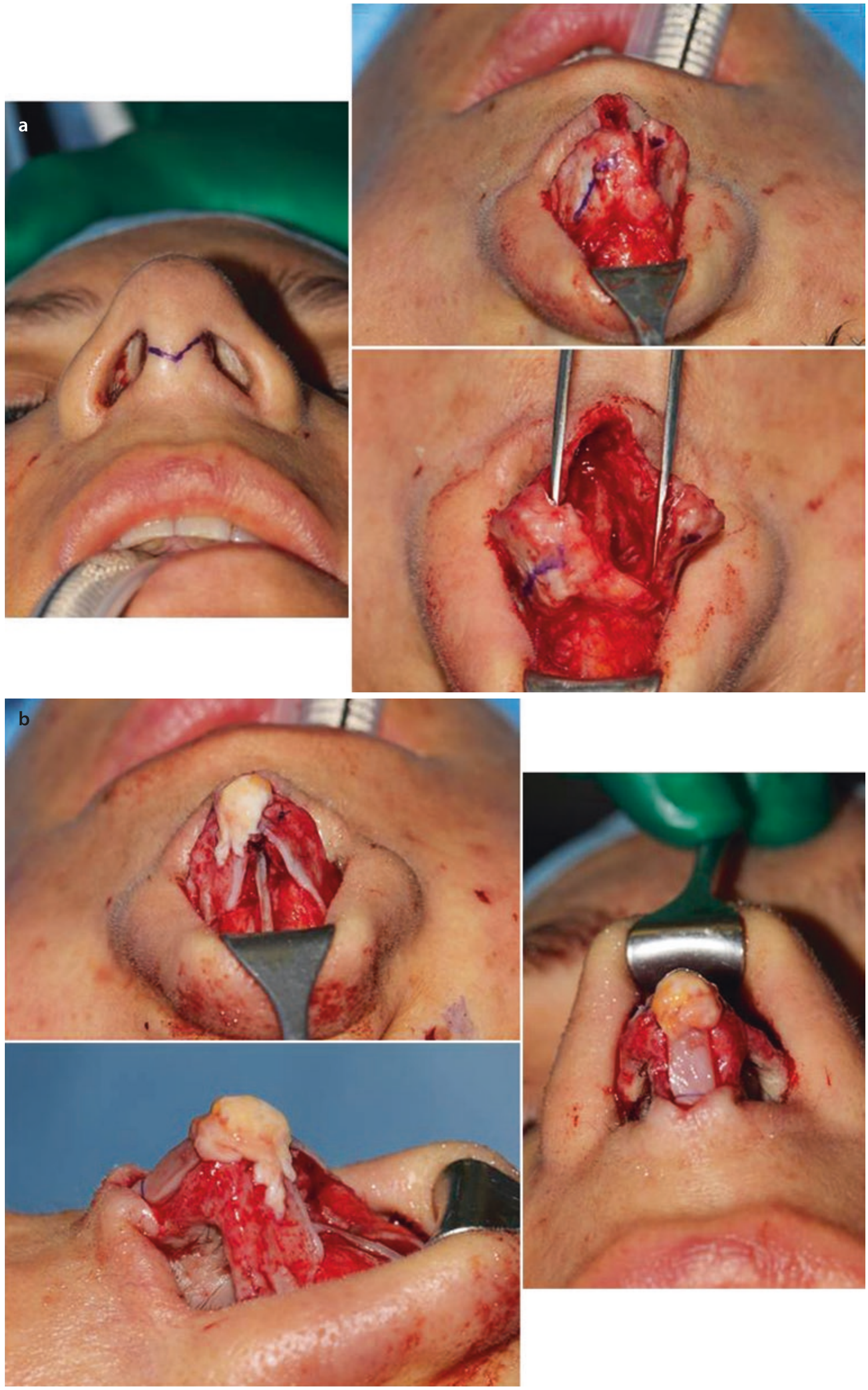
Fig. 12.54 (continued)

12.2.49 Case 49: Correction of Hanging Columella with Columellar Strut from Double-Layered Conchal Cartilage (Sandwich Graft) Plus Double-Layered Shield Graft and Soft-Tissue Graft

A 42-year-old female presented after three previous nasal surgeries with numerous nasal base abnormalities, including a bulky tip, a hanging columella, pinched alae, asymmetrical nostrils, and fullness of the supratip (◘ Fig. 12.55). A retracted V-shaped transcolumellar scar was also observed.

Using the external rhinoplasty approach, the retracted columellar scar was excised. Surgical exploration then revealed damaged medial crura and a concave right lateral crus. Dissection of the septum also revealed an L-shaped frame with a strong dorsum but a weak caudal septum. The left concha was then harvested and scored in the midline, and the convex sides were sutured back-to-back to create a flat double-layered sandwich graft. The graft was then sewn to the anterior border of the septum (modified septal extension graft). The hanging columella was corrected using a tongue-in-groove technique in which the fragmented and scarred medial crura were sewn directly to the sandwich graft. For alae contouring rim grafts on both sides. To avoid an overly short nose, a double-layered shield graft was placed and covered with soft tissue. Finally, the dorsum was smoothed with the powered cylindrical drill bit.

Fig. 12.55 (**a**–**b**) Correction of hanging columella with sandwich graft plus double-layered shield graft, covered with soft-tissue graft. (**c**–**e**) Front view, profile view, base view pre-op/post-op



■ **Fig. 12.55** (continued)

Fig. 12.55 (continued)

12.2.50 Case 50: Correction of Hanging Columella with Columellar Strut and Extended Spreader Grafts, Total Reconstruction of the Lower Framework

A 25-year-old female presented following septorhinoplasty that was performed elsewhere (Fig. 12.56). Examination revealed an overrotated tip with overly prominent soft-tissue facets and a hanging columella. A straight-line transcolumellar scar was visible, and an inverted-V deformity and a wide bony vault were also observed. To revise the nose, an inverted-V-type transcolumellar incision was used for the open approach. Surgical exploration revealed subtotal absence of both LLCs. Only the right medial crus and half of the left medial crus remained, although multiple fragments of tip cartilage were scattered throughout the nasal tip. Septal cartilage was used to rebuild the missing tip framework. A columellar strut was placed and supported with bilateral extended spreader grafts. The medial crural remnants were also sewn to the strut graft. Long strips of septal cartilage were then sewn to the upper end of the strut graft and then thinned using a motorized drill to recreate domal folds, replacing the missing domes and lateral crura. The dorsum was then smoothed and covered with allogenic fascia lata.

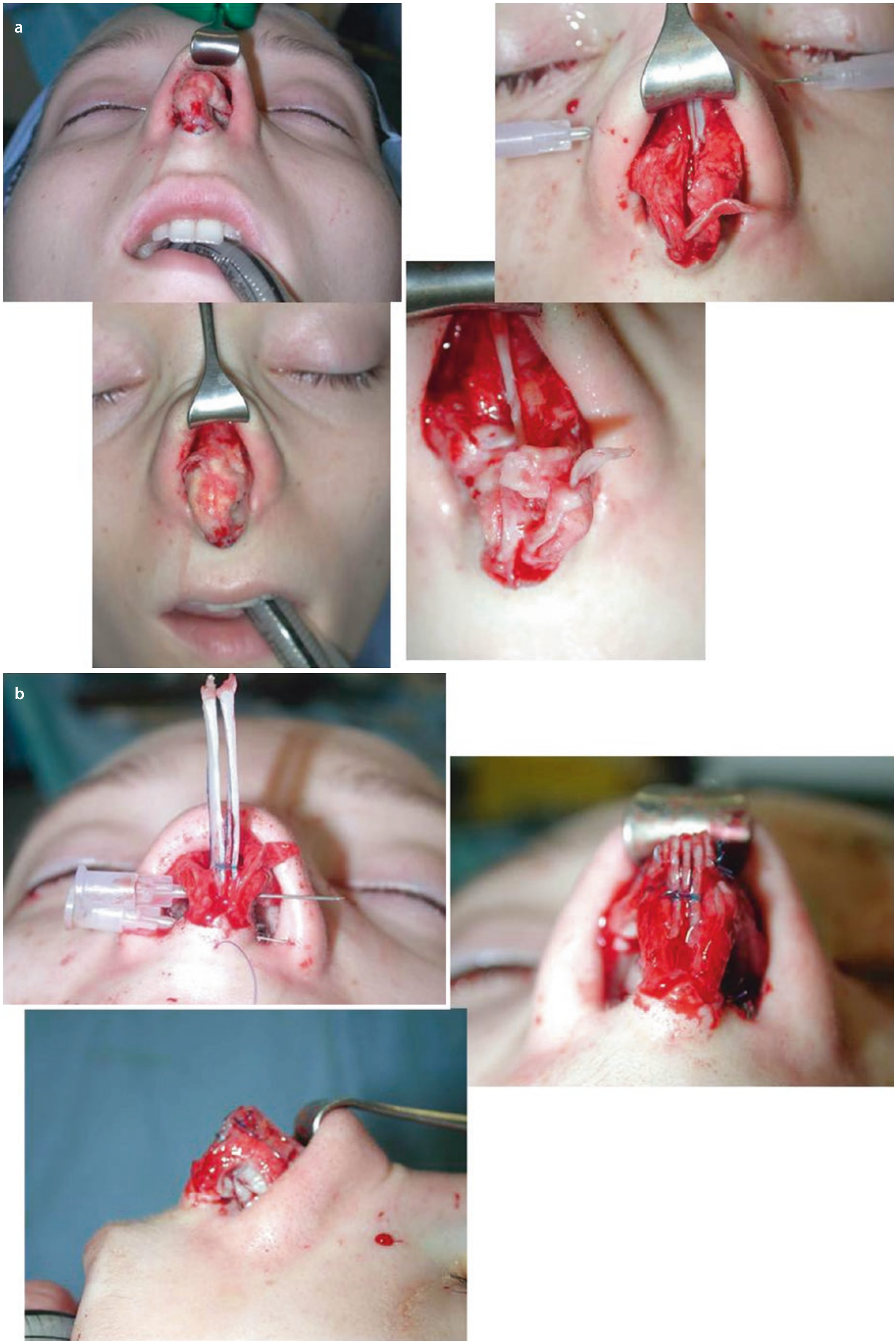


Fig. 12.56 (**a**–**b**) Correction of hanging columella with strut, combined with reconstruction of the overresected LLCs with septal cartilage using bending technique. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 12.56 (continued)

Fig. 12.56 (continued)

Suggested Reading

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Malformations

Content

Malformation

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_13

13.1 Surgical Principles

Naturally occurring malformations of the lower lateral cartilages (LLCs) are common, and the use of the open rhinoplasty approach makes the recognition and characterization of tip malformations far more reliable and precise. Likewise, many unsuccessful rhinoplasties result from the inability to properly recognize and treat congenital LLC malformations because of poor surgical exposure using the closed approach. Malformations of the nasal tip may occur unilaterally or bilaterally with variations in both type and magnitude. Virtually any segment of the LLC can be affected by congenital anomalies, including the medial crural footpods, the medial crura themselves, or the nasal domes. However, the most common site for naturally occurring tip malformations is the lateral crus, with crural concavity being the most commonly seen anomaly. Although most malformations of the LLC are associated with cosmetic disturbances, concave malformations of the lateral crura are also commonly associated with functional impairment, particularly in noses with weak lateral crura that are prone to inspiratory collapse or in noses with an adjacent septal deformity that exacerbates nasal valve obstruction. In the thin-skinned nose, concavities of the lateral crus are often visible externally, but overlying soft tissues may conceal smaller concavities, underscoring the importance of a careful endonasal examination as part of the preoperative evaluation process. While some LLC deformities are hidden by the overlying soft tissues, we prefer not to rely solely on soft-tissue camouflage for treatment. Instead, correction of all skeletal deformities is preferred in order to optimize both the functional and cosmetic results. Although Daniel feels that a slight crural concavity (coupled with convexity of the intermediate crura) will yield the best tip contour, we believe that flat and sturdy lateral crura yield not only a pleasant tip contour but also provide the structural rigidity necessary for reliable function of the nasal airway.

Many LLC deformities lend themselves to straightforward surgical correction. For example, asymmetrical or overly protrusive medial crural footpods can be corrected by transecting the medial crus just above the footpod and then coapting the footpods with intercrural sutures or transcutaneous mattress (transfixion) sutures. Alternatively, the footpods can be completely excised, and the columellar pedestal can be contoured with only transfixion sutures. Another common deformity is buckling of the intermediate crura within the infratip lobule. This can be corrected by suturing the intermediate crura to a columellar strut graft or, if unilateral, by performing a unilateral medial crural overlap procedure.

The most common LLC deformities are concavities of the lateral crura, which can be oriented longitudinally or transversely and which may be unilateral or bilateral. For transverse concave deformities of the lateral crus, excising and flipping the concave segment (upside-down technique (Fig. 13.1) is recommended, whereas we prefer leaving a narrow caudal rim strip to facilitate suture reattachment as recommended by Aiach (Fig. 13.2). Occasionally in bilateral deformities, the flipped segment is returned to the contralateral side (contralateral upside-down technique) to enhance bilateral symmetry.

In a longitudinally oriented concavity, a variety of techniques are possible. If the lateral crus is overly weak and the defect is small to intermediate in size, we prefer placement of horizontal mattress sutures to simultaneously flatten and stiffen the lateral crus (Fig. 13.3). As the mattress suture is slowly tightened, the concavity is gradually eliminated, and a knot is tied while the suture is held with forceps to prevent slippage. Typically, multiple sutures are placed in series to completely flatten and strengthen the affected crural segment. And unlike excisional techniques, the horizontal mattress suture technique is potentially reversible.

Another option for treatment of a longitudinal crural concavity is the fold-over flap technique. In this technique, the cephalic margin is incised during a cephalic trim and is partially undermined so that it remains pedicled to the perichondrium just above the incision line. The flap is then rotated superiorly and inverted so that it rests on top of the crural concavity. When sutured to the underlying cartilage, the fold-over flap serves to fill the concavity as well as to strengthen and flatten the lateral crus (Fig. 13.4). Alternatively, the flap can be rotated in the opposite direction to fill a pocket created beneath the crural concavity. Again, suture fixation serves to flatten and strengthen the lateral crural remnant (Fig. 13.5). Although the fold-under flap is more effective at strengthening weak lateral crura, wide dissection of vestibular skin from beneath the lateral crus is more difficult and more time-consuming.

If the lateral crus is too narrow to permit a fold-over or fold-under technique, a batten graft fashioned from septal cartilage will simultaneously correct the crural concavity and eliminate the strength deficiency. Batten grafts are a valuable technique in both cosmetic and functional rhinoplasty (Fig. 13.6). For optimal cosmetic results, batten grafts should be carefully beveled along their outer edges for concealment. Batten grafts are sometimes positioned beyond the caudal border of the lateral crura to stabilize the alar rim against cephalic retraction and to simultaneously strengthen the alar rim against alar collapse. Similarly, batten grafts can also be extended laterally to prevent inward collapse of the lateral crura near the piriform aperture. Finally, if lateral crural concavity is combined with an overprojected tip, a lateral crural overlap technique is preferred, since both tip deprojection and crural flattening are accomplished simultaneously (Fig. 13.7).

13

Fig. 13.1 Upside-down technique

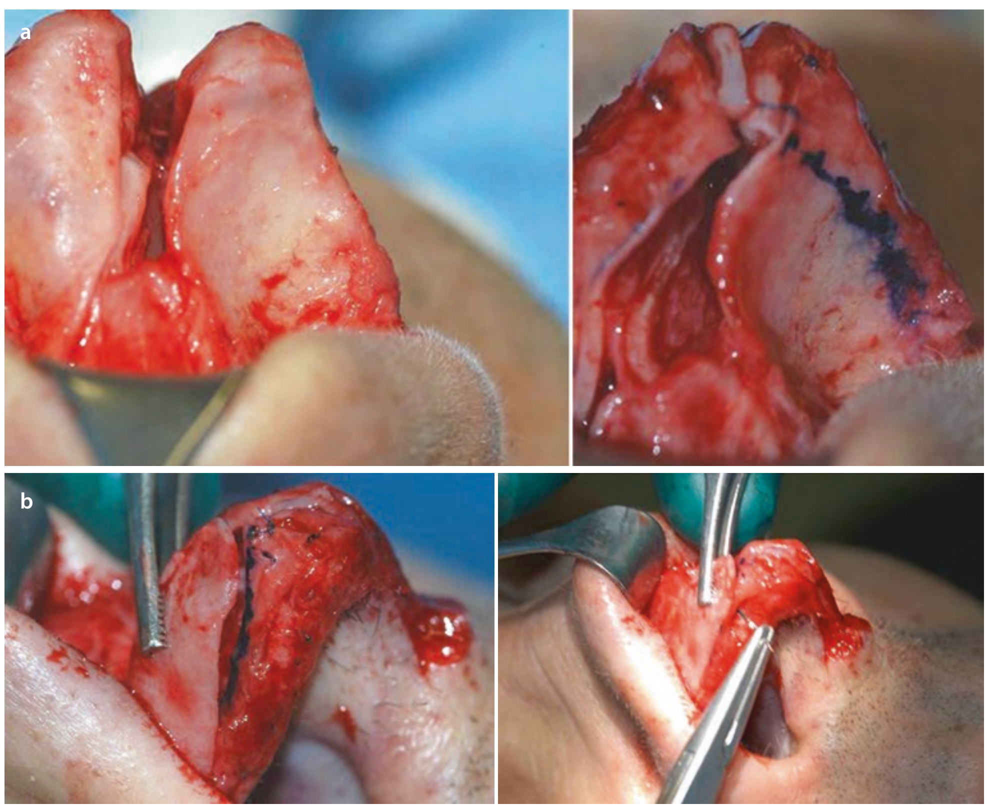


Fig. 13.2 (a, b) Modified Upside-down technique

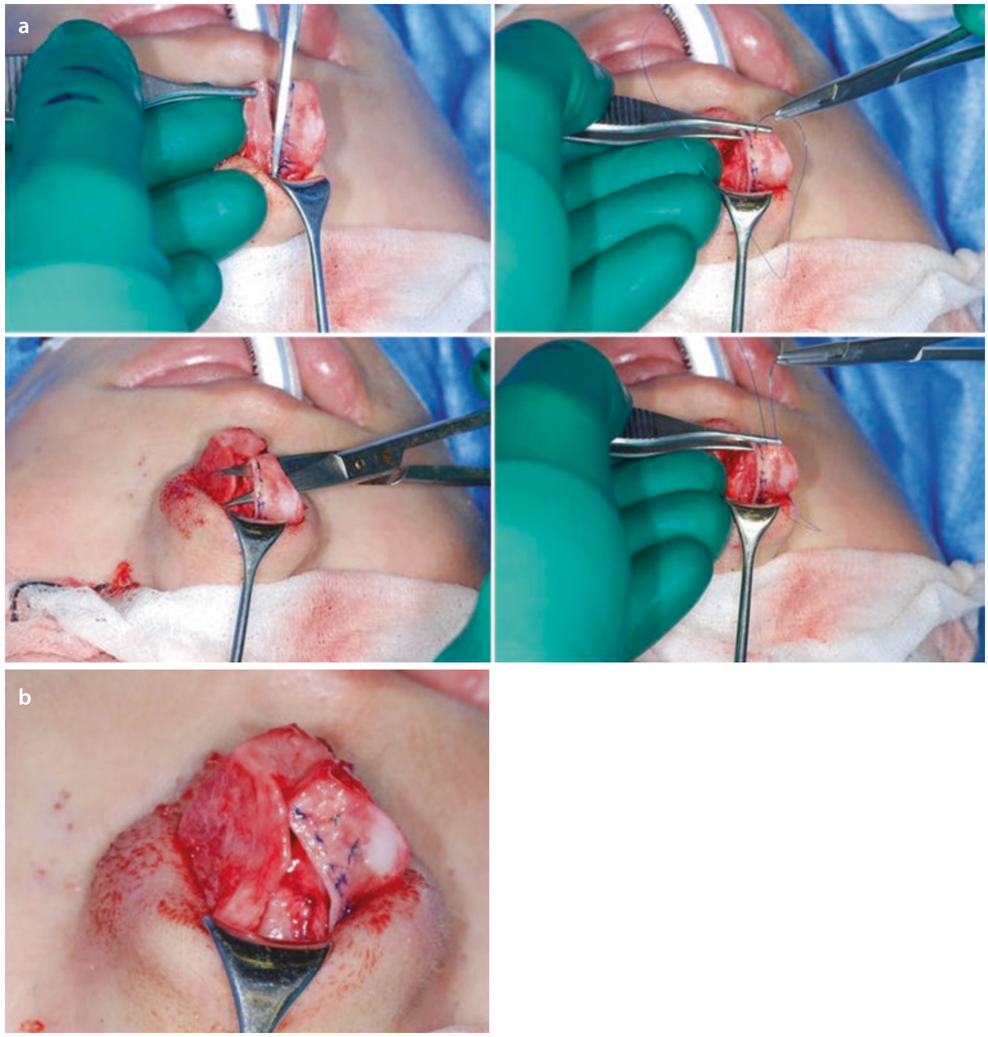


Fig. 13.3 (**a, b**) Horizontal mattress suture

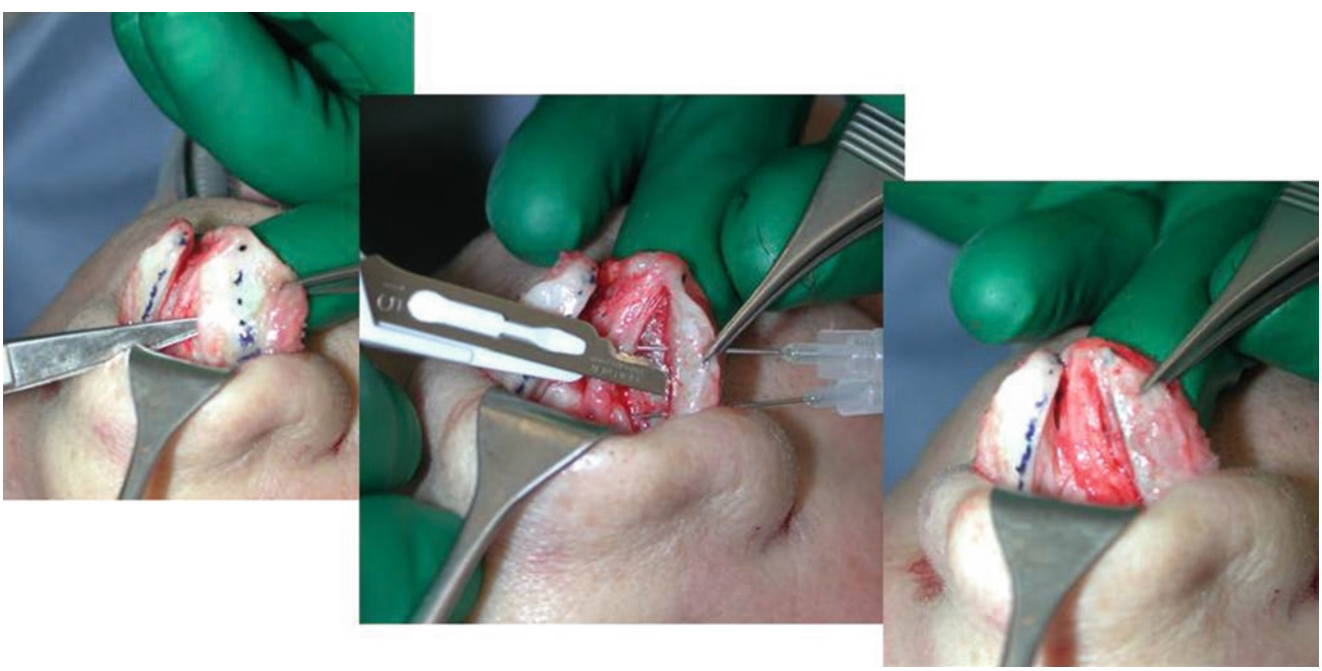
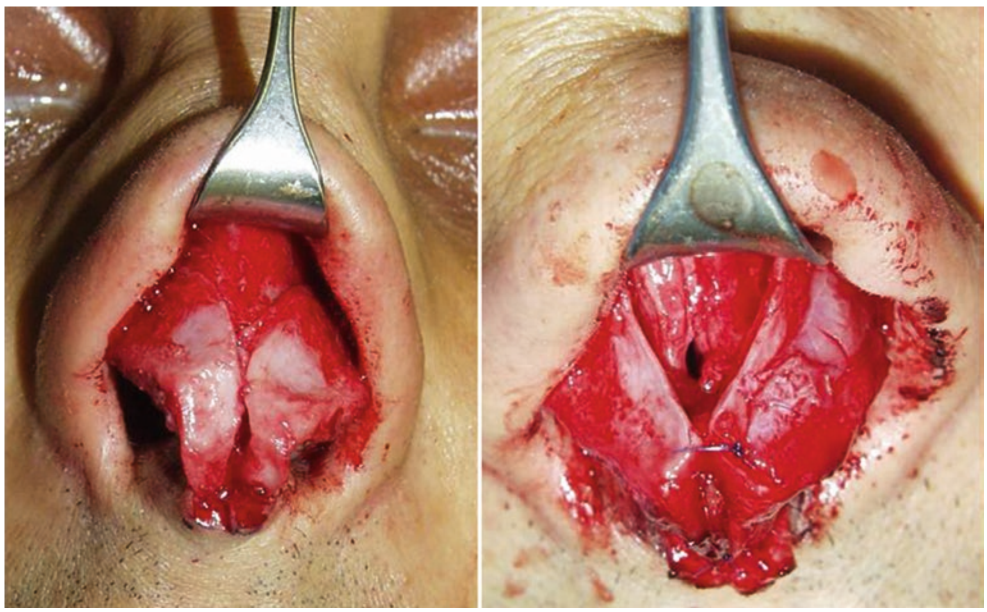


Fig. 13.4 Cephalic turn-over flap

Fig. 13.5 Cephalic fold-under flap

Fig. 13.6 Batten graft technique



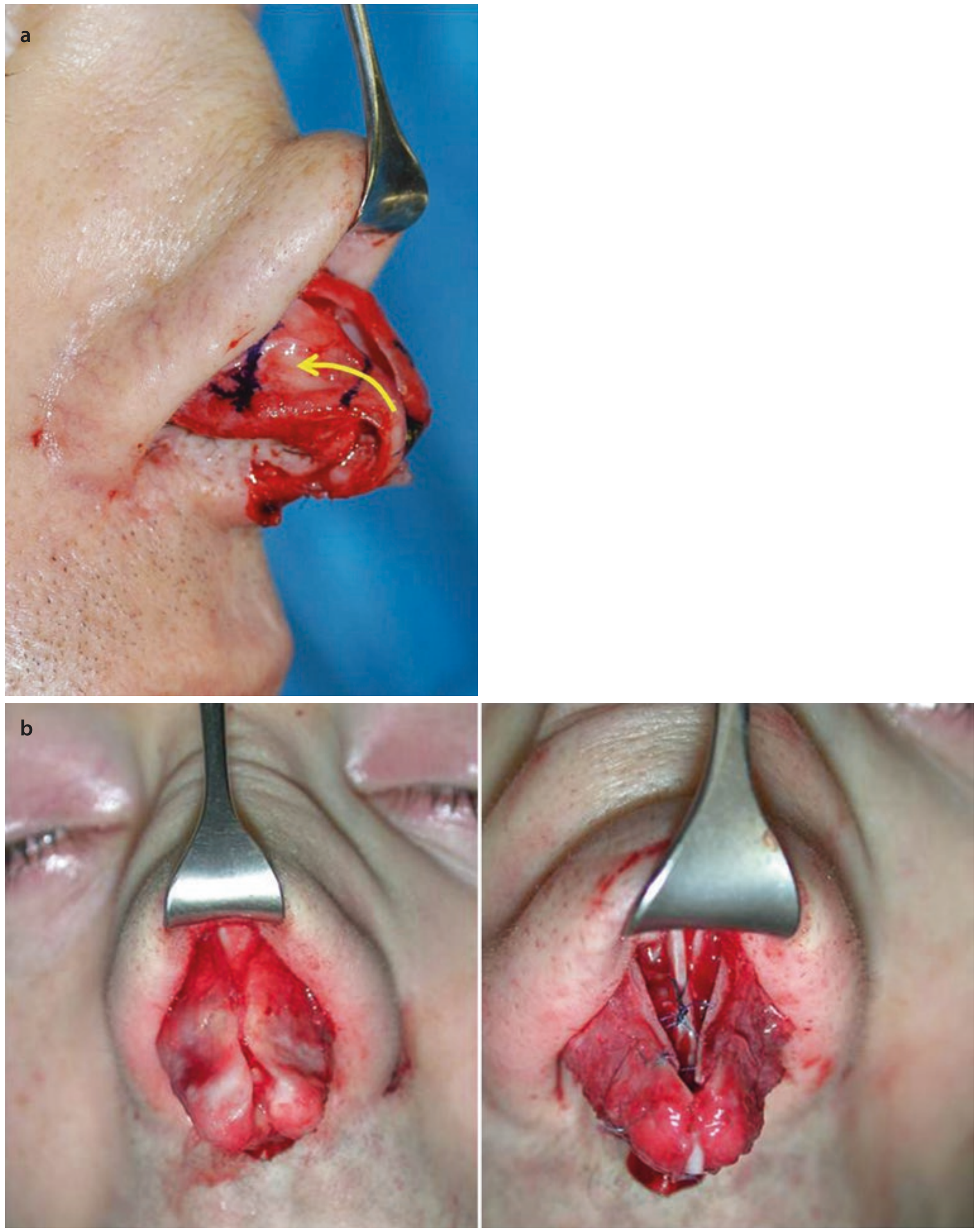


Fig. 13.7 (**a, b**) Lateral crural overlay technique

13.2 Case Studies

13.2.1 Primary Cases

Case 1: Horizontal Mattress Sutures

A 19-year-old female presented complaining of a peculiar-looking nasal tip. Examination revealed prominent concavities of both lateral crura and a tilted columella from caudal septal dislocation. Using the open approach, the caudal septum was repositioned and secured to a transverse drill hole created within the nasal spine. Fading (oblique) medial osteotomies, combined with percutaneous low-to-high lateral osteotomies, were then used to narrow the bony pyramid. For correction of the crural concavity, a cephalic trim was performed, and the excised cartilage was retained. After elevating the vestibular skin from the residual lateral crus, horizontal mattress sutures were used to flatten the concavity, and the previously excised cephalic specimen was used as an onlay batten graft for additional stability. The procedure was performed bilaterally. Owing to the additional crural rigidity obtained through the aforementioned procedures, spanning sutures could be used to control flaring without fear of recurrent crural collapse. A columellar strut graft was also placed to enhance tip support (▪ Fig. 13.8).

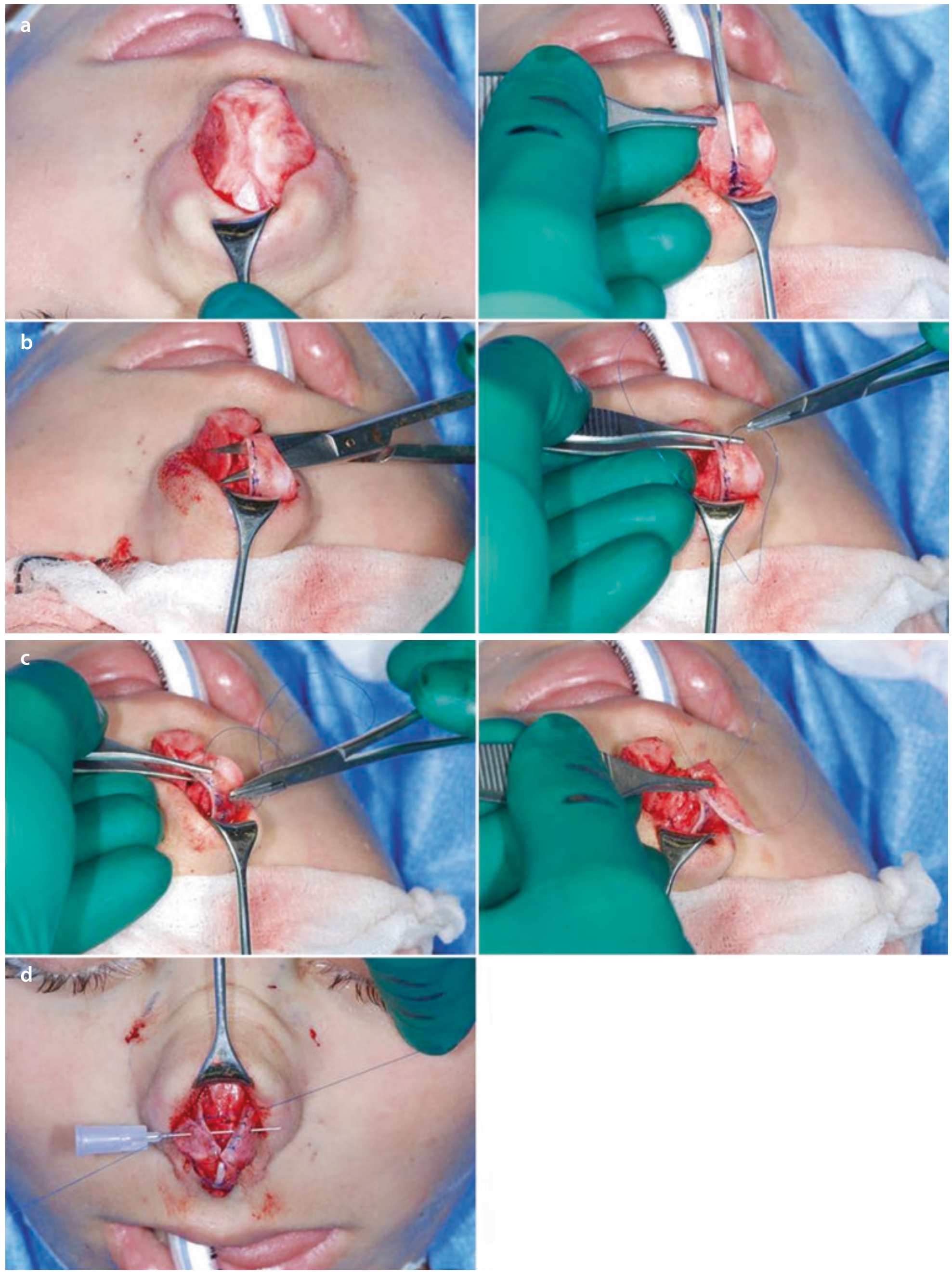


Fig. 13.8 (**a**) Cephalic resection. (**b**) Horizontal mattress sutures. (**c**) Batten graft from the excised cephalic portion. (**d**) Applying spanning sutures. (**e**) Placing a columellar strut. (**f–h**) Front view, profile view, base view pre-op/post-op

Fig. 13.8 (continued)

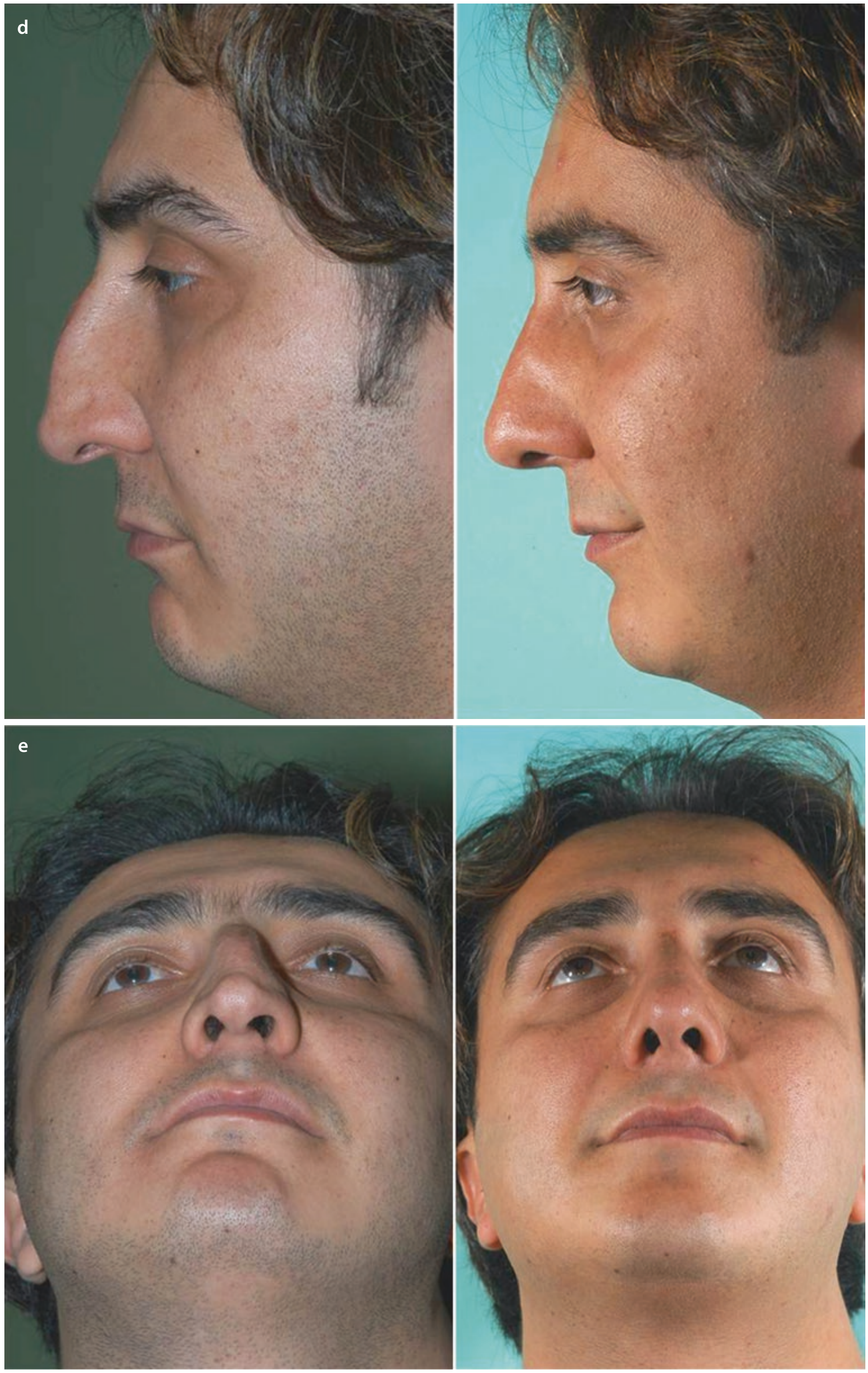
Fig. 13.8 (continued)

Case 2: Upside-Down Technique

A 31-year-old male presented after previous septoplasty complaining of persistent bilateral nasal obstruction that had failed to improve with septal surgery. Examination revealed bilateral lateral crural concavities, a persistent septal deviation, and bilateral synechiae. After opening the nose, deep transverse concavities were observed involving both lateral crura. After dividing the synechiae, the L-strut was straightened using spreader grafts. The concavities were corrected by excising the involved cartilage segments, turning the specimens 90°, and suturing each specimen to the contralateral defect to produce a modest bilateral crural convexity. Transdomal sutures and a tip graft were then used for further tip refinement, correcting both the crural concavities and the alar rounding simultaneously (◘ Fig. 13.9).

Fig. 13.9 **(a–b)** Upside-down technique. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 13.9 (continued)



Case 3: Upside-Down Technique

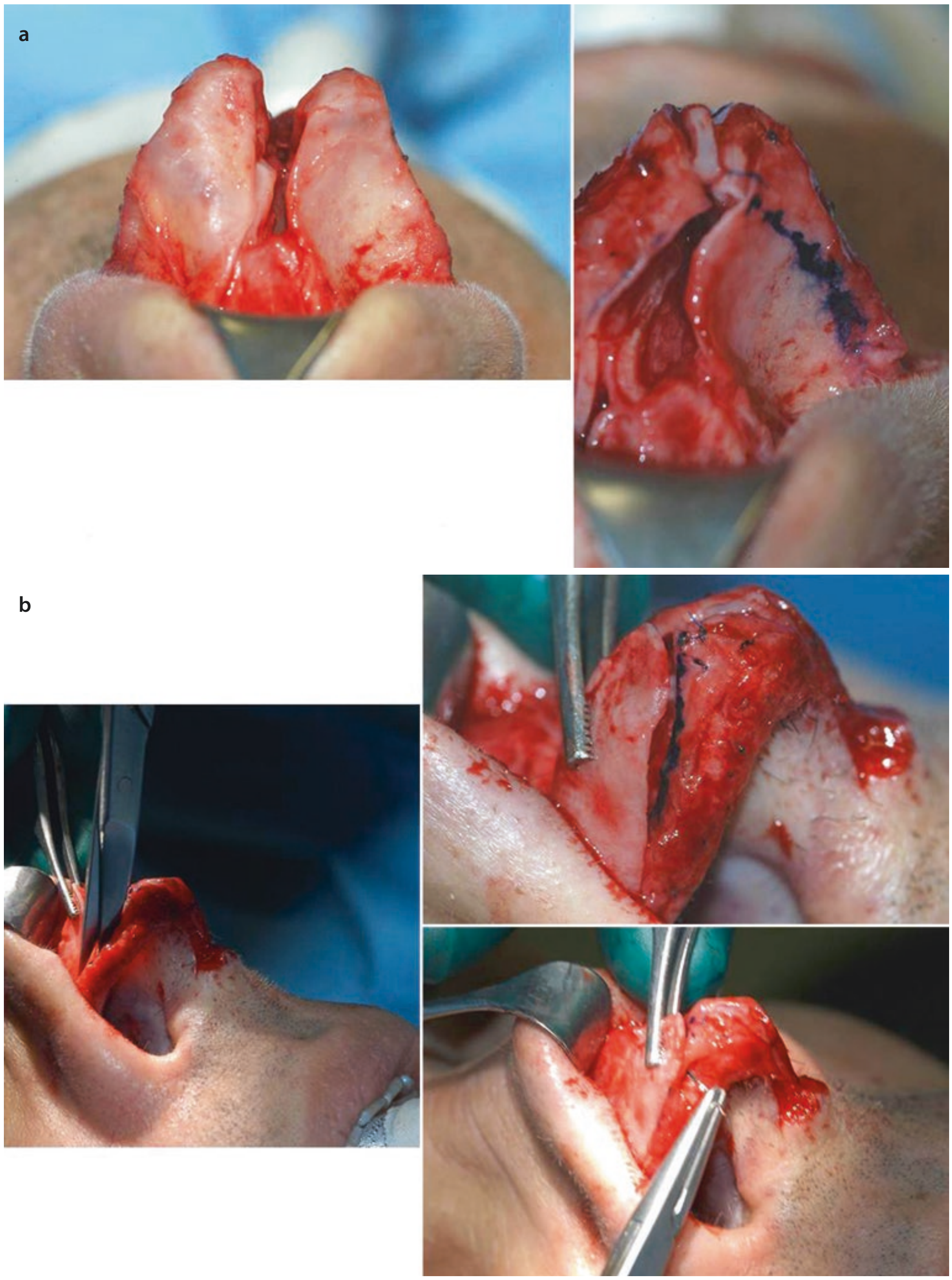
A 44-year-old male presented with nasal airway obstruction. Examination revealed pronounced concave collapse involving the central aspect of both lateral crura. Dynamic valve collapse was observed upon gentle nasal inspiration. Surgical exploration with the open approach revealed deep lateral crural concavities immediately adjacent to both nasal domes. After columellar strut placement, a left unilateral upside-down procedure was used to correct the left concavity and a septal onlay batten graft was used to fill the right concavity. Small onlay cartilage grafts were also used to fill concavities of the intermediate crura. Improved contour and nasal function were achieved (Fig. 13.10).

Fig. 13.10 **(a–b)** Upside-down technique. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 13.10 (continued)

Case 4: Modified Upside-Down Technique

A 43-year-old male was seen complaining of a nasal tip deformity which he feared was produced by a nasal tumor. Examination revealed a conspicuous concavity of the right lateral crus, which was confirmed using open rhinoplasty. Because of the presence of thick tip cartilages, the deep concavity was eliminated using a (right) upside-down technique in which a narrow caudal rim strip was preserved to facilitate suture fixation of the inverted segment. As a result of improved stability, spanning sutures were then used for tip refinement (◘ Fig. 13.11).



◘ **Fig. 13.11** (**a**–**c**) Modified upside-down technique with preserving a caudal strip of the lateral crus. (**d**) Ala spanning suture. (**e**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 13.11 (continued)

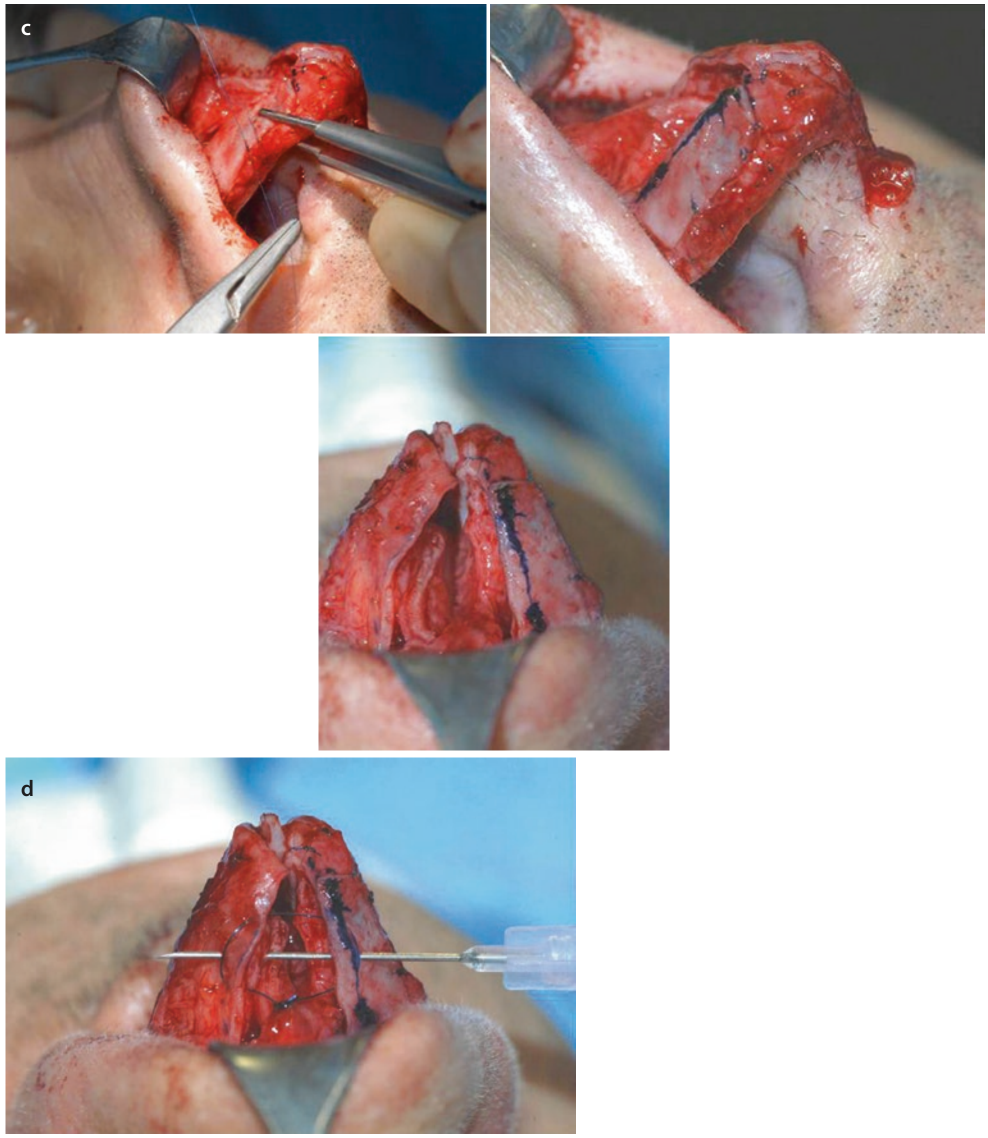


Fig. 13.11 (continued)

Fig. 13.11 (continued)

Case 5: Fold-under flap (lateral crural underlay)Technique

A 27-year-old male presented with a deviated nose and irregularities of the nasal dorsum. The tip was overly round, and concavities of the lateral crura were observed through the nasal skin. Both soft triangles were retracted, and protruding medial crural footpods produced an overly wide columellar pedestal. Endonasal examination revealed a deviated septum.

Using the open rhinoplasty approach, surgical exploration confirmed the preoperative diagnosis of lateral crural concavities. In combination with septal deviation, the left crural concavity resulted in complete left nasal airway obstruction. After removing the deformed central septum, the nasal pyramid was straightened using parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies. The caudal septum was then shortened at its base and placed into a groove created within the anterior nasal spine (ANS) for stabilization. After creating transverse drill holes using a Lindemann burr, the caudal septum was sutured to the midline groove of the ANS using three separate sutures.

Spreader grafts fashioned from septal cartilage were then sutured to the dorsal septum. The concave left LLC was eliminated using a cephalic fold-under flap to flatten the lateral crus. On the contralateral side, the cephalic margin was excised for symmetry. Before suturing the medial crura to the columellar strut graft, both medial crural footpods were transected but not removed. Mattress sutures were then applied to narrow the protruding footpods and contour the columellar pedestal. Narrow skin pockets were dissected along both alar margins, and alar rim grafts were placed bilaterally. Finally, three layers of allogenic fascia lata were soaked in gentamicin antibiotic solution and used to augment the nasal dorsum (◘ Fig. 13.12).

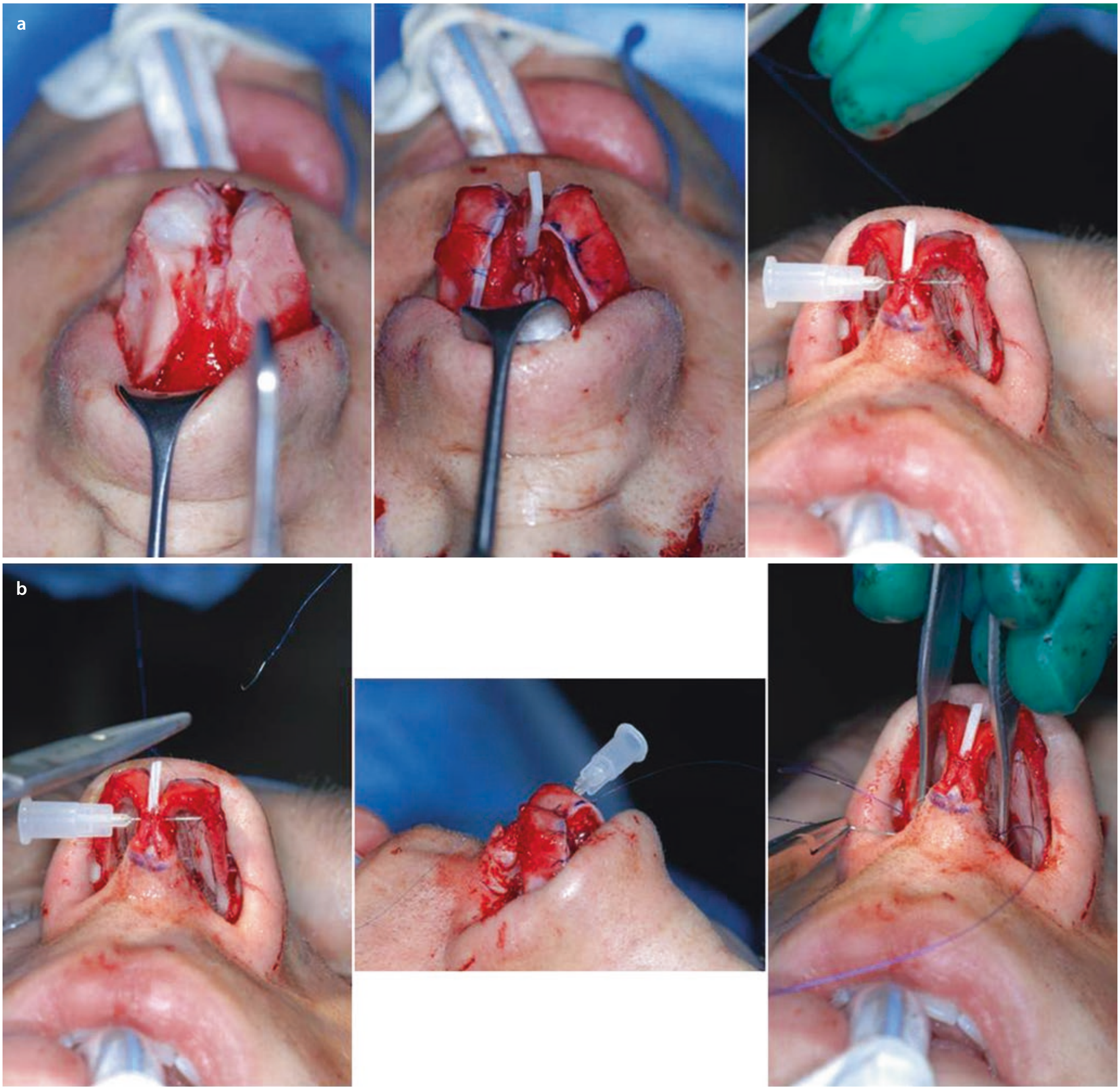


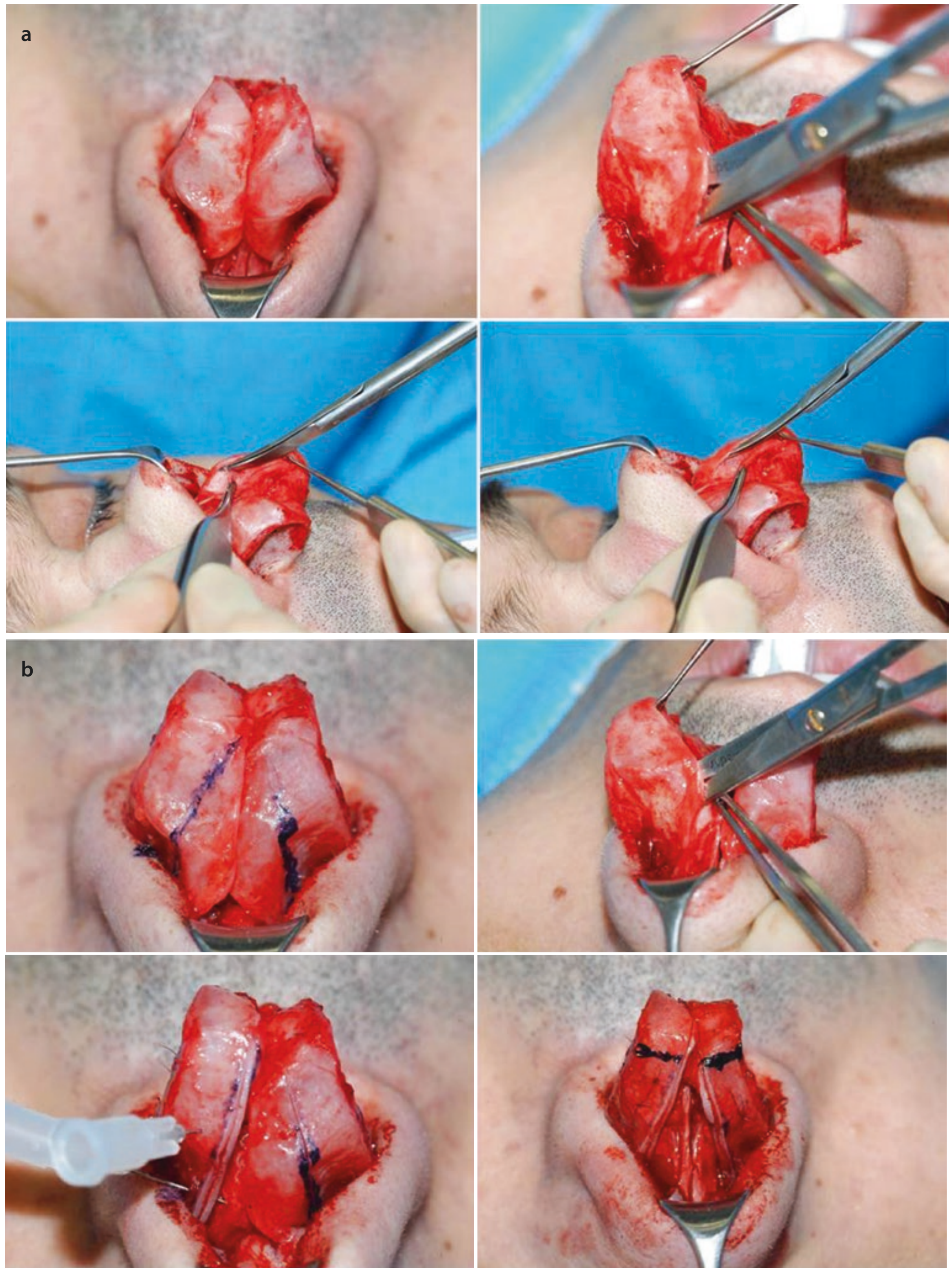
Fig. 13.12 (**a**–**b**) Fold-under flap technique left side combined with columellar strut graft. (**c**) Contouring the tip with transdomal sutures. (**d**–**g**) Front view, profile view, base view pre-op/post-op

Fig. 13.12 (continued)

Fig. 13.12 (continued)

Case 6: Fold-under Flap Technique

A 33-year-old male presented for primary rhinoplasty complaining of bilateral nasal obstruction and collapse of the nostrils on inspiration. Examination revealed an overly long nose with an overprojected dorsum, a ptotic and overprojected tip, and an overly acute nasolabial angle. Surgical exploration with the open approach showed deep concavities of both lateral crura. After lowering the dorsum and reconstructing the middle vault with spreader flaps, both crural concavities were corrected using cephalic fold-under flaps. For additional lateral crural support and for increased tip rotation, a lateral crural overlap procedure was performed near the piriform area and reinforced with an onlay graft of septal cartilage (▪ Fig. 13.13).



■ **Fig. 13.13** (**a**–**b**) Fold-under flap (Lateral crural underlay) technique, drawing of an additional lateral crural overlap (sliding) technique. (**c**–**e**) Front view, profile view, base view pre-op/post-op

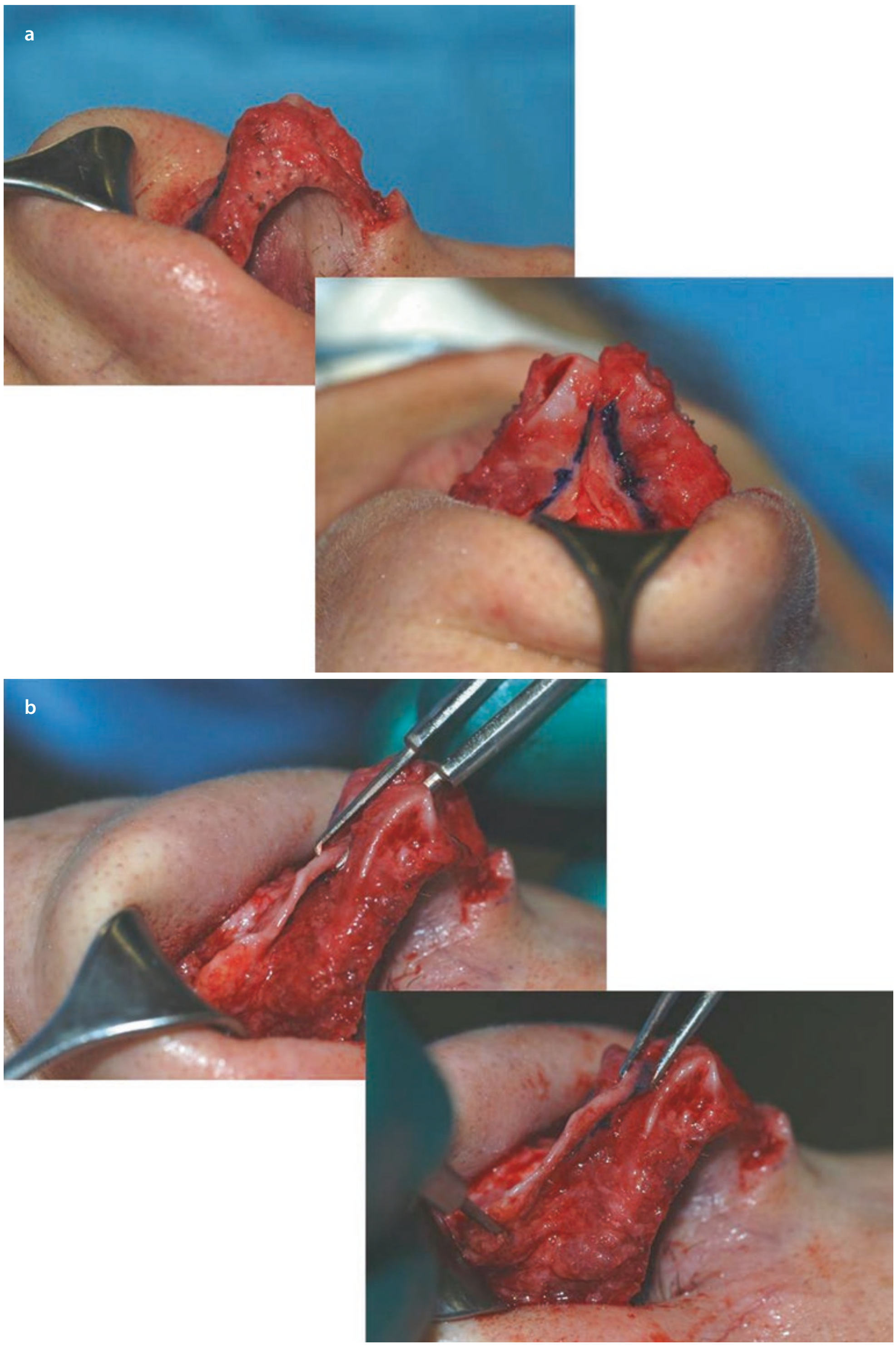
Fig. 13.13 (continued)

Fig. 13.13 (continued)

13.2.2 Secondary Cases

Case 1: Lateral Crural Overlap Technique

A 29-year-old male presented for revision rhinoplasty and airway restoration after three unsuccessful nasal surgeries. Examination revealed an overprojected and deviated nasal dorsum with an obvious malformation of the right lower lateral cartilage. After straightening the nose with an extracorporeal septoplasty and reconstructing the middle vault with bilateral spreader grafts, the right lateral crural malformation was corrected using a lateral crural overlap technique. Both cosmetic and functional improvements were achieved (◘ Fig. 13.14).



◘ **Fig. 13.14** (**a**–**b**) Lateral crural overlap technique. The cephalic portion is flipped over to fill the concavity of the lateral crus. (**c**–**e**) Front view, profile view, base view pre-op/post-op

Fig. 13.14 (continued)

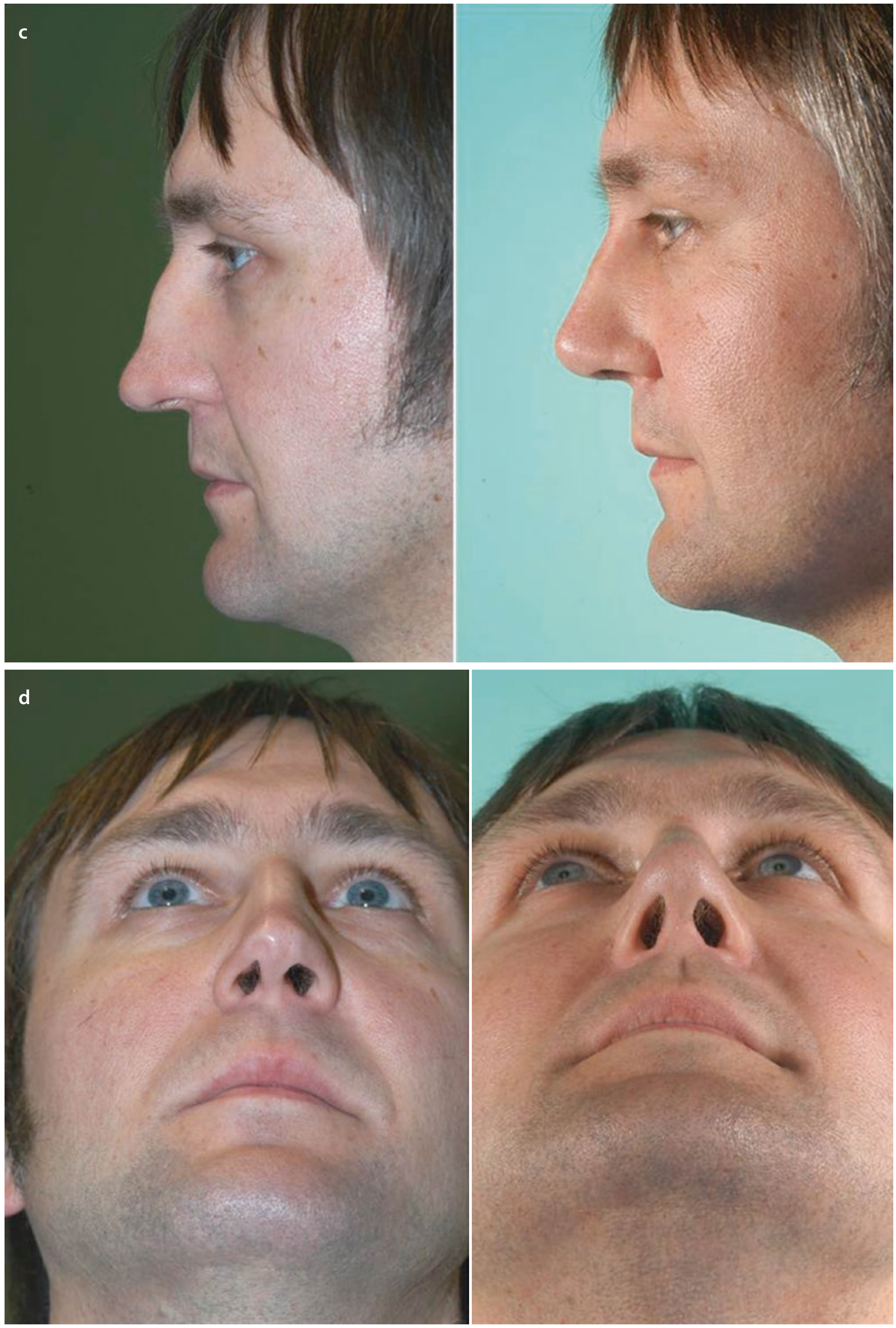
Fig. 13.14 (continued)

Case 2: Turn-over-flap (Lateral Crural Overlay) Technique Combined with Batten Graft

A 46-year-old male presented for correction of a postsurgical saddle-nose deformity. Examination revealed an overprojected tip with weak tip cartilage, a concavity of the right lateral crus, and a deepened nasolabial angle. The septum was deviated to the left, and the caudal septum was dislocated from the nasal spine and displaced into the right nasal vestibule. Surgical correction via the open approach included straightening of the septum and rasping the dorsum to create a straight bony profile. A columellar strut was placed for medial crural support, and an onlay batten graft was used to fill the right crural concavity. The left lateral crus was strengthened with a lateral crural overlap technique, and the tip was rotated using a suspension suture. The saddled dorsum was augmented with morselized septal cartilage to create a straight dorsal profile (Fig. 13.15).

Fig. 13.15 **(a)** Lateral crural overlay (fold-over flap) technique on the right side, batten onlay graft on the left side. **(b–d)** Front view, profile view, base view pre-op/post-op

Fig. 13.15 (continued)



Case 3: Fold-over Flap Technique (Lateral Crural Overlap)

A 37-year-old male patient presented after previous nasal surgery with a C-shaped nasal deviation resulting from a severe persistent septal deformity. The tip was asymmetrical, and dimpling of both alae, caused by pronounced concavities of both lateral crura, was also observed. The columella was oblique, and endonasal examination revealed obstruction of both internal valves.

Using the open approach, surgical exploration revealed a severe septal deformity that necessitated an extracorporeal septal reconstruction. Spreader grafts fashioned from conchal cartilage were used to widen the internal nasal valves. The oblique columella was straightened using a columellar strut graft created from a double-layered conchal sandwich graft. The crural concavities were corrected using a fold-over flap technique, in which the cephalic portion has been flipped over to fill the concavity. However, during the overlap procedure, the axis of the segments was reoriented and rotated outward so that a normal contour resulted. The deviated and widened bony pyramid was then corrected using parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies (Fig. 13.16).

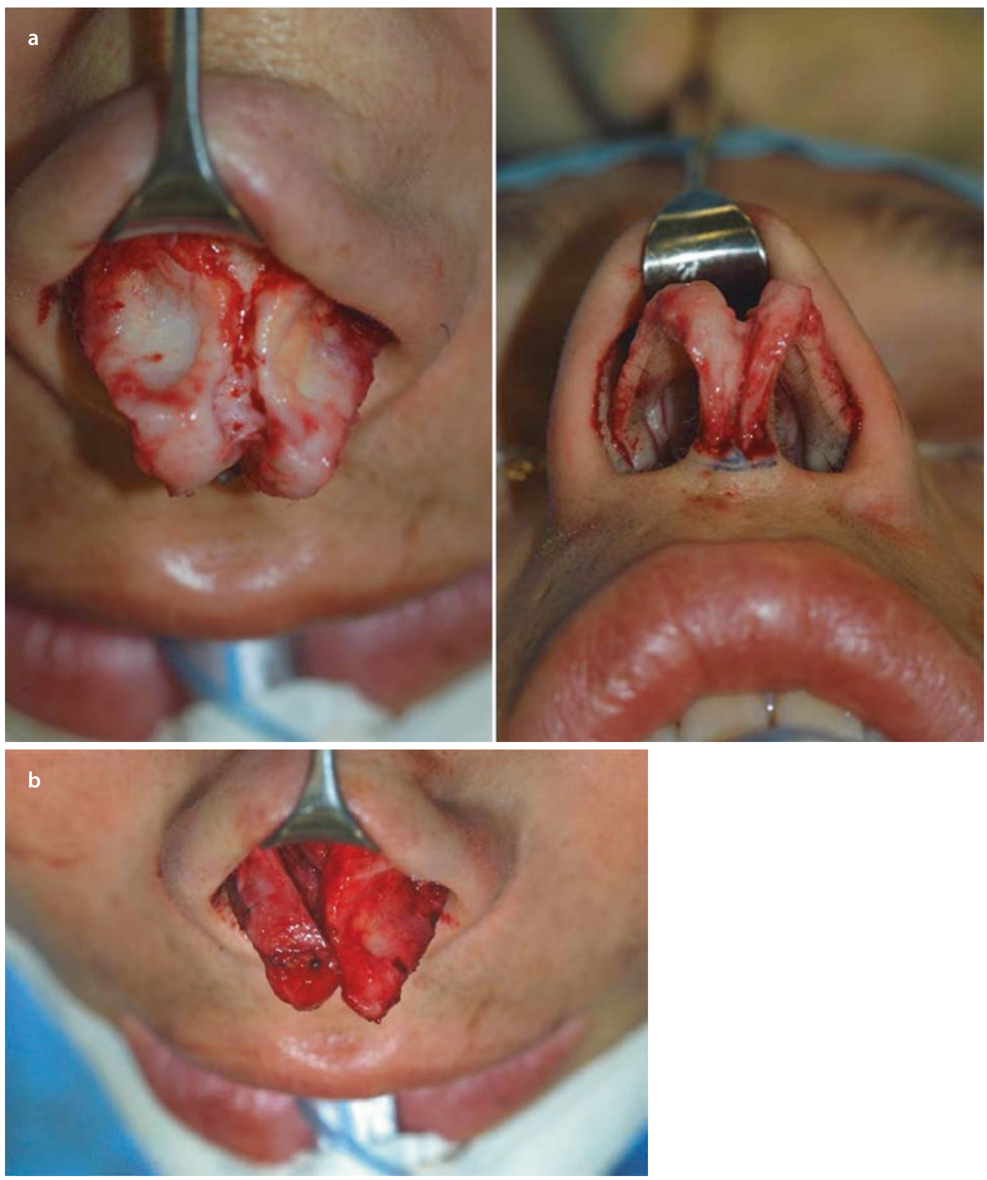


Fig. 13.16 (a–b) Fold-over flap technique: the wide cephalic portion is flipped over to fill the concavity and to smooth the contour. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 13.16 (continued)

Fig. 13.16 (continued)

Case 4: Upside-Down Technique

A 36-year-old female presented for revision rhinoplasty. Examination revealed an overprojected tip and dorsum canted to the patient's left side by a persistent septal deviation. Untreated concavities of the lateral crura were also evident, particularly on the right side. Surgical exploration with open rhinoplasty revealed a deep concavity of the right lateral crus and malpositioning of the anterior nasal spine to the left of midline. To reposition the nasal septum, the nasal spine was fractured, relocated to the sagittal midline, and immobilized with microplates and screws. Spreader grafts were also used to maintain a straight dorsal septum. Using the "upside-down" technique, the deformed right crural segment was excised, flipped 180°, and used to reconstruct the ipsilateral defect. On the left side the small cephalic excess was flipped over and fixed. A lateral crural overlap technique was then used bilaterally to deproject the nasal tip, but deprojection was greater on the left side to equalize domal projection. A shield graft was also used for enhanced contour and stabilization, and morselized cartilage was used as a dorsal onlay graft to camouflage minor surface irregularities (◘ Fig. 13.17).

◘ **Fig. 13.17** **(a–c)** Upside-down technique on the right side and lateral crural overlay on the left side. **(d–f)** Front view, profile view, base view pre-op/post-op

Fig. 13.17 (continued)

■ **Fig. 13.17** (continued)

Case 5: Modified Upside-Down Technique Combined with Total Septal Reconstruction Using Both Conchae (See Secondary Septoplasty, 2.2.14)

A 26-year-old female presented complaining of nasal obstruction and a persistent congenital nasal tip deformity after two previous unsuccessful nasal surgeries. Examination revealed a wide nose with a collapsed middle vault and concave malformations of both lower lateral cartilages. Surgical exploration with the open approach revealed insufficient septal donor cartilage for complete reconstruction. Conchal cartilage was then harvested from both ears and used for L-strut reconstruction. The lateral crural concavities were eliminated using a modified "upside-down-technique" in which a small rim of the lateral crus was preserved, and the deformed segment was then resected, flipped 180°, and sutured on top of the ipsilateral remnant of crural cartilage. Following cartilage transposition, spanning sutures were used to control flaring. The bony hump was also reduced with a rasp, and the middle vault was augmented with a small residual piece of morselized septal cartilage (Fig. 13.18).

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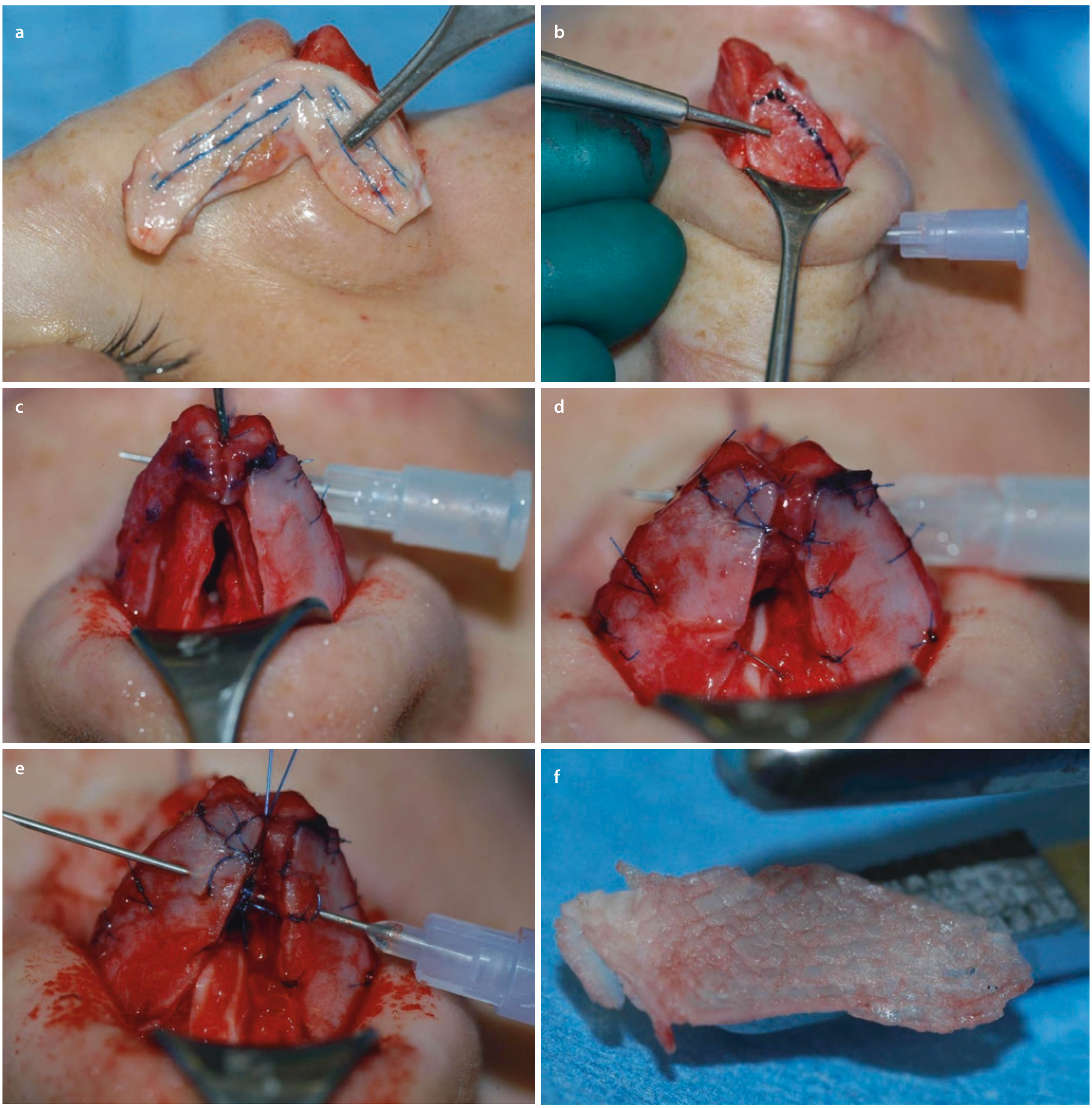


Fig. 13.18 **(a)** Total septal reconstruction. **(b–d)** Modified upside-down tehnique. **(e)** Ala spanning suture. **(f)** Morselized cartilage graft for camouflaging the dorsum. **(g–i)** Front view, profile view, base view pre-op/post-op

Fig. 13.18 (continued)

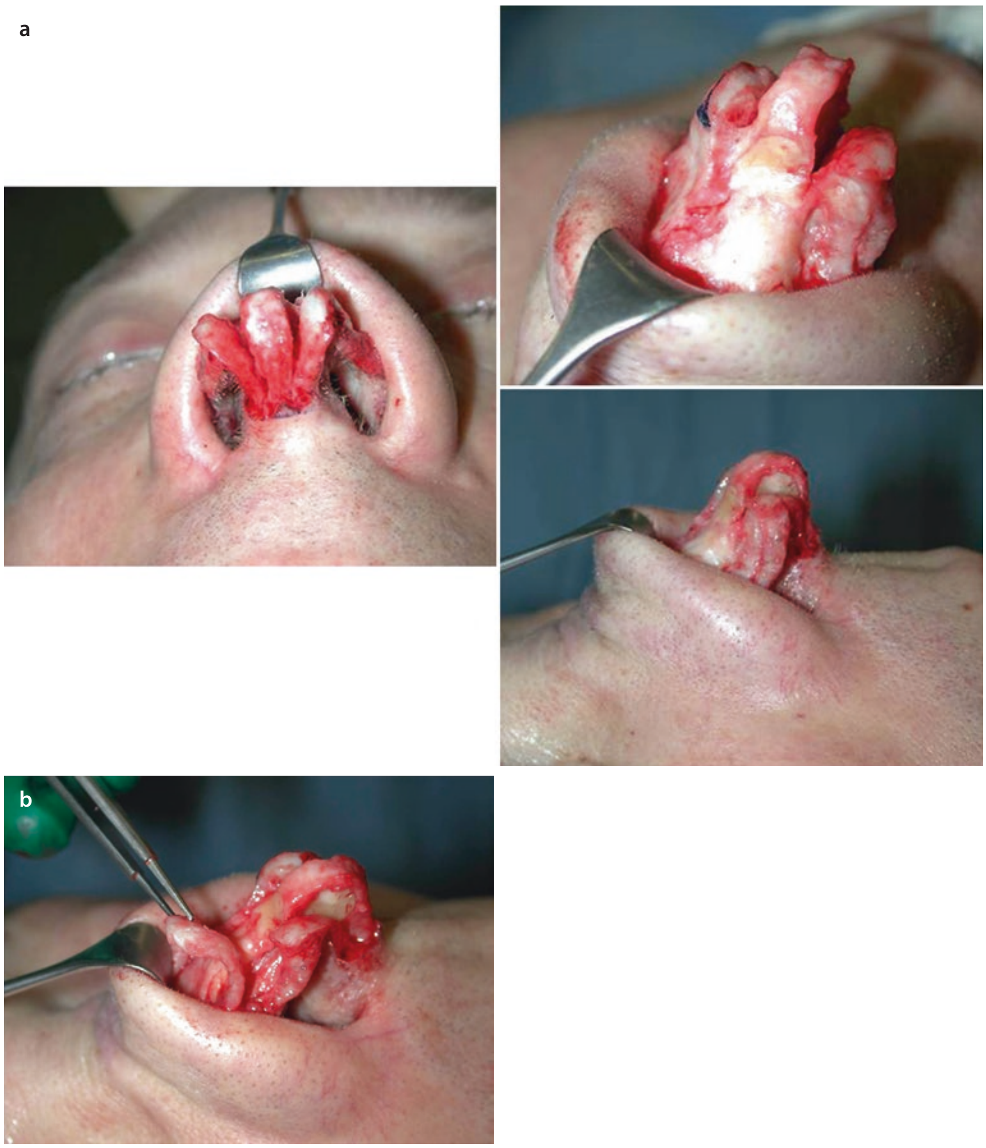
Fig. 13.18 (continued)

Case 6: Modified Upside-Down Technique Combined with Dorsal Reconstruction

A 47-year-old male presented after ten previous nasal surgeries requesting a more attractive nose with the creation of a slight dorsal hump. Examination revealed a conspicuous dorsal deformity with scarred and discolored skin and numerous contour irregularities. The middle vault was overprojected and deviated to the right as a result of a warped underlying rib cartilage graft. Tip ptosis and an overly acute nasolabial angle were also observed. Upon surgical exploration with the open rhinoplasty approach, a crudely shaped piece of rib cartilage was found serving as a columellar strut graft. Concavities of both lateral crura were hidden beneath onlay grafts of rib cartilage. After removing the onlay grafts, the lateral crura were observed to be abnormally wide. This permitted the entire crus to be removed, flipped 180°, divided longitudinally, and then used to reconstruct both lateral crura. The dorsum was then augmented with a DC-F graft fashioned from autologous temporalis fascia filled with diced cartilage obtained from the previously implanted rib grafts (Fig. 13.19).

Fig. 13.19 **(a–d)** Modified upside-down technique. **(e–g)** Front view, profile view, base view pre-op/post-op

a



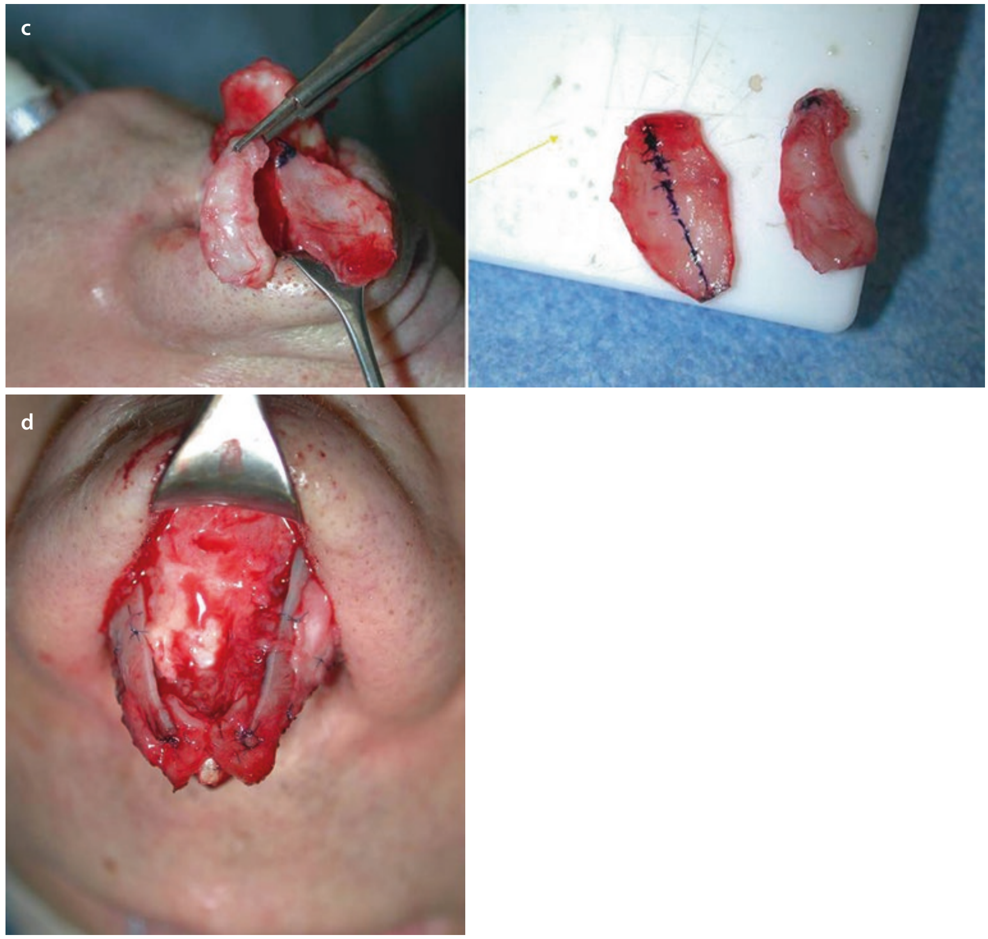


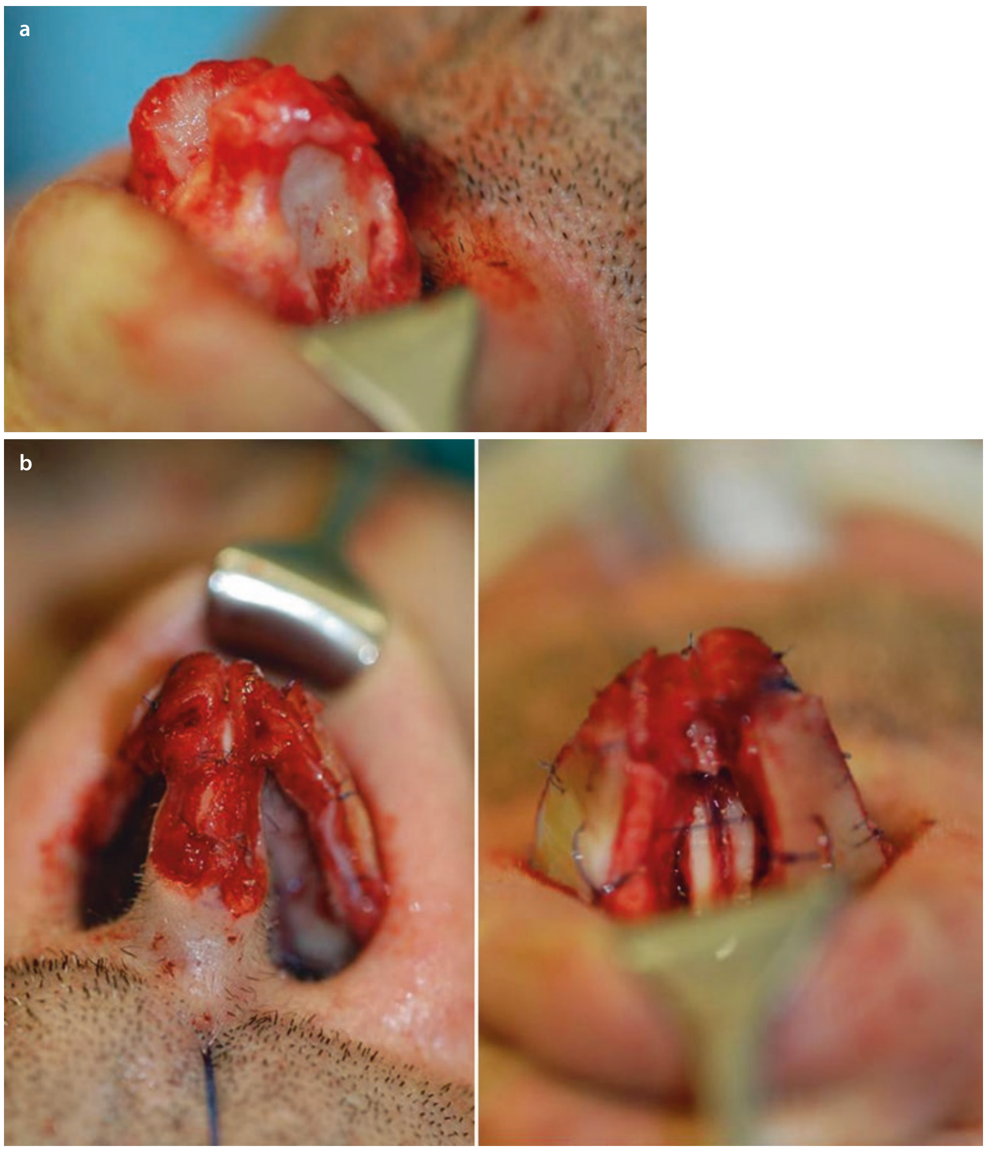
Fig. 13.19 (continued)

Fig. 13.19 (continued)

Fig. 13.19 (continued)

Case 7: Upside-Down Technique Combined with Batten Graft

A 49-year-old male presented for revision rhinoplasty after five unsuccessful surgeries performed elsewhere. On examination, persistent malformations of the lateral crura with nostril asymmetry were observed. In addition, the dorsum was overly wide and crooked. Palpation revealed absence of the caudal septum. Using the external approach, reconstruction of the L-strut was accomplished using bilateral conchal grafts to create an L-shaped replacement graft. The replacement graft was then sutured to the nasal spine and integrated into the residual dorsal septum. Misshapen and collapsed medial crura were then sutured to the L-strut replacement graft for support. Deep concavities of both lateral crura were then eliminated using the "upside-down" technique in which the deformed segments were excised, flipped, and reattached. Finally, spanning sutures were used to control flaring, and a tip suspension suture with a posterior sling was used to strengthen tip support (◘ Fig. 13.20).



◘ **Fig. 13.20** **(a–b)** Upside-down technique combined with batten graft. **(c–e)** Front view, profile view, base view pre-op/post-op

Fig. 13.20 (continued)

■ **Fig. 13.20** (continued)

Case 8: Upside-Down Technique Combined with Batten Graft

A 41-year-old female presented complaining of nasal obstruction with collapse of the left nostril after rhinoplasty was performed elsewhere. The patient also reported gradual loss of tip projection resulting in an overly prominent dorsum. Examination also revealed an overresected bony vault resulting in an underprojected nasion. After exploration of the nose via the open approach, overresected and concave lateral crura, overly sharp angulations of the nasal domes, and vertical division of the right nasal dome were observed. After resection of the deviated central septum and cartilaginous dorsum, spreader flaps were used to reconstitute the middle vault. The resected cartilaginous hump was then used as a columellar strut graft, and both lateral crural remnants were sutured to the strut after the right crural remnant was flipped to eliminate the concave deformity. A batten graft fashioned from septal cartilage was then placed to prevent collapse of the left lateral crus, and a small cephalic trim from the left lateral crus was used to augment the right side. Spanning sutures were then used for contour refinement. Two layers of allogenic fascia lata were used to camouflage the dorsum (Fig. 13.21).

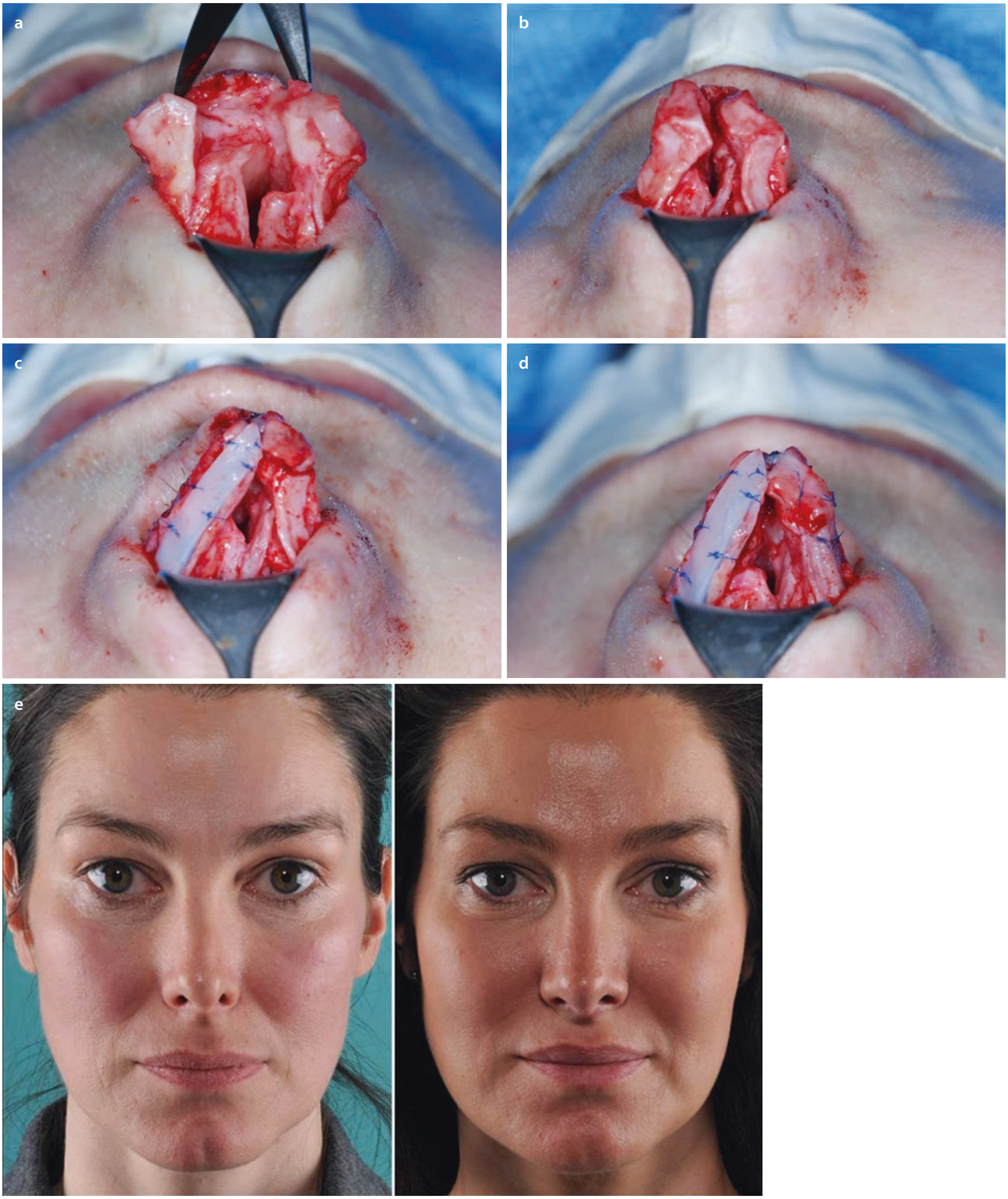


Fig. 13.21 (a–d) Upside-down technique (*right*) combined with batten graft (*both sides*). **(e–g)** Front view, profile view, base view pre-op/post-op

Fig. 13.21 (continued)

Case 9: Lateral Crural Strut Graft

A 17-year-old female patient presented with nasal obstruction following a horseback riding accident and previous rhinoplasty. Examination revealed a round and amorphous nasal tip with collapse of the left nostril from scar contracture. Opening the internal nasal valve by insertion of a small glass spatula revealed a positive Cottle test, as nasal breathing returned to normal with this maneuver. The dorsum revealed a C-shaped curvature to the right, and the profile revealed a small dorsal hump.

Using the external rhinoplasty approach, surgical exploration revealed a severe deformity of the right lateral crus. After separating the ULCs from the septum, the deformed central septum was excised, and the cartilaginous dorsum was lowered by scissors resection. The bony hump was lowered using an electric drill fitted with a cylindrical drill bit. After straightening the deviated bony pyramid using parasagittal medial, percutaneous low-to-low lateral, and percutaneous transverse osteotomies, spreader grafts fashioned from the excised septum were sutured into position. Another piece of septal cartilage was thinned and sutured on top of the damaged right lateral crus. On the left side, a lateral crural strut graft was used to strengthen the lateral crus, and a columellar strut graft was placed for tip support. After partially closing the skin flap, finely diced residual cartilage was injected for radix augmentation (▫ Fig. 13.22).

Fig. 13.22 **(a–b)** Lateral crural strut graft (*left*) and batten graft (*right*). **(c–e)** Front view, profile view, base view pre-op/post-op

■ **Fig. 13.22** (continued)

Case 10: Combination Overlap Technique, Horizontal Mattress Sutures, and Batten Graft Refinements with free diced cartialge

A 32-year-old female presented after three previous rhinoplasties with a deformed and deviated nasal tip and a small, narrow, and asymmetrical nasal dorsum with a depressed right nasal bone. The patient also complained of nasal obstruction, which was alleviated by manual distention of the internal nasal valves.

Surgical exploration revealed untreated malformations of both LLCs and no sign of previous spreader graft placement. After removal of the nasal tip scars, a pinched and concave left lateral crus and a missing right lateral crus were found. Exploration of the bony vault revealed that previous lateral osteotomies were positioned too high on the bony side wall, and the right cranial fragment had collapsed inward. Repeat osteotomies seemed ill-advised; therefore, camouflage of the collapsed bony segment with free diced cartilage was planned.

A residual septal deformity was resected and used for spreader grafts. The ANS was malpositioned 4 mm to the left of midline, but owing to the small size of the nasal spine, transection and relocation of the bone with microplates were not feasible. Consequently, the straightened caudal septum was sutured to the perforated ANS in a side-to-side configuration. The tip deformity was first addressed with placement of a columellar strut graft. Next, buckling of the right intermediate crus was eliminated with a medial crural overlap (sliding) technique, and the left lateral crus was flattened with horizontal mattress sutures and splinted with a batten graft. A batten graft was also used to replace the missing right lateral crus. Finally, the tip was then contoured with transdomal sutures, the flaring was controlled with spanning sutures, and the tip position was stabilized using a tip suspension suture. In order to avoid any irregularities, allogenic fascia was placed over the dorsum, and free diced cartilage was used for smoothing the tip contour (◘ Fig. 13.23).

■ **Fig. 13.23** **(a–f)** Combination lateral crural overlap technique, horizontal mattress sutures, and batten graft. Additionally allogenic fascia lata for smoothing the dorsum and free diced cartilage for smoothing the lateral wall and the tip

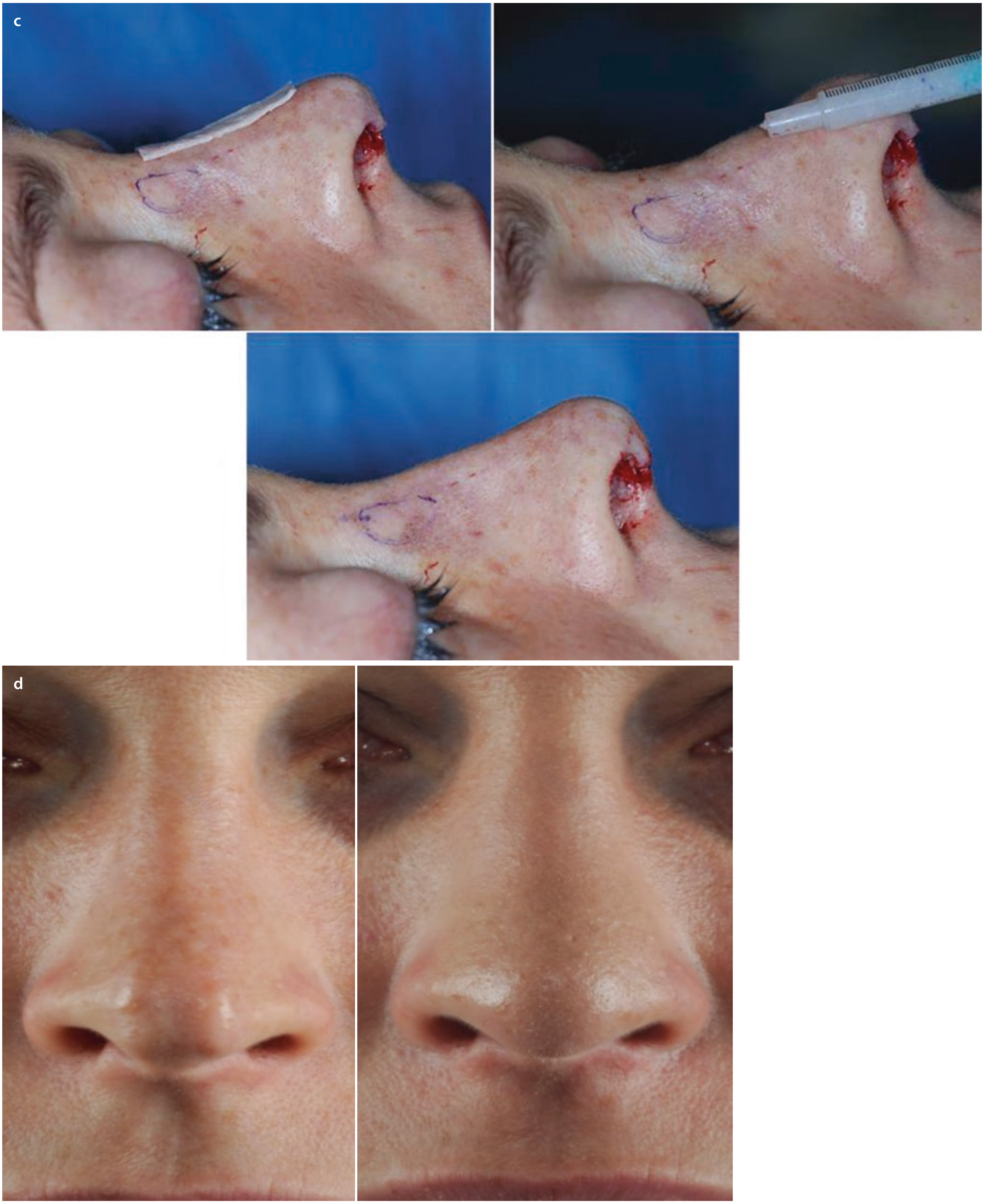


Fig. 13.23 (continued)

Fig. 13.23 (continued)

Suggested Reading

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Complex Revision

Content

Complex Revisions

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_14

The nose is the central aesthetic element of the face, and a failed rhinoplasty may lead to significant psychosocial stress and dysfunction. The impact of a failed rhinoplasty should prompt the surgeon to explore the cause of treatment failure and to consider attempting to salvage the outcome with secondary surgery. However, the inexperienced surgeon often exacerbates the initial treatment failure when attempting to correct his or her own work, creating an ever greater challenge for the next surgeon. In such cases, the patient is often apprehensive, skeptical, and mistrusting of further surgery, even at the hands of an accomplished revision rhinoplasty specialist. However, the embarrassment and emotional angst of a failed rhinoplasty eventually prompt further surgery despite the associated fear and anxiety. Yet, in addition to the psychological issues of the revision rhinoplasty patient, the revision surgeon must also contend with the technical challenges of a previously operated nose. Disruption of surgical navigation planes, excessive bleeding, and dense scarring typically make the dissection far more challenging. Moreover, missing, distorted, or damaged skeletal structures typically necessitate complex skeletal grafting, and graft survival is less reliable due to compromised circulation. In the worst-case scenario, vascular insufficiency can lead to graft or skin necrosis. Even when the technical aspects of surgery are successful, postoperative swelling is often increased, and the healing process is usually prolonged. For all of these reasons, a candid and explicit preoperative discussion in which the limitations, risks, and complications of revision rhinoplasty are reviewed in detail must be undertaken. Additional time must also be allotted for a complete discussion of the relevant issues.

14.1 Case 1: Long-Term Result of Complex Tip Reconstruction (12-Year Follow-Up)

A 50-year-old patient presented following two functional and cosmetic septorhinoplasties. Examination revealed retraction, fixation, and scarring of the supratip skin from previous surgical perforation. Asymmetrical nasal bones with a C-shaped dorsal deformity, overly prominent soft-tissue triangles, and left-sided alar retraction were also observed. Although the open approach carried an increased risk of skin necrosis in the area of iatrogenic skin perforation, the advantage of a precise diagnostic assessment made the open approach justifiable. Upon opening the nose, the left lateral crus and the nasal dome were both missing and had been replaced with a malpositioned cartilage onlay graft. Reconstruction was achieved using donor septal cartilage. Both lower lateral cartilages (LLCs) were reconstructed using narrow strips of septal cartilage thinned with a motorized diamond fraise to create individual domal/lateral crural replacement grafts. Spanning sutures were then used to contour the lobule, and a shield graft fashioned from tragal cartilage was added for additional tip contour. A suspension suture with a posterior sling was then used for tip rotation and stabilization (◘ Figs. 14.1 and 14.2).

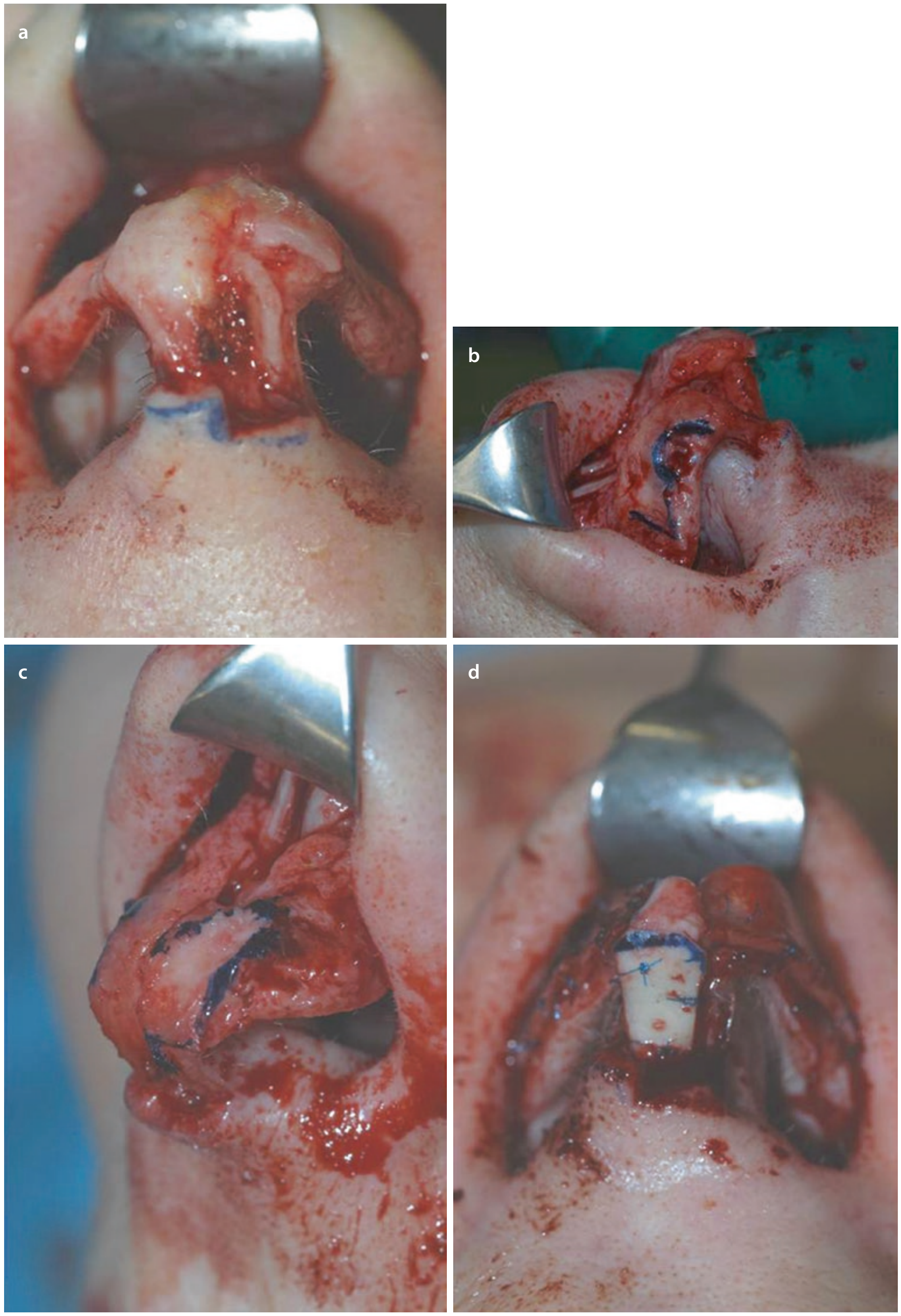


Fig. 14.1 (**a**, **b**) Left lateral crus and both domes have been removed and replaced by a combined shield-onlay graft, which has been dislocated. (**c**, **d**) Reconstruction of the missing parts by septal cartilage grafts, shield graft from tragus for tip contouring. (**c**–**e**) Pre-/postoperative images after 1 year

Fig. 14.1 (continued)

Fig. 14.1 (continued)

Fig. 14.2 (**a**–**c**) Twelve-year follow-up

Fig. 14.2 (continued)

14.2 Case 2: Complex Reconstruction with Extracorporeal Septal Reconstruction, Cartilage Grafts from Ear and Rib and Dorsal Reconstruction with DC-F Graft

A 41-year-old female presented after three previous septorhinoplasties complaining of nasal obstruction and a misshapen nose. Examination revealed an overly short and saddled nose, a pinched tip with retracted soft-tissue facets, and asymmetrical nostrils from a malpositioned columella. Endonasal examination revealed nasal polyposis and an 18-mm septal perforation high in the nasal vault. Open access was achieved via an inverted-V transcolumellar incision located at the narrowest segment of the columella, above the previous malpositioned columellar incision. Dissection was challenging because of extensive surgical scarring, and large portions of quadrangular cartilage were found to be missing, including the caudal septum and the anterior septal angle. Large portions of the LLCs were also previously resected. Reconstruction of the L-strut was accomplished using a double-layered conchal cartilage graft reinforced from behind with small residual strips of septal cartilage sewn to a PDS foil scaffold. The L-strut replacement graft was secured to the nasal spine using a transverse drill hole for suture fixation. The septal perforation was closed using a four-flap technique in which the superior flap was an advancement flap from the upper lateral cartilage mucosa and not a bridging flap, as recommended in some textbooks. The nasal polyps were also removed. Thin and malleable rib cartilage grafts fashioned from the tenth rib were then used to replace the missing LLCs, and a nonintegrated shield graft was also placed. A DC-F graft constructed from autologous temporalis fascia and filled with a combination of diced conchal and rib cartilage was then used to augment the overresected nasal dorsum (Fig. 14.3).

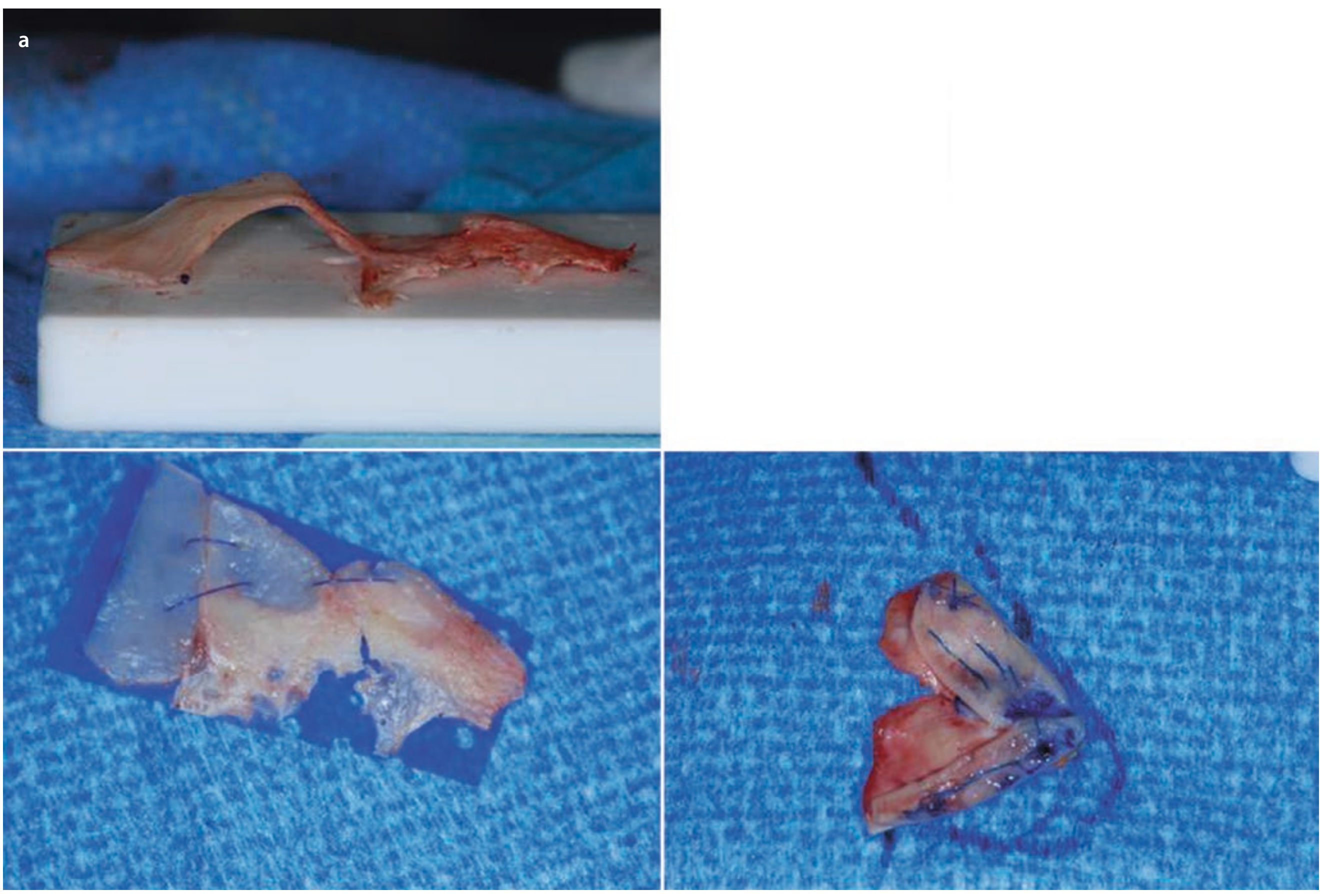


Fig. 14.3 Residual straightened parts of the septum are sutured to a PDS foil. (**a**) In front of this reconstruction, a double-layered concha graft was placed to reconstruct the anterior septal angle to support the tip and to lengthen the nose. (**b**) The L-strut replacement graft is brought into position with a translabial guiding suture; rib graft and deep temporalis fascia are harvested; LLCs are reconstructed with strips from rib grafts. (**c**) DC-F for dorsal reconstruction. (**d**–**f**) pre-op/2 yr post-op

Fig. 14.3 (continued)

Fig. 14.3 (continued)

■ **Fig. 14.3** (continued)

14.3 Case 3: Complex Nose Reconstruction in a Patient with Partial Necrosis of the Columella

A 43-year-old female presented after four previous open rhinoplasties complicated by ischemic necrosis of the columella. Although the primary surgeon recommended immediate columellar reconstruction, we persuaded the patient to wait until the necrotic segment healed by secondary intention. Examination of the nose also revealed a rightward C-shaped deformity of the dorsum, collapse of the right lateral crus, and conspicuous nostril asymmetry. Following healing of the columella, a two-stage revision surgery was recommended in which the columellar scar would be treated secondarily. Open rhinoplasty was performed via a transcolumellar incision located at the upper edge of the depressed columellar scar. Only minor fragments of LLCs remained, and all of the surplus septal cartilage was missing, making septal graft harvest impossible. Although rib cartilage was ultimately used for reconstruction, breast implants, a pectus excavatum, and diffusely calcified rib cartilage made an inframammary crease incision ill-advised. Thin strips of rib cartilage were then fabricated and placed over the LLC remnants. However, owing to excessive cartilage rigidity, transdomal sutures failed to provide a satisfactory tip contour. Consequently, the domes were vertically divided and sutured back together to achieve the desired shape. Dorsal irregularities were then excised, and two layers of allogenic fascia lata were also used for camouflage, for profile augmentation, and for improved dorsal aesthetic lines. Three months later, the patient returned for treatment of the depressed columellar scar. The depressed segment was carefully de-epithelialized and covered with a full-thickness postauricular skin graft (Fig. 14.4).

Fig. 14.4 (**a**) Severe nasal deformity after four previous rhinoplasty, last with open approach, wound healing problems, and partial necrosis of the columellar flap. (**b**) Deep scar after secondary healing. (**c**) Reconstruction of the LLCs with rib cartilage (dome division technique). (**d**–**f**) Pre-/postoperative images after the first stage of reconstruction (nose). (**g**) Second stage of reconstruction: correcting the deep retracted columellar scar (**f**) by full-thickness postauricular skin graft

Fig. 14.4 (continued)

Fig. 14.4 (continued)

14.4 Case 4: Reconstruction of Tip and Dorsum with Rib Grafts

A 32-year-old patient presented for revision rhinoplasty after several previous rhinoplasties. Her main complaints included an over-shortened nose, a wide bony pyramid, a pollybeak deformity, as well as a severely retracted transcolumellar incision scar.

Using an open approach technique, the scar was carefully excised. Dissection of the dorsum revealed a Medpor implant which was removed. Following division of the tip consisting only of scar tissue and cartilaginous fragments, the septum was found to be over-resected anteriorly and no longer in continuity with the ethmoid bone, whereas the central part was deviated to the left. The bony pyramid was straightened and narrowed by parasaggital, lateral low-to-low, and transverse osteotomies. Next, the deformed part of the septum was removed. Strips of rib cartilage were fixed to the residual ULCs, and the residual septum was fixed in between and to the ANS. For stabilization of the keystone area, a criss-cross suture was applied. A septal extension graft was created from the removed septum and put in front of the over-resected anterior septal border. It was kept in position with extended spreader grafts. The missing caudal framework was replaced by cartilage strips from rib cartilage which were thinned to 1 mm thickness using the sculpture board (Medicon^{R}). They were fixed to a columellar strut made from rib cartilage and then molded by transdomal and spanning sutures. Before flipping back the skin flap, the nasofrontal angle was deepened with a cylindrical drill and rim grafts were placed. After suturing the skin flap, the nasal dorsum was smoothed with free diced cartilage.

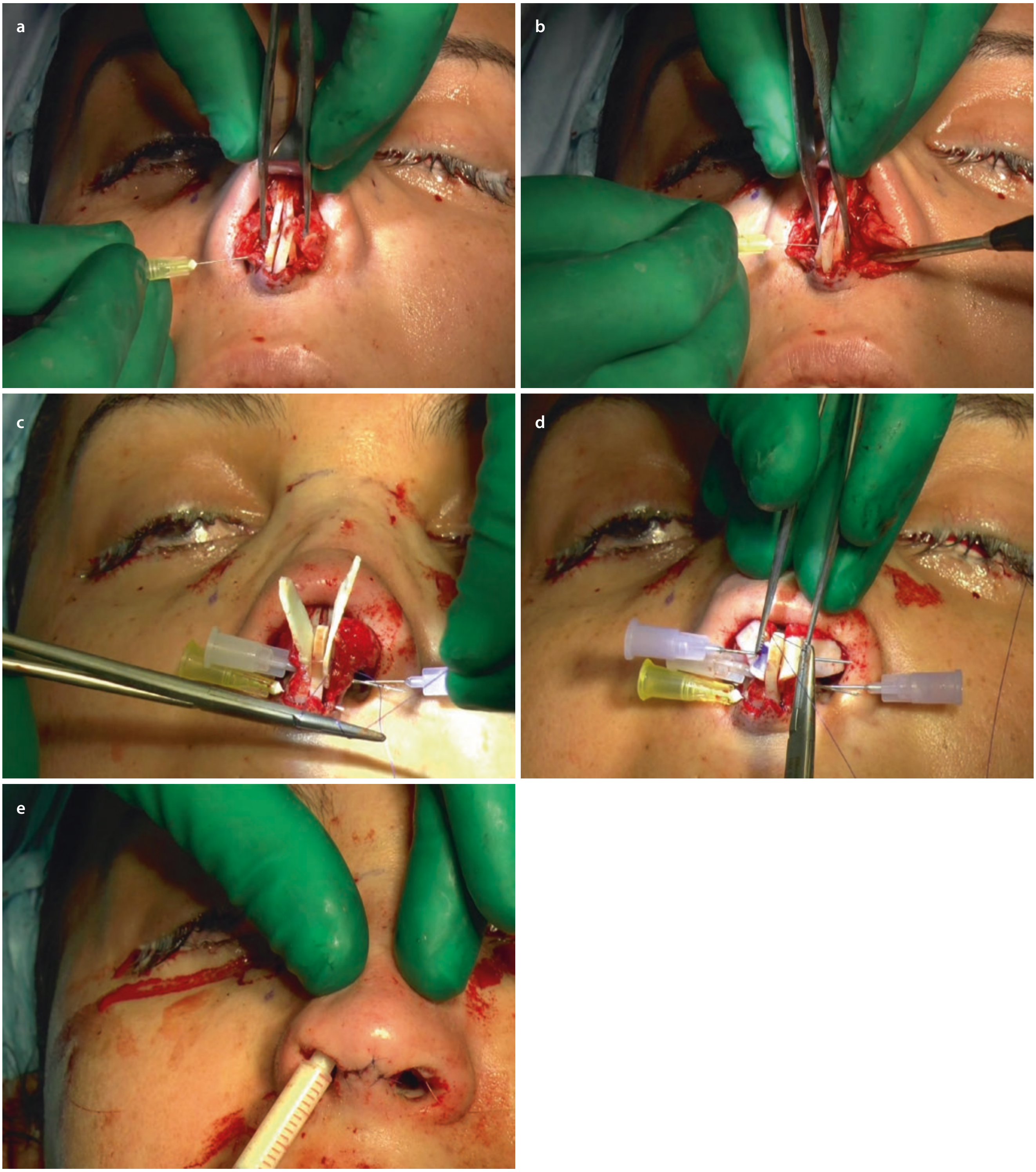


Fig. 14.5 (**a**) Reconstruction of the dorsum with double-layered rib grafts. (**b**) Columellar strut from rib graft. (**c**, **d**) Reconstruction of the LLCs from strips of rib graft, using bending technique. (**e**) Refinement with free diced cartilage

■ **Fig. 14.5** (continued)

Fig. 14.5 (continued)

14.5 Case 5: Complex Tip Reconstruction

A 27-year-old female presented 10 years after a previous rhinoplasty for revision surgery (Fig. 14.6c: profile before and after first rhinoplasty). The patient stated that she had been given the nickname of "rhino," which made her reluctant to participate in social activities. She further stated that the primary surgeon told her there was no chance of achieving a better nose. Examination revealed a markedly overprojected nasal tip with a protruding columella and a conspicuous low columellar scar. The columella was also overly wide, asymmetrical, and dislocated from the nasal spine, resulting in nostril asymmetry. A heavily overresected dorsum with excessive dorsal width was also observed. For reconstruction, the open approach was performed through a new transcolumellar incision properly located above the old columellar scar. Exploration revealed large missing segments of medial and intermediate crura. Additionally, both lateral crural remnants were collapsed and measured only 2–3 mm in width. The caudal septum, which had been horizontally overexcised, was still vertically too long and was dislocated from the nasal spine. Consequently, it was trimmed to match the height of the nasal spine and sutured in the midline using a transverse drill hole. The quadrangular septum and right concha were then harvested for graft material. A double-layered conchal graft was used to lengthen the septum and to provide tip support. Five-millimeter strips of septal cartilage were used to replace the overresected lateral crura, and the medial ends were sewn to the conchal graft. Spanning sutures were then placed for tip refinement, and a suspension suture with a posterior sling was used for tip stabilization. After narrowing and straightening the bony dorsum, a DC-F graft (created from allogenic fascia lata and diced remnants of septal and conchal cartilage) was used for dorsal augmentation (Fig. 14.6).

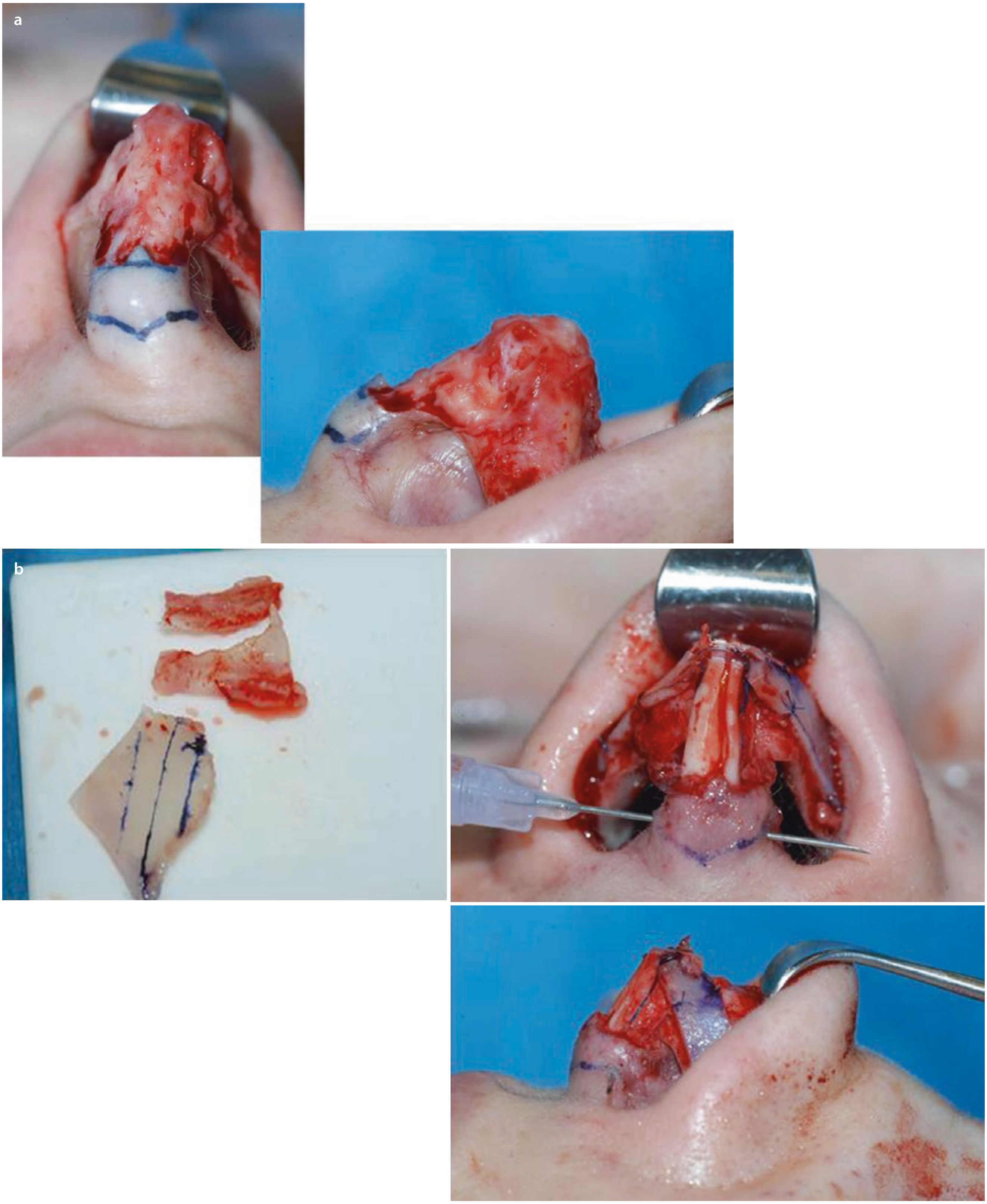


Fig. 14.6 (**a**) Large parts of the LLCs are missing but by an unknown graft, used as a columellar strut resulted in an overprojection. (**b**) Replacing the columellar strut by double-layered conchal graft, reconstruction of the missing LLCs with batten graft technique. (**c**) The patient at the age of 17 before first operation when she first introduced herself to us. (**d**, **e**) Pre-op/2yr post-op

Fig. 14.6 (continued)

Fig. 14.6 (continued)

14.6 Case 6: Severe Psychological Problems After Minor Surgical Deformity with 15-Year Follow-Up

A 17-year-old female presented after unsuccessful rhinoplasty performed elsewhere. Postoperatively she became disturbed about her unsightly nostril contour, and subsequently she developed bulimia. Examination revealed a wide and asymmetrical columella with retraction of the left alar rim. The dorsum was still slightly overprojected and canted to her right, and the caudal septum was dislocated to the left. Open exploration of the nose revealed overresection of the left lateral crus, predisposing to alar retraction. The caudal septum was then repositioned to the midline by trimming the base to match the height of the nasal spine and suturing it to a nasal spine drill hole. In order to create a symmetrical tip framework, a piece of septal cartilage was thinned on one side with a motorized diamond fraise in order to create a slightly convex shape. The modified cartilage was then used to augment the overresected lateral crura. By recreating a symmetrical and sturdy tip framework, alar retraction was eliminated without the use of a chondrocutaneous composite graft, which would have been a more complex alternative option (Figs. 14.7 and 14.8).

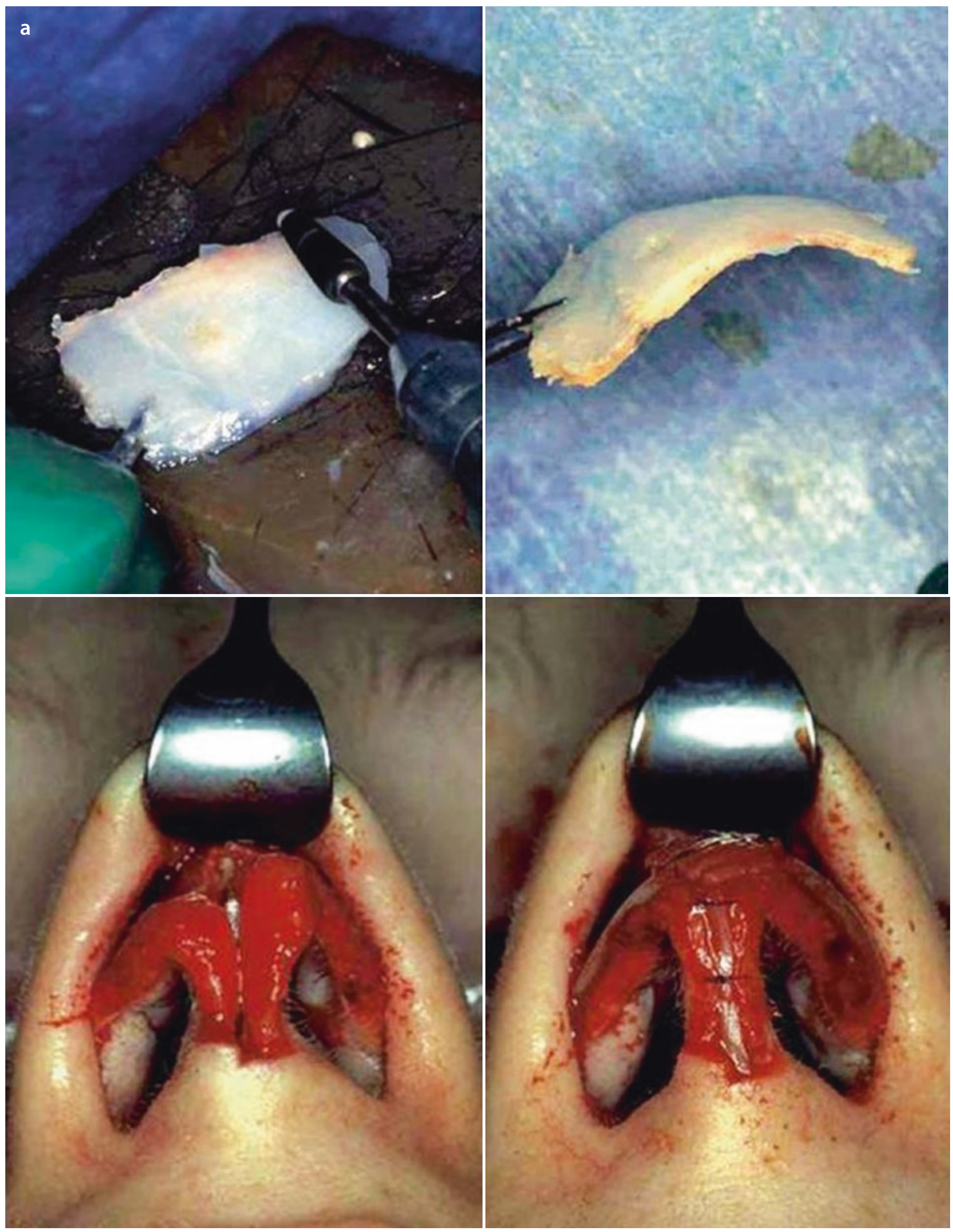


Fig. 14.7 (**a**) Molding bended cartilage graft from a straight septum. This graft was used to replace the missing part of the left lateral crus, which was pulled cranially. With this reconstruction, a symmetrical framework was achieved and the retraction could be corrected. (**b**–**d**) Pre-op/post-op. images after 1 year

Fig. 14.7 (continued)

Fig. 14.7 (continued)

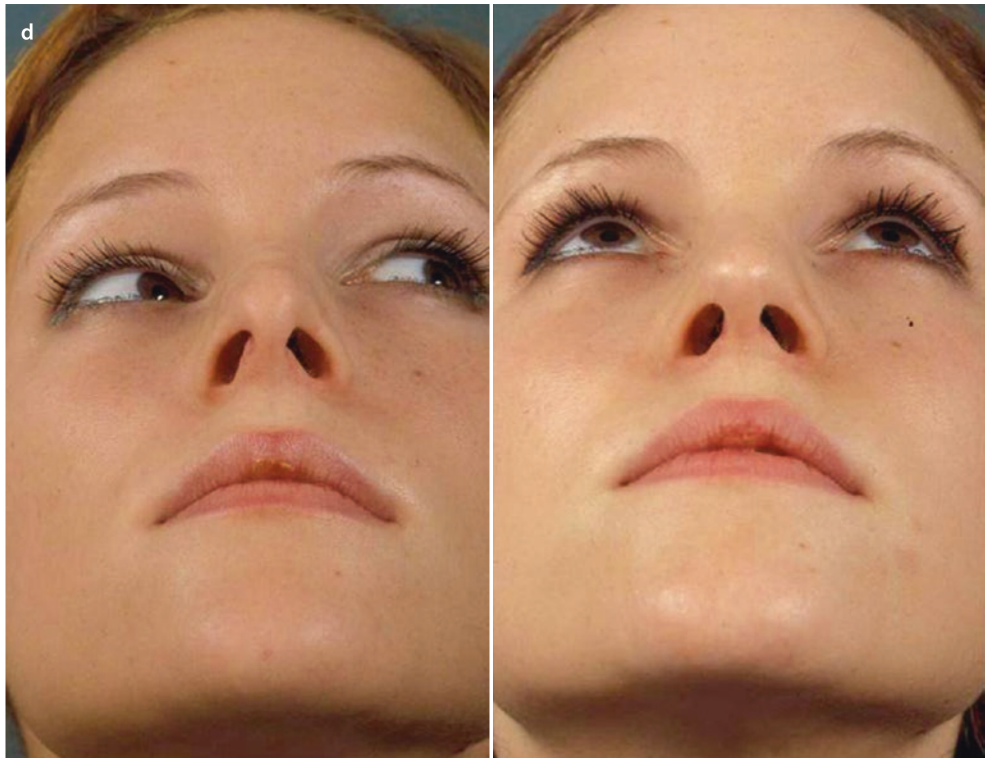


Fig. 14.8 (**a**–**c**) Fifteen-year follow-up

Fig. 14.8 (continued)

14.7 Case 7: Scar Correction After a Failed Open Approach

A 31-year-old female presented after open rhinoplasty performed elsewhere. Her recovery was complicated by inadequate wound healing and severe scarring and distortion of the tip and columella. Examination revealed a counterrotated and tethered tip/infratip complex with retraction of the columella. Massage and stretching of the columella did not improve the deformity. The patient sought second opinions from other surgeons, some of whom blamed the open rhinoplasty approach. However, from our perspective, the problem resulted from the shortcomings of the previous surgeon. After allowing the nose to heal for 1 year, augmentation of the columella with a postauricular chondrocutaneous composite graft was undertaken. Upon opening the nose and excising the columellar scar, an 8-mm columellar skin defect resulted. However, the composite graft was too thick to create a smooth and attractive columellar profile. Consequently, we removed and thinned the auricular skin, sutured the conchal cartilage into the columellar defect, and used the thinned auricular skin as a full-thickness graft to cover the cartilage graft. Owing to the small graft size, healing was favorable. Six months later, the dorsum was lowered, and the tip was augmented using a cap graft to complete the staged reconstruction (◘ Fig. 14.9).

Fig. 14.9 (**a**, **b**) Severe scarring and distortion of the columella after open approach. (**c**) Revision revealed skin defect of 8 mm. (**d**) Reconstruction of the columella by cartilage graft and full-thickness skin graft from the auricle. (**e**, **f**) Pre-/post-op after 2 years

Fig. 14.9 (continued)

14.8 Case 8: Complex Tip Reconstruction

A 65-year-old female presented with a complaint of nasal obstruction after four unsuccessful nasal surgeries performed elsewhere. Examination revealed a malformed tip, a stenotic left nostril, and an overresected, scarred, and severely retracted columella. The endonasal examination revealed previous removal of the entire bony and cartilaginous septum, except for a narrow L-strut. Open access was performed using the previous columellar scar, but an inverted-V type incision was employed rather than the straight-line incision used previously. Dissection was challenging because of heavy scarring, and exposure of the tip framework revealed subtotal absence of both LLCs. For skeletal reconstruction, both conchae were harvested. One concha was used to create a double-layered columellar sandwich graft, which was supported from behind by extended (conchal) spreader grafts. The missing domes and lateral crura were then reconstructed from thin strips of the opposite concha. The dorsum was then smoothed with two layers of allogenic fascia lata. Silicone nostril stents were used for 3 months postoperatively to prevent recurrent stenosis and collapse. Although additional surgery was recommended, the patient was so pleased with her functional and cosmetic outcome that she declined further treatment (Fig. 14.10).

Fig. 14.10 (**a**) Subtotal absence of both LLCs after four previous surgeries, reconstruction with thin strips of conchal cartilage (bending technique) and double-layered sandwich graft used as a modified septal extension graft. (**b**–**d**) Pre-/postoperative images after 1 year, having used silicone stents for 3 months. The stent is shown in *B*

Fig. 14.10 (continued)

■ **Fig. 14.10** (continued)

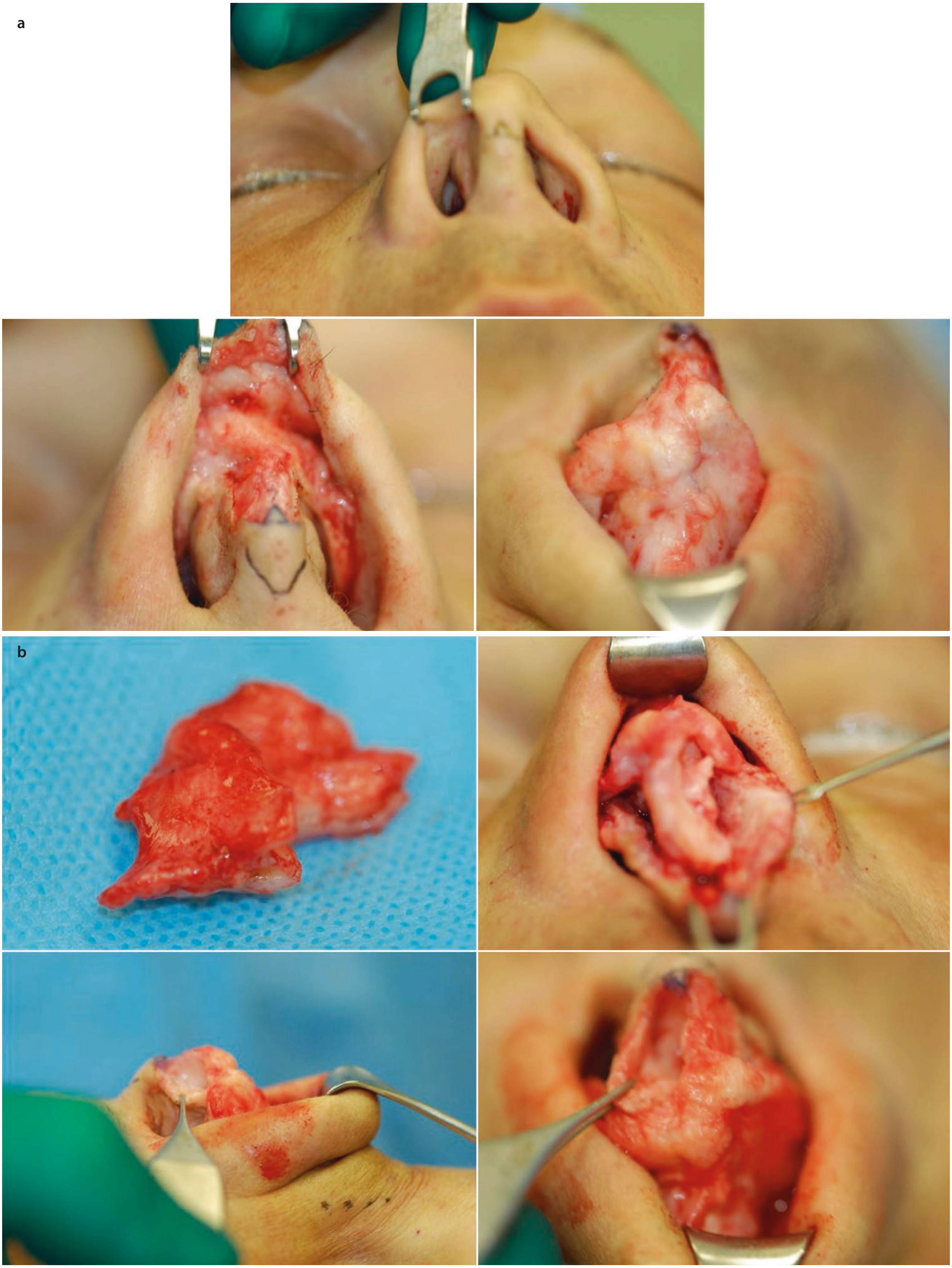
14.9 Case 9: Complex Reconstruction of the Nasal Framework in Severely Scared Skin

A 41-year-old male presented after three previous rhinoplasties with severe deformity of the external and internal nose. Examination revealed a C-shaped nasal axis and severe retraction of both soft-tissue triangles. The columella was tilted obliquely, and dislocation of the caudal septum from the ANS was obstructing the left nasal vestibule. The nostrils were severely asymmetrical, and the transcolumellar scar was plainly visible. On profile view, the radix was severely overprojected and virtually eliminated the nasofrontal angle. Additionally, severe overrotation of the rounded nasal tip resulted in a conspicuous pig-nose deformity. Endonasal examination revealed copious scars and synechiae on both sides.

Using the open approach (but positioning the incision at the narrowest segment of the columella and ignoring the previous low V-shaped incision), we encountered a twisted and useless columellar strut graft that was removed. Moreover, on further exploration, both LLCs were completely absent. The caudal septum was also overresected, and the residual septum was overly thick and consisted largely of bone.

A 12-mm-wide dorsal L-strut was preserved, but the remaining septum was harvested and thinned using a cylindrical drill bit. A double-layered sandwich graft was then fashioned from conchal cartilage and sutured in front of the ANS via transosseous drill hole fixation. To stabilize the sandwich graft at its opposite end, the septal graft material was used to bridge the sandwich graft and the dorsal L-strut, thereby enabling the counterrotation of the nasal tip and lengthening of the nose. The missing LLCs were then reconstructed using strips of autologous rib cartilage sutured to the sandwich graft. To bend the rib grafts and create natural-appearing domes, the strips were thinned with the cylindrical drill bit, and spanning sutures were used to contour the domal arches. A shield graft was used to further improve contour and to augment the retracted soft-tissue triangles. The radix was then lowered with the drill, and the bony pyramid was straightened with osteotomies. To correct saddling of the middle vault, a DC-F was fashioned from rib cartilage and allogenic fascia lata.

Two years after the initial reconstruction, the dorsum was smoothed by shaving the now solidified DC-F graft, and the tip was further counterrotated using another shield graft fashioned from tragal cartilage. A third and final stage after two additional years completed the reconstruction with placement of free diced cartilage to the dorsum harvested from the contralateral concha (◘ Fig. 14.11).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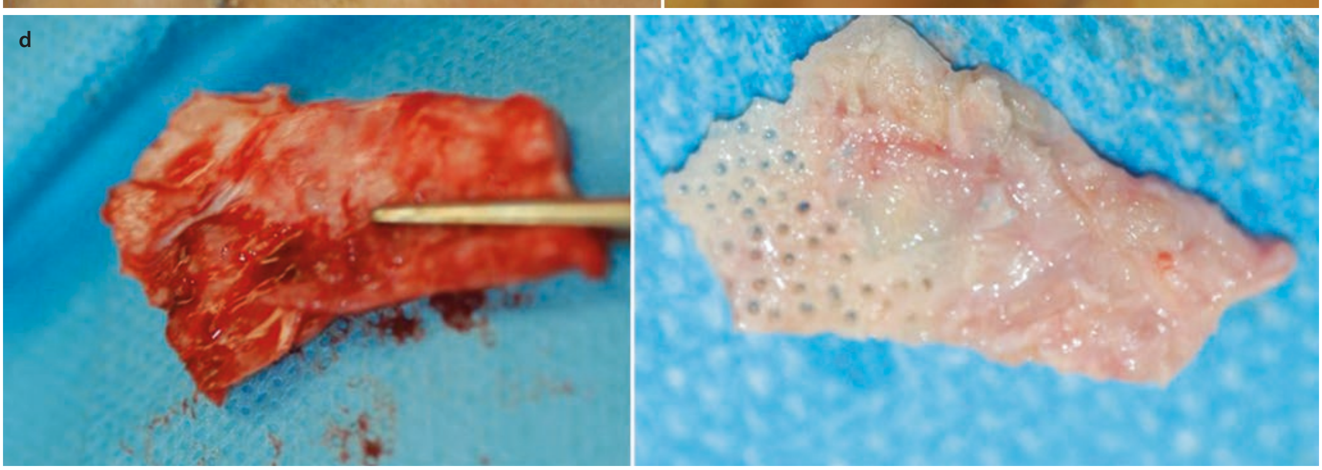
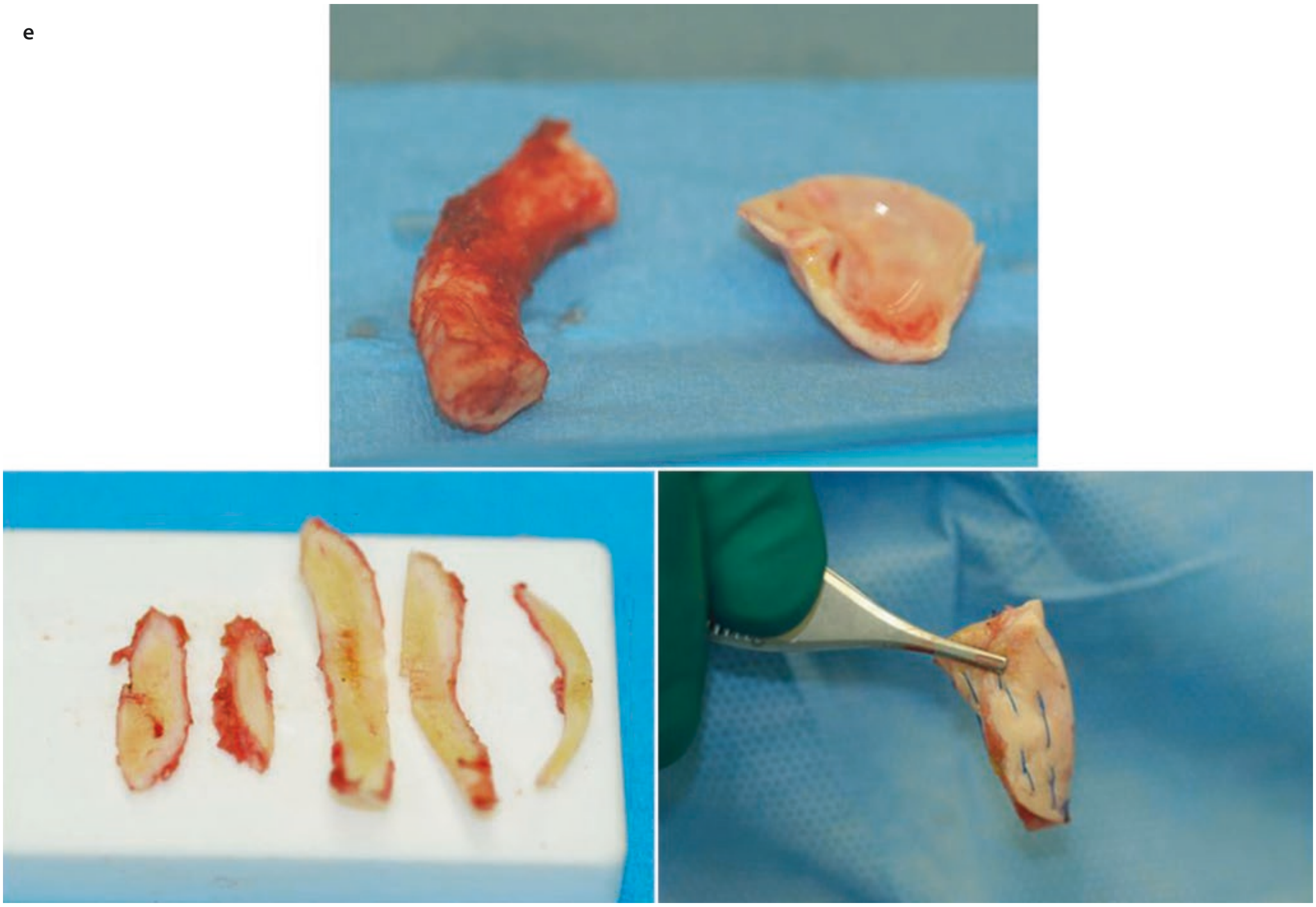


Fig. 14.11 (continued)

Fig. 14.11 (**a**) Severe webbing of both vestibules. After opening the nose, both LLCs were missing. (**b**) Residual septum was very thick and largely bone; severe scarring of the tip. (**c**) After removing the scars and the thin columellar strut, the tip collapsed and appeared severely pinched. (**d**) Straightening and thinning of the removed septum; the bony part was applied with multiple drill holes so soft tissue could grow through for better blood supply and for stabilization. (**e**, **f**) Rib cartilage for reconstruction of the LLCs and for fabricating a DC-F, conchal cartilage for constructing a double-layered sandwich graft. (**g**) DC-F graft for dorsal reconstruction. (**h**–**j**) Pre-op/4yr post-op e



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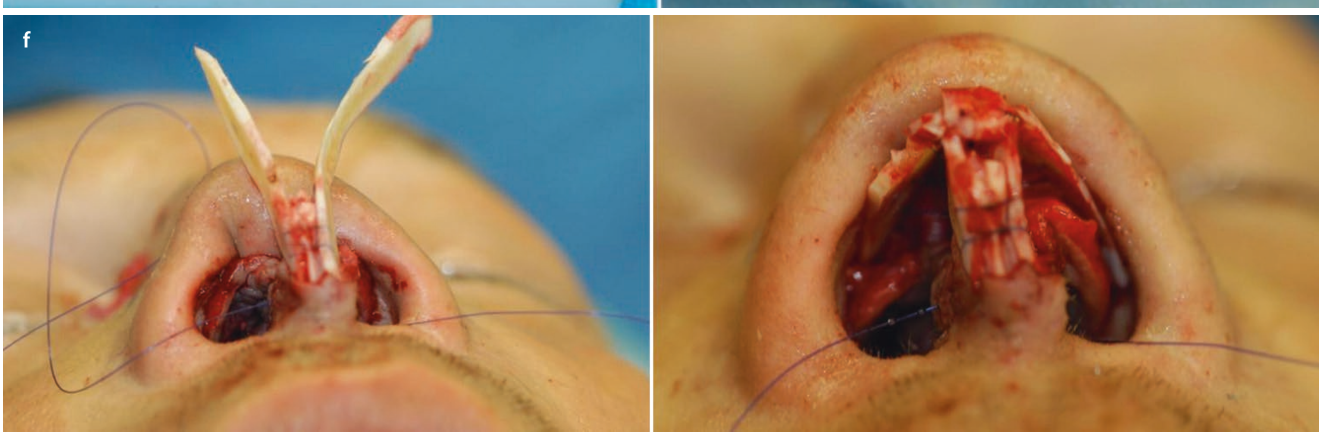

Fig. 14.11 (continued)

Fig. 14.11 (continued)

g

h

Fig. 14.11 (continued)

14.10 Case 10: Complex Tip and Dorsal Reconstruction Including Extracorporeal Septal Reconstruction

A 37-year-old male presented for secondary rhinoplasty after a failed aesthetic procedure that also resulted in nasal airway obstruction. A C-shaped and overresected dorsum with a wide, asymmetric, and deviated nasal pyramid was seen on examination. The tip was also bulbous and ptotic with a pinched right nostril. On gentle inspiration, the right nostril also collapsed producing additional airway obstruction. Endonasal examination revealed obstruction of both nasal passages from transverse deviation of the anterior septum. Using an open rhinoplasty approach through an inverted-V incision, surgical exploration revealed weak and overresected lateral crura with concave collapse on the right side. The caudal septum was also dislocated from the ANS producing obstruction of both nasal passages anteriorly. Following bilateral paramedian sagittal osteotomies with a side-cutting burr, the septal partition was removed for extracorporeal septal reconstruction. The bony pyramid was then mobilized, straightened, and narrowed using bilateral transverse and low-to-low (percutaneous) lateral osteotomies. The ninth rib was then harvested to create rough-cut cartilage strips measuring 2.0–2.5 mm in thickness, which were then further thinned to a final thickness of 1.5 mm using a cartilage sculpting board (Medicon; Tuttlingen, Germany). Extended spreader grafts were then sutured to the septum to achieve the desired increase in nasal length, and the neoseptum was reimplanted by suturing the construct to the nasal bones in the midline with paired transcutaneous/transosseous sutures. After passing the sutures through the nasal skin and bony pyramid, the suture "tails" were then pulled into the subcutaneous pocket and tied over the nasal bones. The neoseptum was also sutured to both ULC. A 2-mm-thick septal extension graft was then fashioned from additional rib cartilage and sutured to the right side of the ANS using drill hole fixation. The opposite end was then secured to the extended spreader grafts resulting in midline graft placement. The medial crura were then sutured to the SEG in a tongue-in-groove relationship to stabilize the columella. The weakened right lateral crus was then augmented with a lateral crural strut graft, and the intermediate and (concave) left lateral crura were both excised. The intermediate crus was replaced with a thinned segment of septal cartilage which was folded and sutured to create a new left dome unit. After suturing the dome to the SEG, the left lateral crus was replaced with a rib cartilage graft. After placement of right tip sutures, lateral crural spanning sutures were placed for additional tip refinement. The remaining rib cartilage was then diced to create a DC-F graft using allogenic fascia lata. The proximal end of the graft was sutured closed, and the graft was then inserted into the subcutaneous pocket overlying the dorsum. The central columellar incision was also sutured closed, and the DC-F graft was then molded digitally and sutured into position. The marginal skin incisions were then closed, and the nose was bandaged (Fig. 14.12).

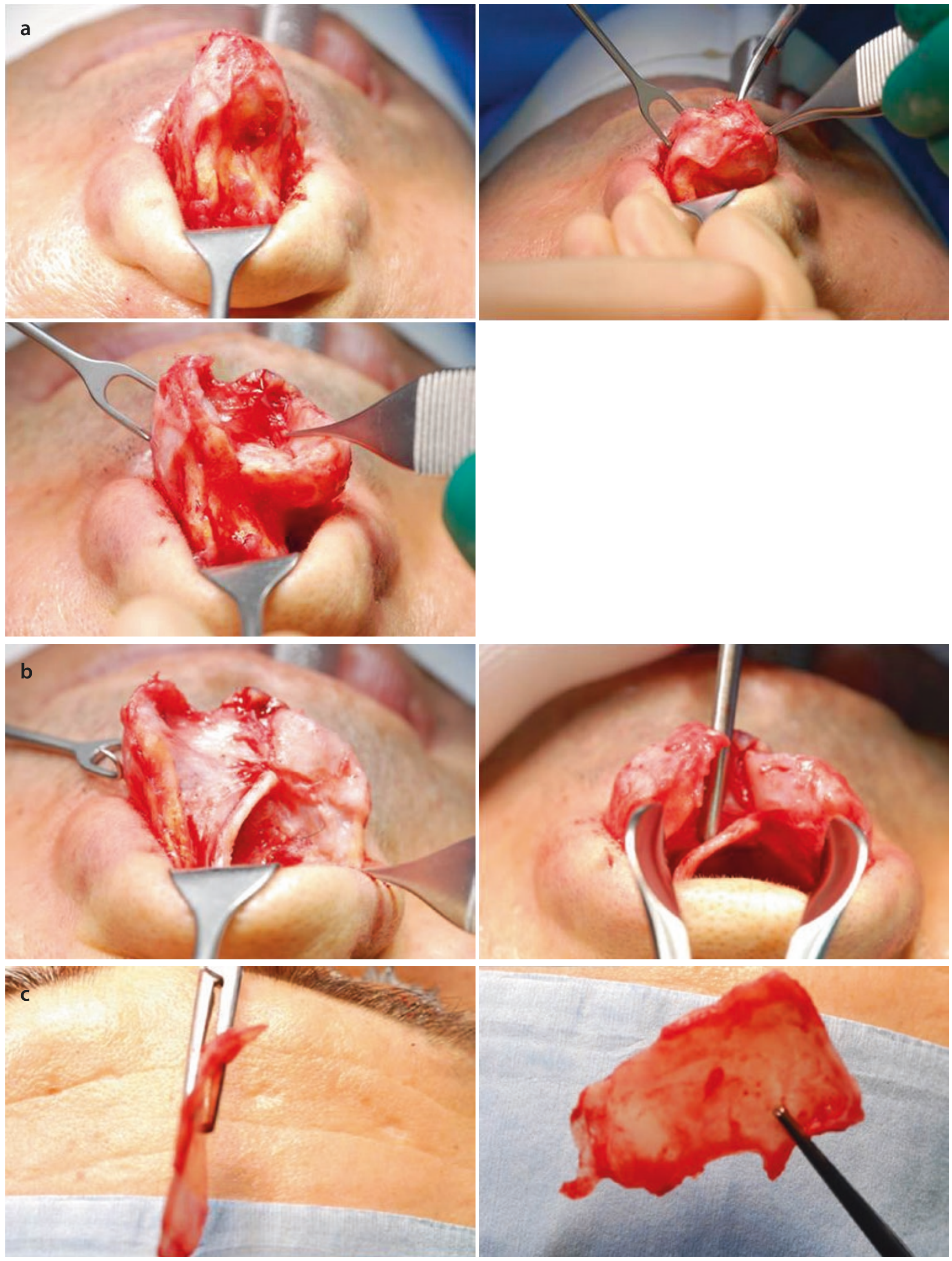

Fig. 14.12 (**a**) Weak and overresected lateral crura with concavity on the right side. (**b**) Transverse deviation of the anterior septum. (**c**) Explanted septum with deformed anterior part. (**d**, **e**) Reconstruction of a neoseptum with extended spreader grafts. (**f**) TTC technique (transcutaneous-transosseous-cerclage technique) for reconstruction of the keystone area. (**g**) DC-F graft for dorsal augmentation. (**h**) Adjusting the DC-F graft. (**i**, **j**) Reconstruction of the lower framework. (**k**–**m**) Pre-op/2 yr post-op

14

Fig. 14.12 (continued)

Fig. 14.12 (continued)

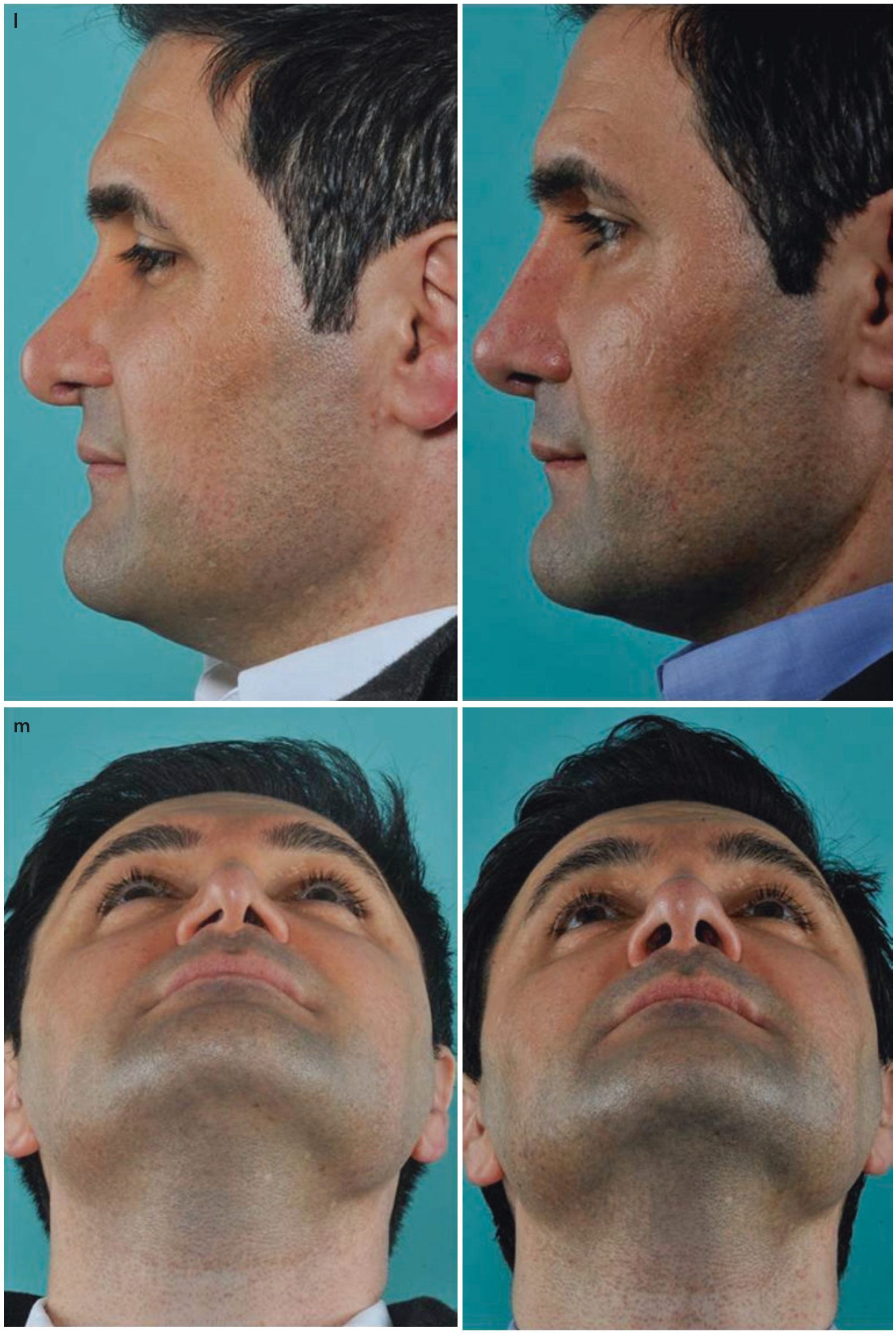

Fig. 14.12 (continued)

Suggested Reading

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Gruber RP, Wall Jr SH, Kaufman DL, Kahn DM. Secondary rhinoplasty. In: Neligan PC, Chang J, editors. Plastic surgery. 3rd ed. Philadelphia: Elsevier Saunders Publishing; 2013.

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Software

Content

New Software for Rhinoplasty Documentation and Record Keeping

W. Gubisch, *Mastering Advanced Rhinoplasty*, https://doi.org/10.1007/978-3-319-67537-4_15

Jack Gunter first introduced schematic illustrations for rhinoplasty in a specific software, "the Gunter Rhinoplasty Diagrams," which gained worldwide acceptance for clarifying surgical procedures in rhinoplasty. A new approach was then developed by Gilbert Aiach by the creative use of detailed illustrations that he had personally drawn, depicting single and specific steps of the procedure. However, this tool, which explained his complex surgeries in an easy way, was again used almost exclusively by its author, since no correlated software was available.

In the meantime, more sophisticated techniques have been progressively developed. Denis Codazzi, from the team of Enrico Robotti in Bergamo, generated a very detailed new 3D imaging program, the "Bergamo 3D Rhinoplasty software," which is currently in its first version. The project was partly funded from the revenues of the Bergamo Open Rhinoplasty biannual course and in equal part by the Sanvenero Rosselli Foundation of Professor Riccardo Mazzola in Milano. The objective is to have a software that is commercially available and easy to use and that includes in detail all the maneuvers performed during a rhinoplasty in a graphic format with easy interpretation. The purpose is both documenting what was specifically done in a single case (record keeping) and to simplify teaching and didactics for future cases. For example, two primary and two secondary cases are presented.

15.1 Case 1: Overprojected Dorsum with Bulbous Tip and Thin Skin (See Sect. 12.2.40)

A 39-year-old female patient was seen after previous rhinoplasty and an unsuccessful attempt to close a septal perforation with a severe plunged tip deformity. The anterior septum was largely missing. The dorsum was overprojected, and the nasal pyramid was very wide.

Using an open approach method, the perforation was closed with a four-flap technique. After harvesting the concha from the right side, a sandwich graft was placed and fixed to the overshortened caudal septum border, giving support to the tip. The bony dorsum was lowered by rasping, and then the nasal pyramid was straightened and narrowed by transcutaneous low-to-low lateral and transverse osteotomies.

The overprojected LLCs were corrected with the sliding or overlap technique. The overlay was 6 mm. The medial crura were fixed to the sandwich graft, and the domes were contoured with transdomal sutures. Spanning sutures and tip suspension sutures were placed, and an extended shield graft was fixed to the dome area.

At the end allogenic fascia lata grafts were tried but removed again because free diced cartilage gave a better result.

Later on function could be improved by inserting a Breathe implant (Karl Storz; Tuttlingen, Germany), to which the upper lateral cartilages were sutured (Figs. 15.1, 15.2, 15.3, 15.4, 15.5, 15.6, 15.7, 15.8, 15.9, 15.10, 15.11, 15.12, and 15.13).

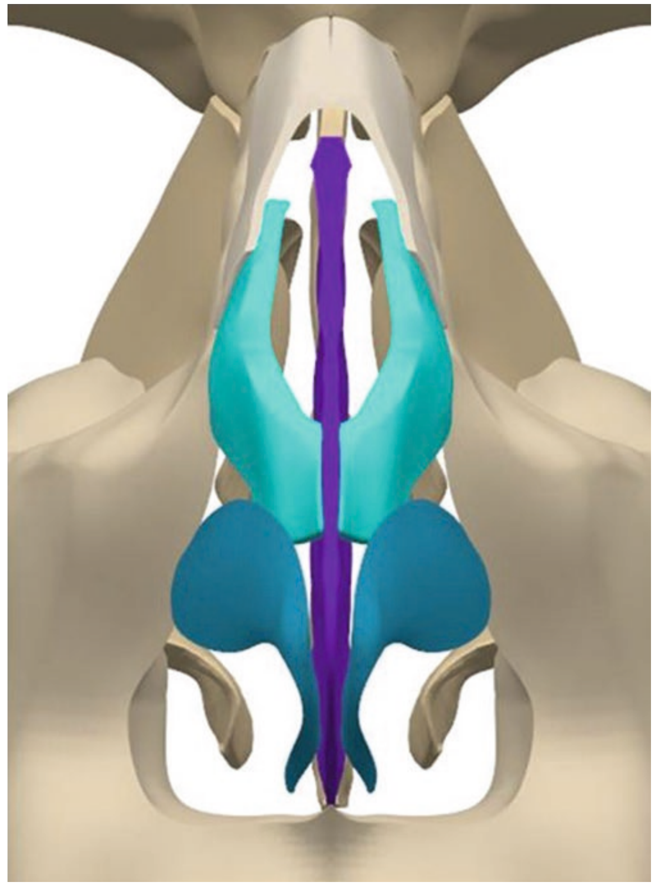


Fig. 15.1 Lowering the dorsum

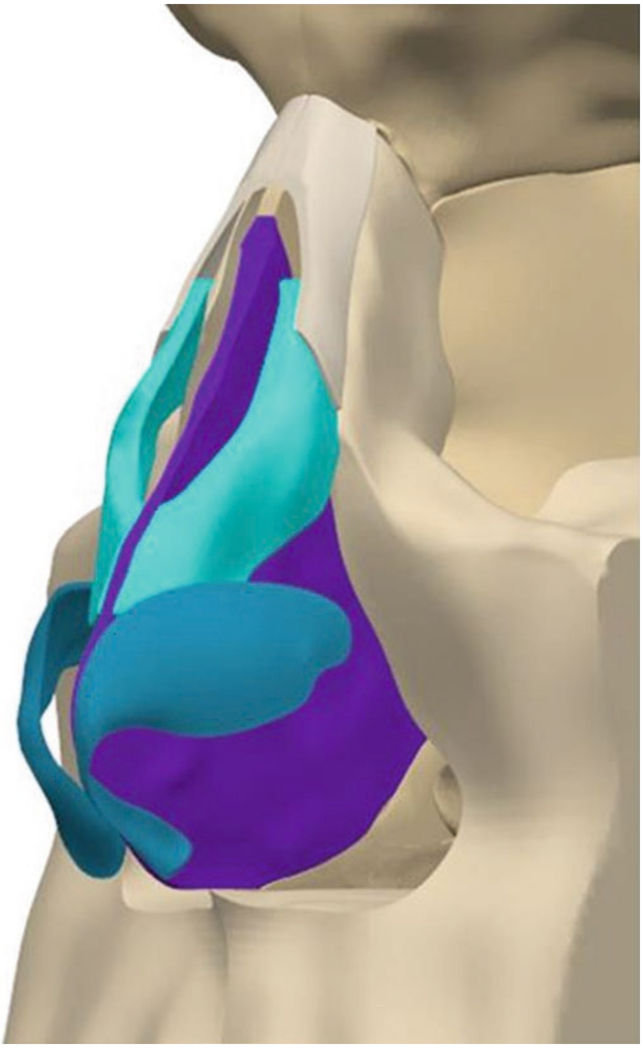


Fig. 15.2 Lowering the dorsum

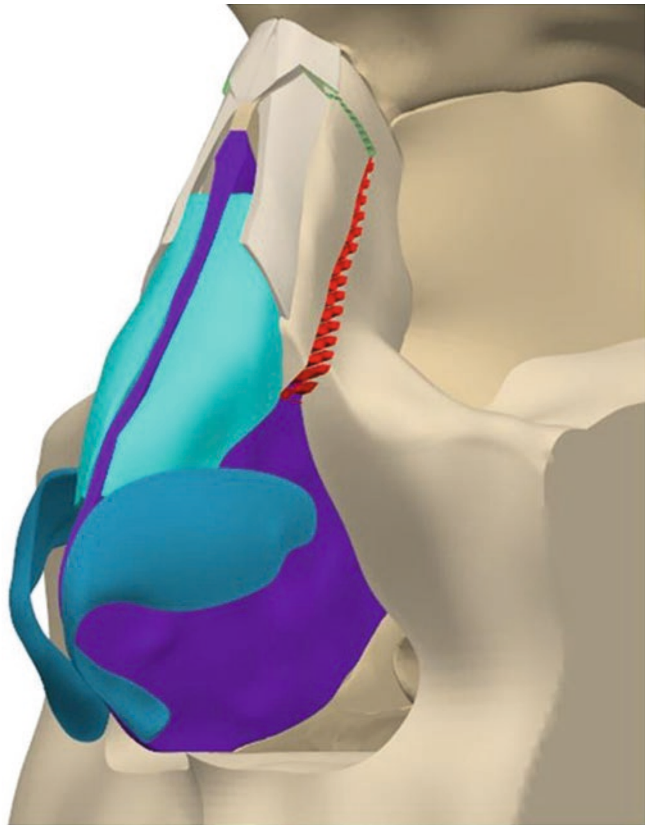


Fig. 15.3 Osteotomies: paramedian, low to low lateral, and transverse; spreader flaps

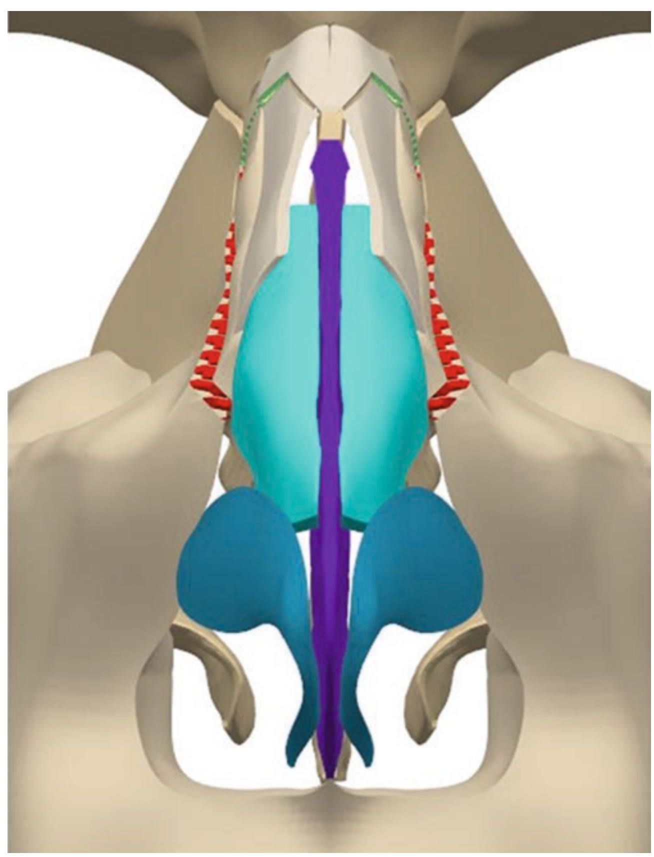


Fig. 15.4 Osteotomies: paramedian, low to low lateral, and transverse; spreader flaps

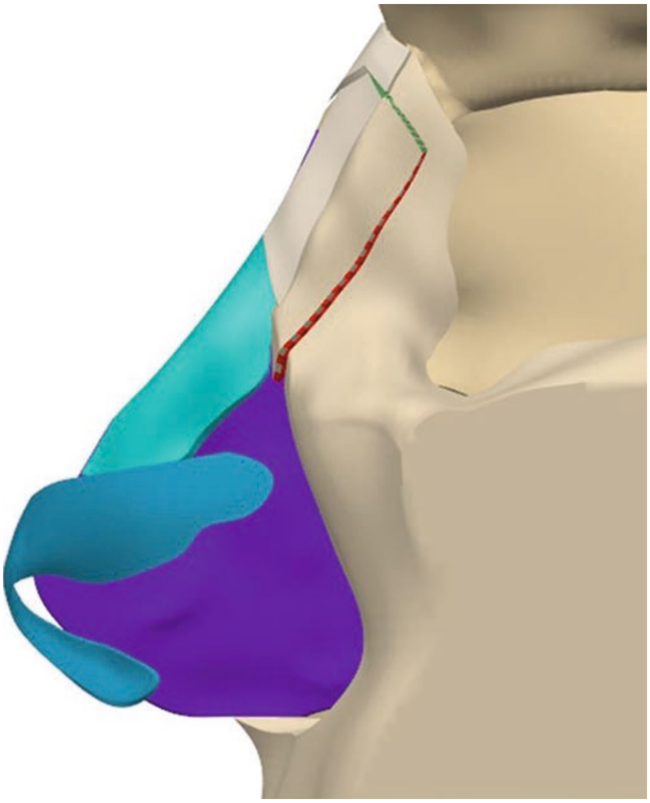


Fig. 15.5 Cephalic trim

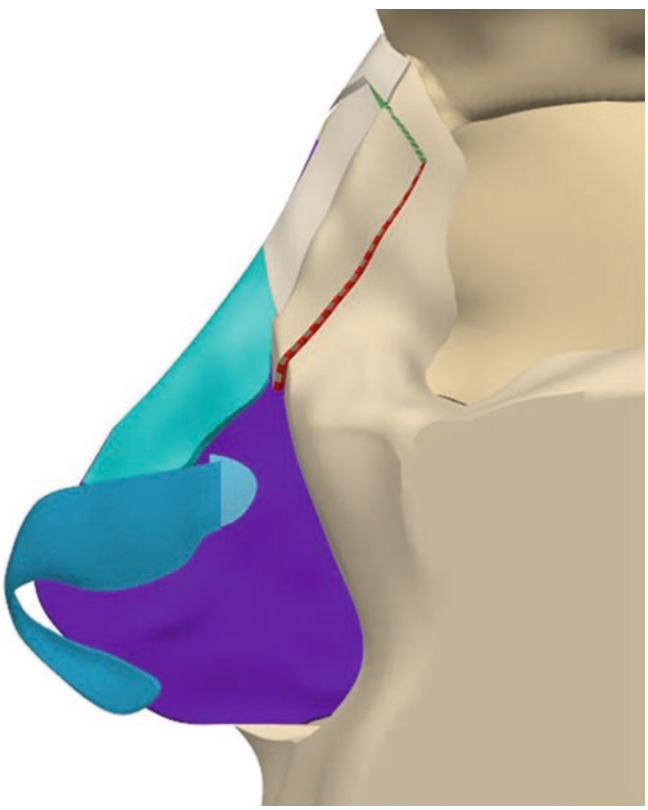


Fig. 15.6 Lateral sliding (lateral crural overlay)

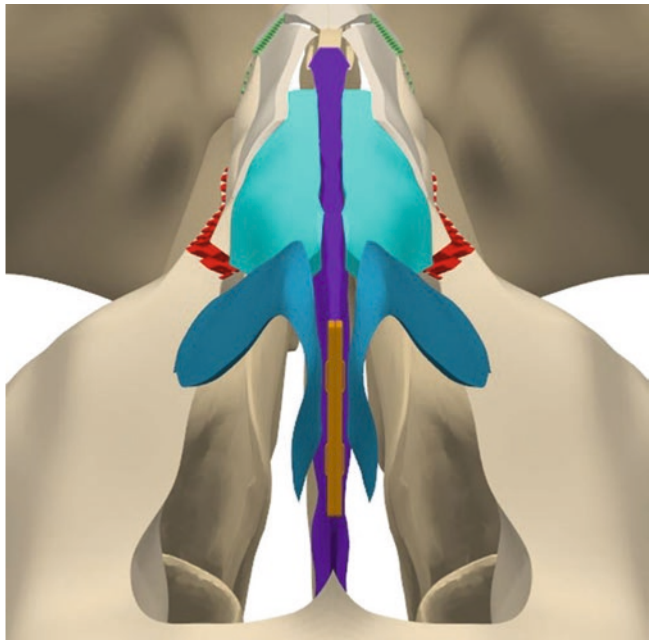


Fig. 15.7 Double-layered conchal graft working as columellar strut

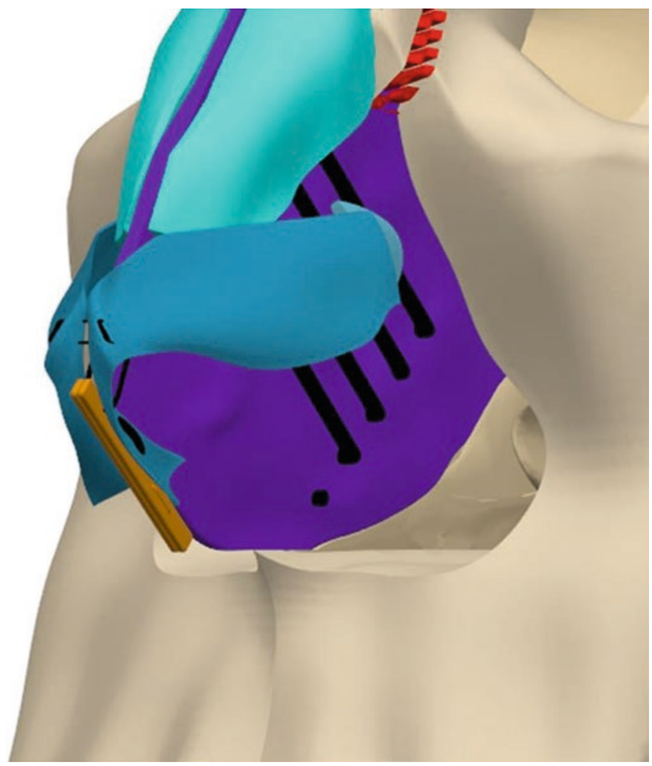


Fig. 15.8 Fixing the medial crura to the sandwich graft; transdomal sutures; tip suspension suture; transseptal mattress sutures = kilting sutures

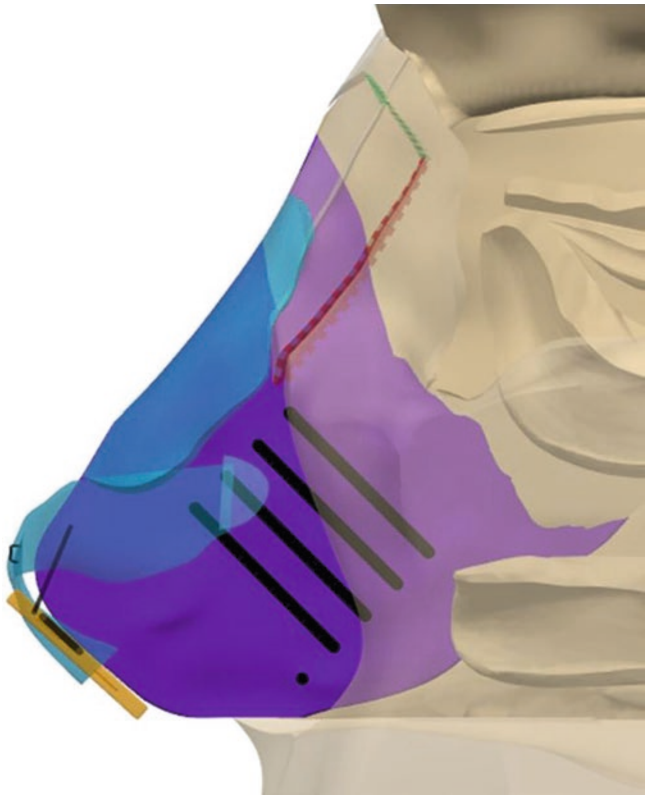


Fig. 15.9 Fixing the medial crura to the sandwich graft; transdomal sutures; tip suspension suture; transseptal mattress sutures = kilting sutures

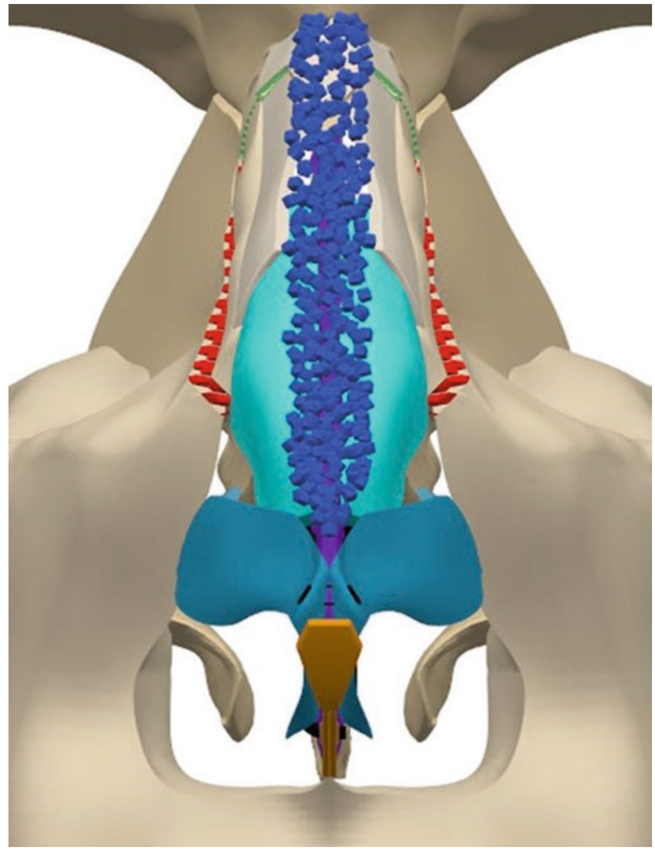


Fig. 15.10 Contouring the dorsum with free diced cartilage; extended shield graft

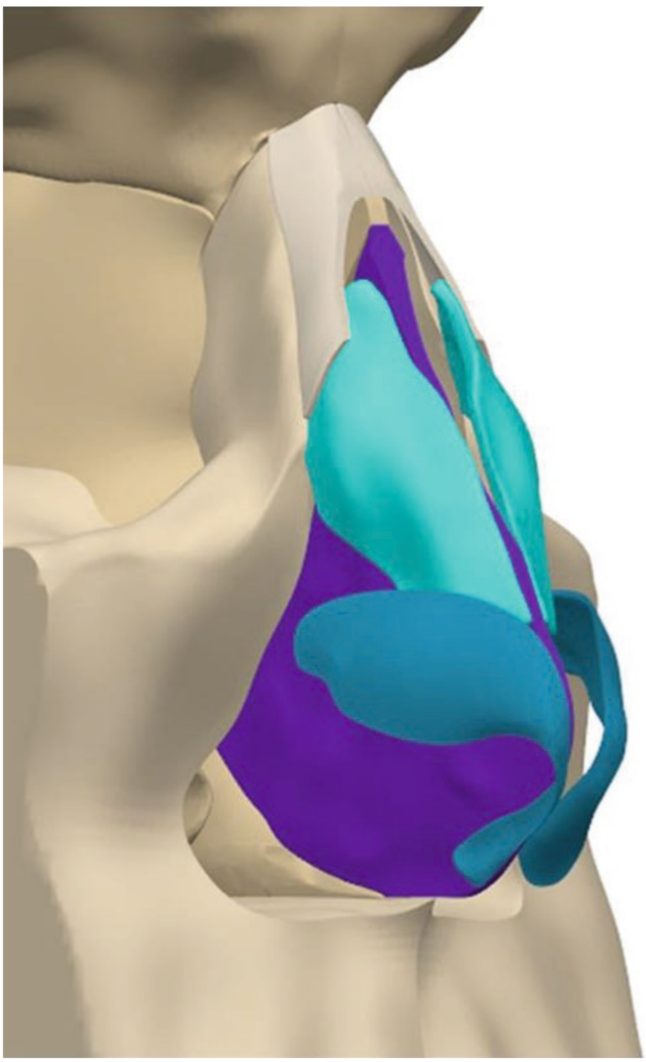
Fig. 15.11 Front view: Pre-op/post-op

Fig. 15.12 Lateral view: Pre-op/post-op

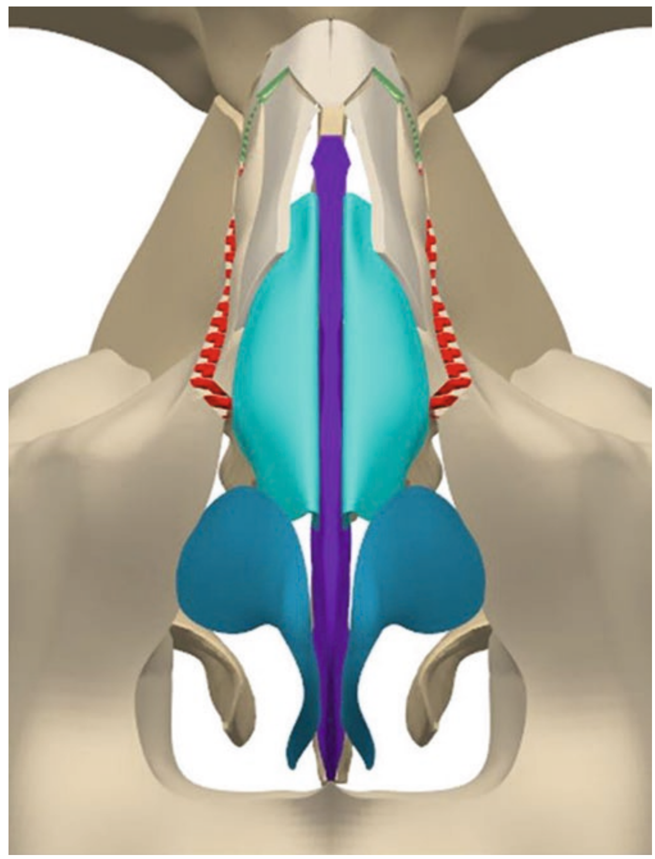
Fig. 15.13 Base view: Pre-op/post-op

15.2 Case 2: Overprojected, Hourglass-Shaped Narrow Dorsum

A 26-year-old patient presented with an overprojected hourglass-shaped narrow dorsum. In an open rhinoplasty approach, the dorsum was lowered with a component technique. After dissecting the extended parts of the ULCs from the undersurface of the bony pyramid, the septum was lowered with a straight scissors. The bony dorsum was then reduced with a chisel so that the excess could be removed in one piece. After transcutaneous low-to-low lateral and transverse osteotomies for narrowing the nasal bones, the leftover ULCs were invaginated and fixed as spreader flaps to the new dorsal septum. The weak lateral crura were strengthened by fold-under flap technique (slipping the cephalic portion under the lateral crus). After placing a columellar strut, the tip was contoured by transdomal sutures. For narrowing the tip, spanning sutures were applied, and the tip complex was fixed by tip suspension suture with a posterior sling to the dorsal septum. The depressor muscle was partially resected, a rim graft was placed on the left side for symmetry, and both soft triangles were augmented with allogenic fascia lata after using this kind of graft as a full-length graft for camouflaging the dorsum (◘ Figs. 15.14, 15.15, 15.16, 15.17, 15.18, 15.19, 15.20, and 15.21).



◘ **Fig. 15.14** Dorsal reduction



◘ **Fig. 15.15** Osteotomies: paramedian, low to low lateral, and transverse

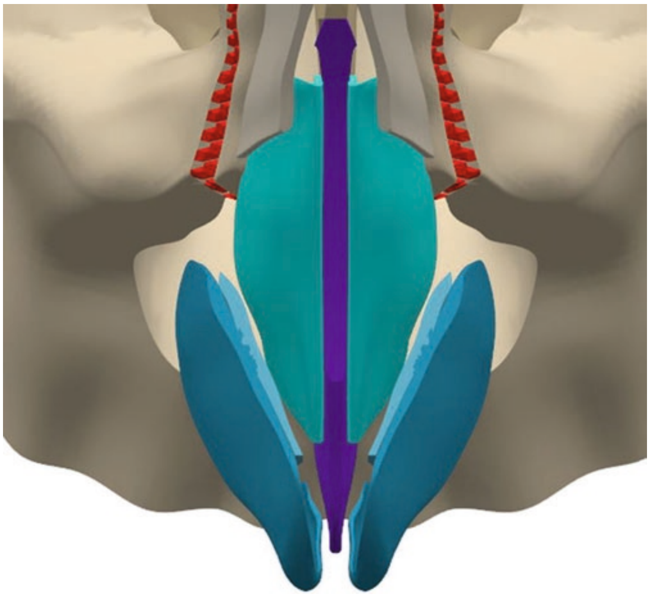


Fig. 15.16 Fold-under flaps (lateral crural underlay)

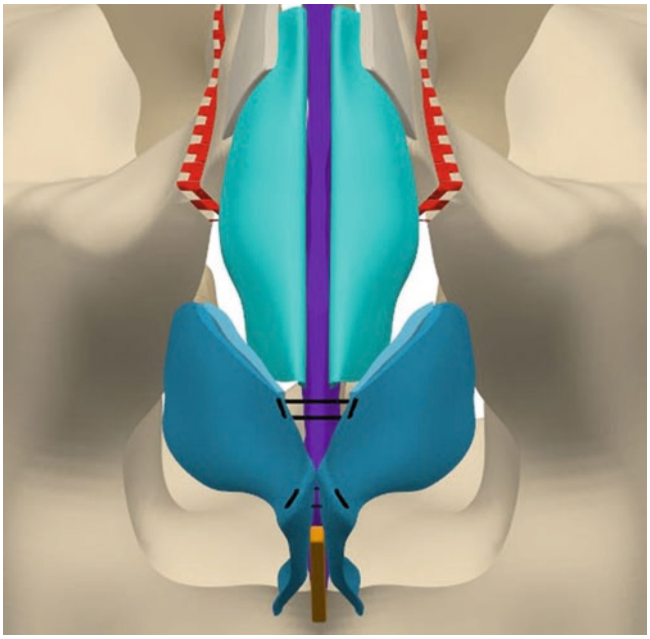


Fig. 15.17 Columellar strut; transdomal sutures, spanning sutures combined with tip suspension suture and posterior sling

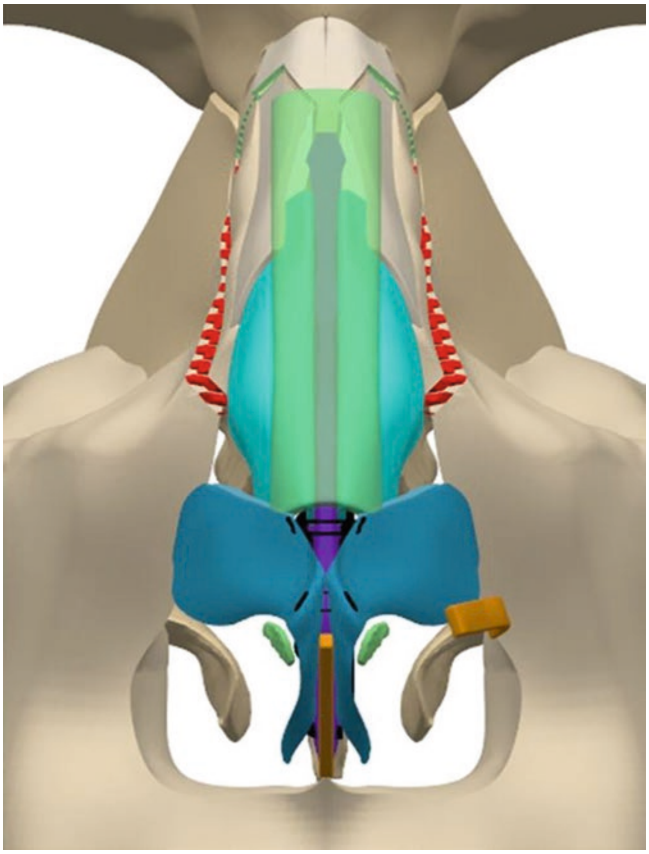


Fig. 15.18 Full-length graft from allogenic fascia lata to the dorsum; augmentation of both soft triangles with allogenic fascia; rim graft on the left side

■ **Fig. 15.19** Front view, profile view, base view. Pre-op/post-op

■ **Fig. 15.20** Front view, profile view, base view. Pre-op/post-op

Fig. 15.21 Front view, profile view, base view. Pre-op/post-op

15.3 Case 3: Primary Rhinoplasty in a Thin-Skinned Patient

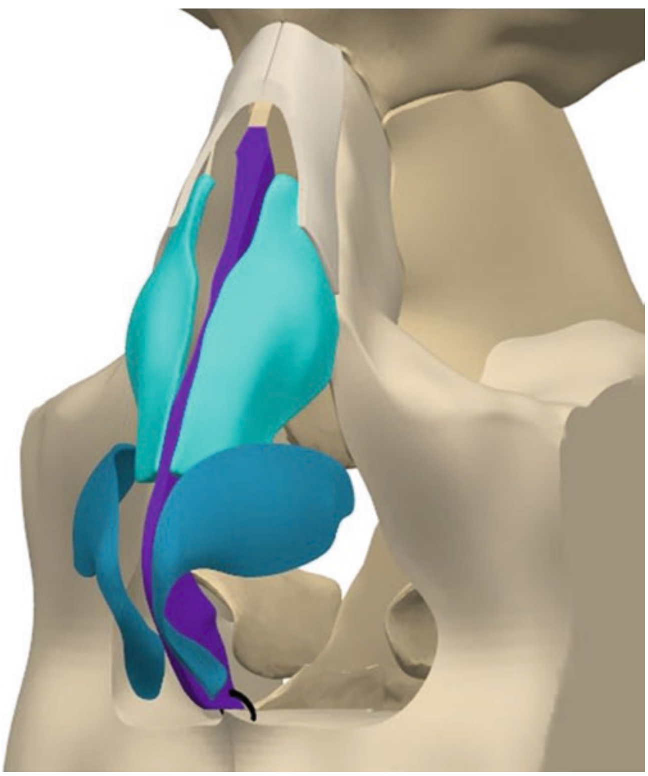
15.3.1 Technique: Camouflaging with Allogenic Fascia

In a thin-skinned patient, there is always the risk of visibility of grafts or even the exposure of minor irregularities. In such patients we shape the necessary grafts from fascia lata and handle them like cartilage grafts.

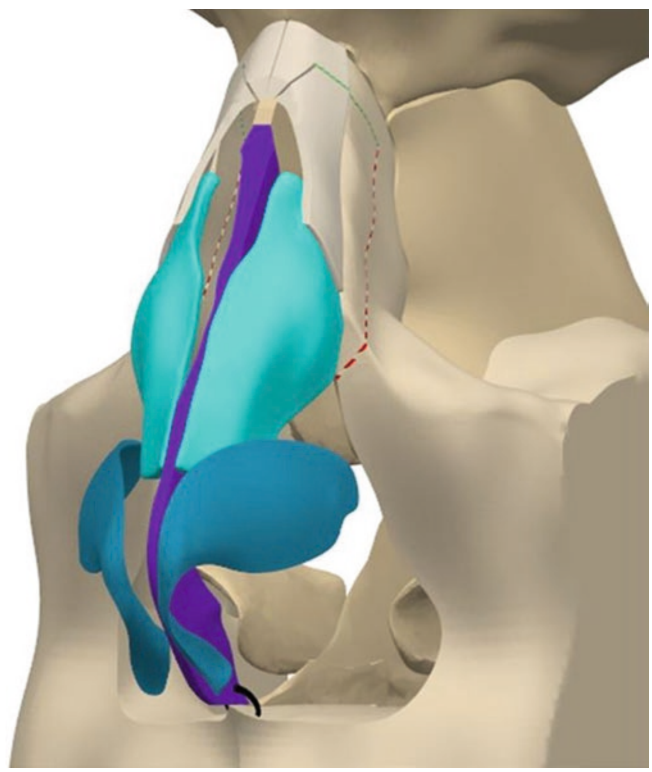
A 16-year-old female patient presented for rhinoplasty because of continuous criticism at her school.

The dorsum was broad and overprojected, the tip was bulbous, but the skin was very thin and shiny. The nasolabial angle was about 135°, but the patient did not complain about that. The septum was deviated to the left with an extended spur.

During open approach rhinoplasty, the spur was resected, and the septum was trimmed at the base so that it could be fixed to the perforated nasal spine. The dorsum was reduced by component technique, and the exceeding ULCs were invaginated and used as spreader grafts after narrowing the nasal bones with paramedian, transcutaneous low-to-low lateral, and transverse osteotomies. Transdomal and spanning sutures were used for narrowing the tip after the medial crura were sutured directly to the caudal septal border (tongue-in-groove technique). Because of the patient's thin skin, the whole dorsum was covered with one layer of allogenic fascia, and a cartilaginous shield graft was removed again and was replaced by a double-layered fascia graft from allogenic fascia lata, cut in the shape of a shield graft (▫ -Figs. 15.22, 15.23, 15.24, 15.25, 15.26, 15.27, 15.28, 15.29, 15.30, and 15.31).



▫ **Fig. 15.22** Dorsal reduction; fixation of the anterior septum to the ANS via a drill hole



▫ **Fig. 15.23** Osteotomies: parasagittal, low to low lateral, and transverse

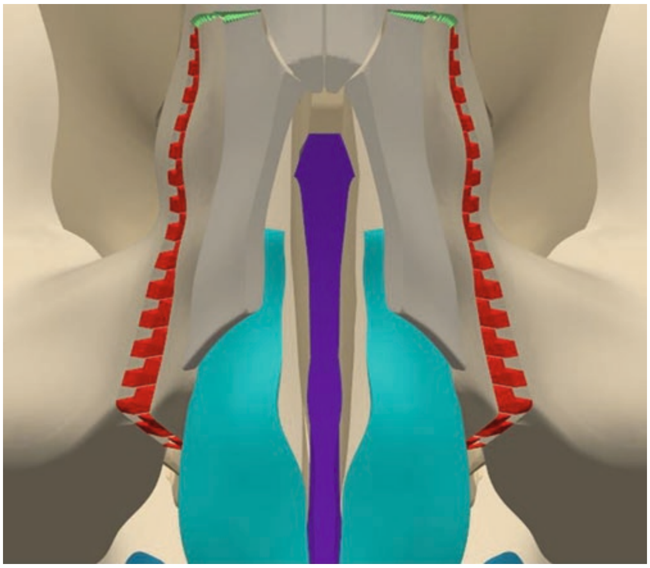


Fig. 15.24 Osteotomies: parasagittal, low to low lateral, and transverse

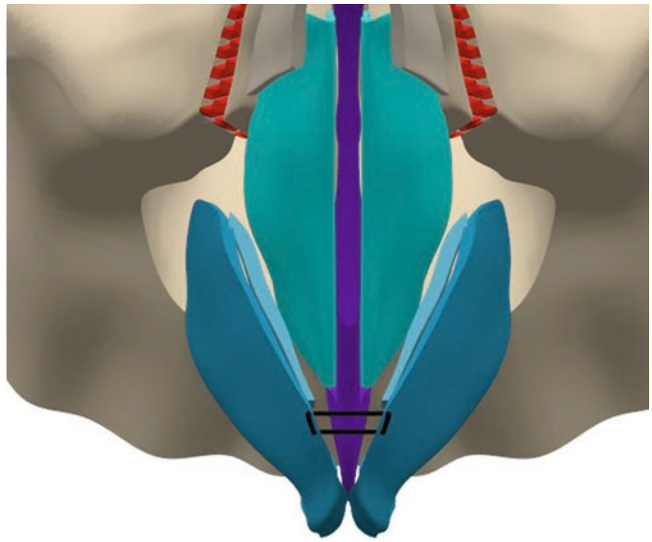


Fig. 15.26 Fold-under flaps (lateral crural underlay); spanning sutures

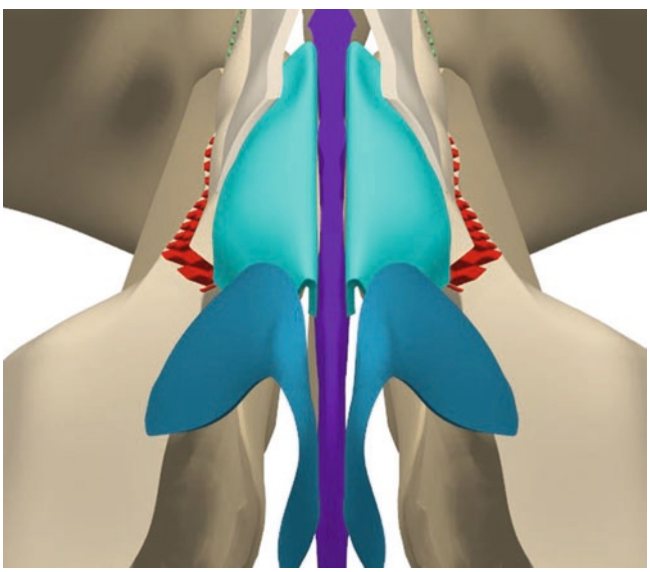


Fig. 15.25 Spreader flaps

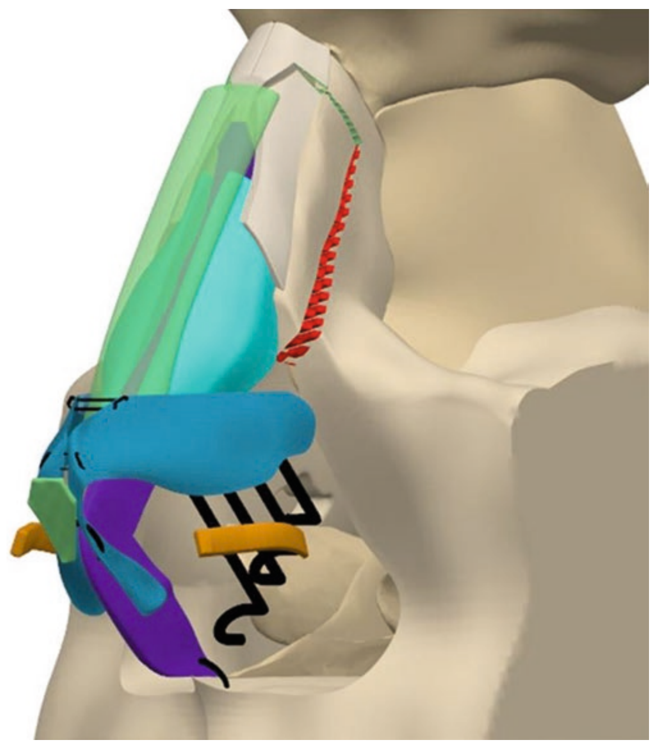


Fig. 15.27 Transdomal sutures; tongue-in-groove technique (fixation of the medial crura to the anterior septum; shield graft from allogenic fascia lata; full-length graft from allogenic fascia lata to the dorsum; rim grafts both sides; transseptal mattress sutures

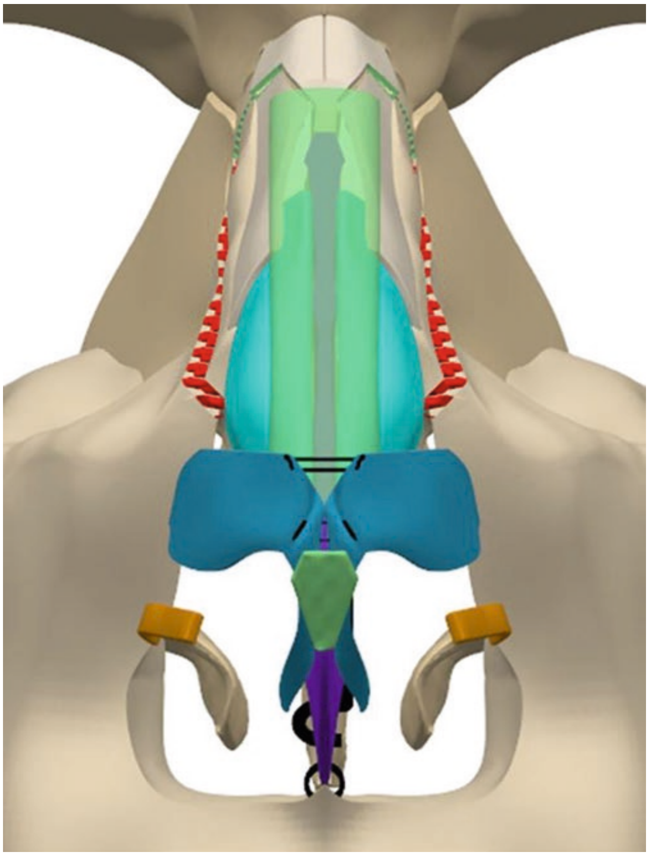


Fig. 15.28 Transdomal sutures; tongue-in-groove technique (fixation of the medial crura to the anterior septum; shield graft from allogenic fascia lata; full-length graft from allogenic fascia lata to the dorsum; rim grafts both sides; transseptal mattress sutures

Fig. 15.29 Front view, profile view, base view. Pre-op/post-op

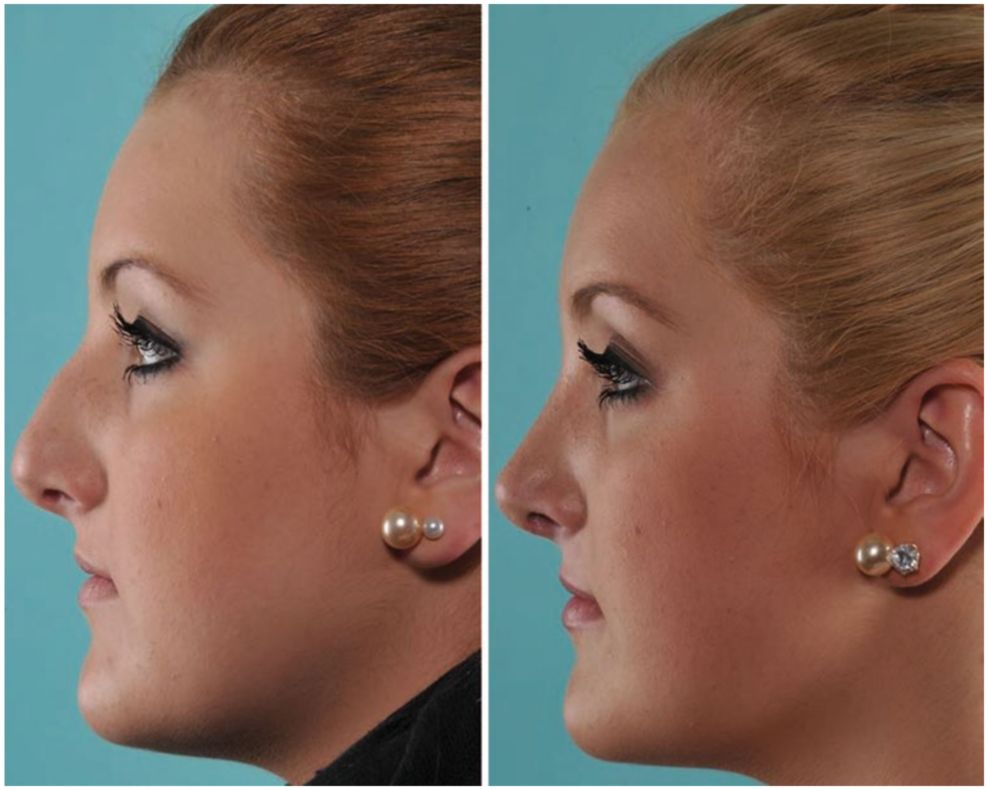


Fig. 15.30 Front view, profile view, base view. Pre-op/post-op

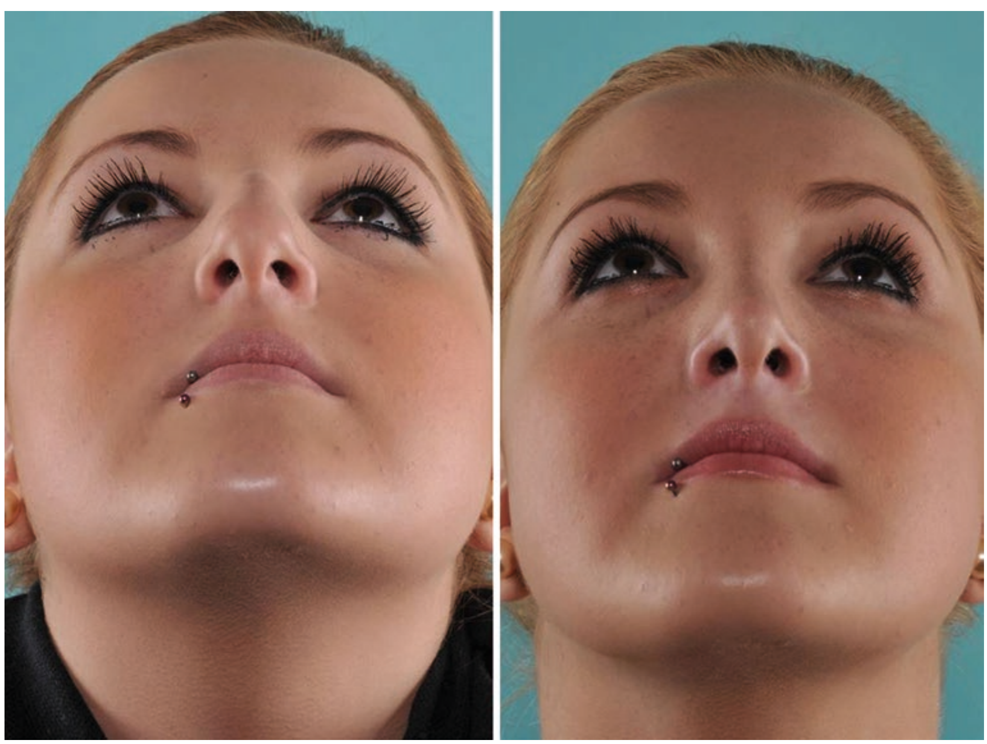
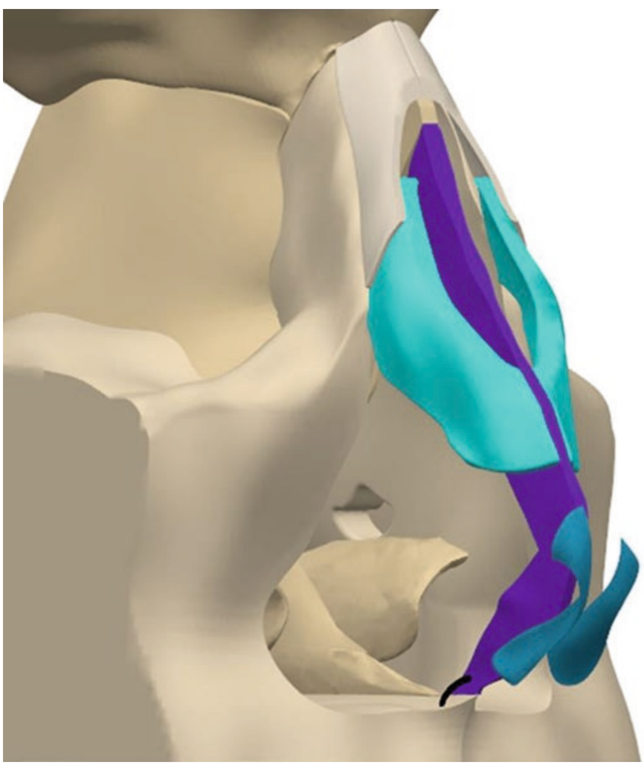


Fig. 15.31 Front view, profile view, base view. Pre-op/post-op

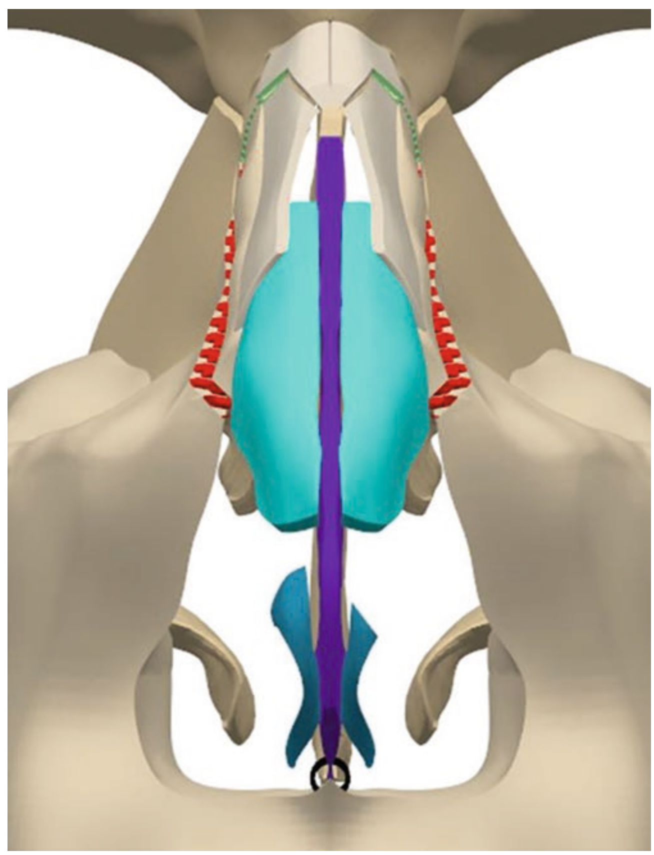
15.4 Case 4: Secondary Rhinoplasty After Overresection of the Dorsum and the LLCs

A 35-year-old female presented after previous rhinoplasty saddle-nose deformity with round uncontoured tip and obtuse nasolabial angle. Endonasal view showed septal spur to the right with large synechia. Using an open approach technique, surgical examination revealed extensive overresection of the LLC: on the right side, the lateral crus was missing, and on the left, the lateral and intermedial crura had been resected. There was no strut, but a lot of scars, which obviously had pulled up the tip.

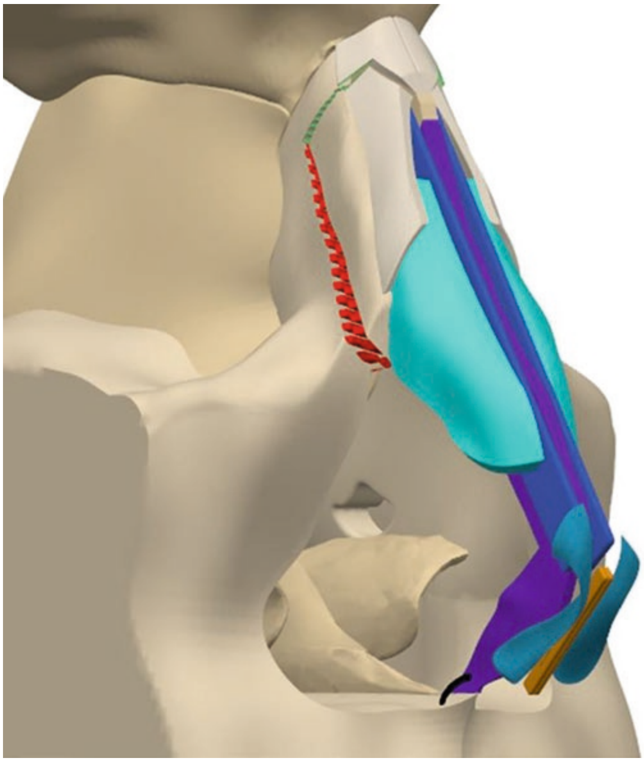
After scar removal, a large piece of cartilage was harvested from the septum, preserving a firm 15-mm-wide cartilaginous L-strut. The spur was removed by shortening the overlong septum at its base and fixing it to the ANS after making a drill hole. The synechia was cut. After parasagittal medial and percutaneous low-to-low lateral and transverse osteotomies, narrowing of the bony pyramid became possible. For lengthening the nose, the right concha was harvested and a double-layered sandwich graft fabricated, which was kept in a more caudal position by two extended spreader grafts from the septum. Two strips from the harvested septum were used for reconstruction of the LLC. The grafts were carefully beveled and then fixed to the remnant medial crura. After bending them, they were fixed directly to the vestibular skin. The whole framework was then contoured by spanning sutures after shaping the domes with transdomal sutures. To secure the position of the reconstructed framework, the medial crura including the overlying septal grafts were fixed to the septal extension graft from the double-layered concha. Additionally, tip suspension suture with posterior sling was placed. The residual concha was diced finely, and, together with allogenic fascia, a DC-F was built and placed to the dorsum. To prevent synechiae, new silicon sheets were placed (◘ Figs. 15.32, 15.33, 15.34, 15.35, 15.36, 15.37, 15.38, 15.39, 15.40, and 15.41).



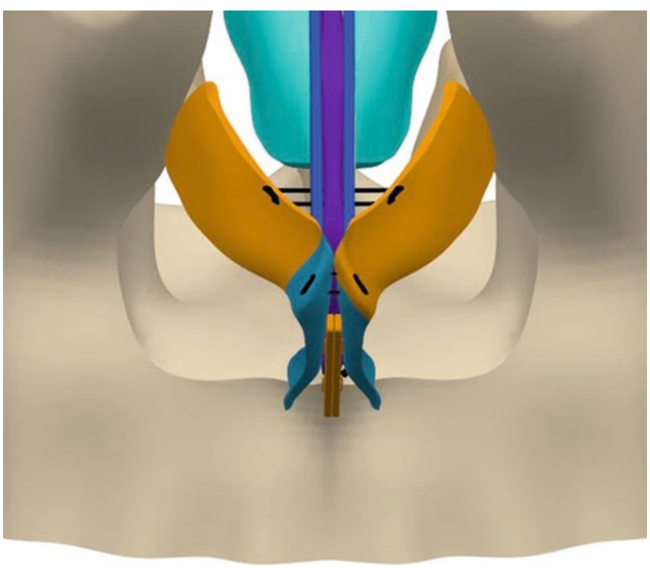
◘ **Fig. 15.32** Harvesting cartilage graft from the septum, leaving 15-mm L-strut; fixing the L-strut to the ANS via a drill hole



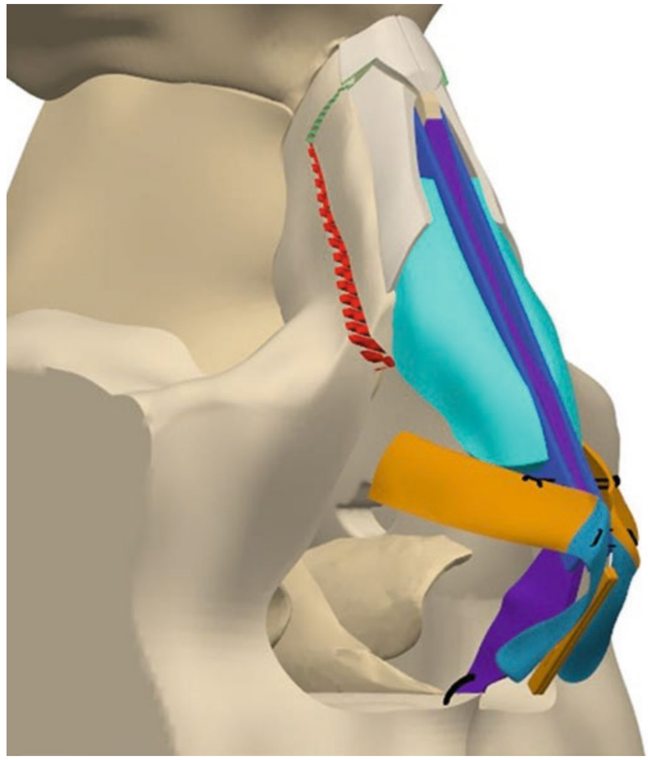
◘ **Fig. 15.33** Osteotomies: parasagittal, low to low lateral, and transverse; narrowing of the bony pyramid



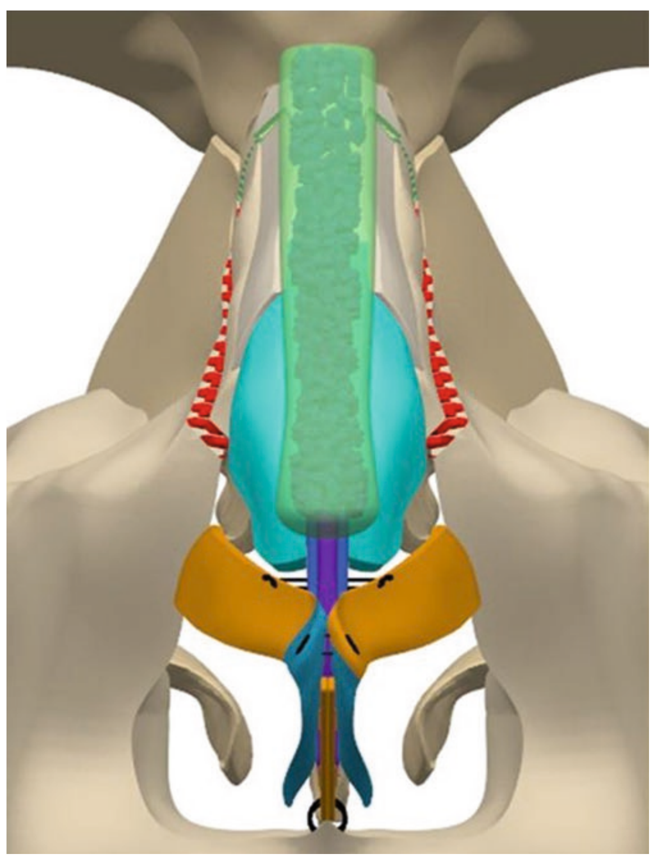
■ **Fig. 15.34** Double-layered conchal graft, working as septal extension graft; extended spreader grafts



■ **Fig. 15.35** Replacing the missing parts of the LLCs with cartilage grafts from the septum; transdomal sutures, spanning sutures combined with tip suspension suture and posterior sling



■ **Fig. 15.36** Replacing the missing parts of the LLCs with cartilage grafts from the septum; transdomal sutures, spanning sutures combined with tip suspension suture and posterior sling



■ **Fig. 15.37** DC-F to the dorsum

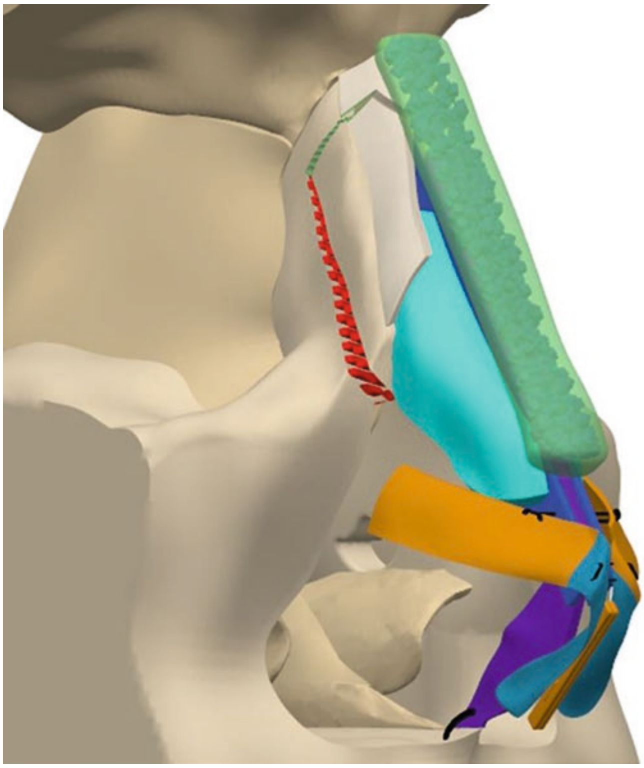


Fig. 15.38 DC-F to the dorsum

Fig. 15.39 Front view, profile view, base view. Pre-op/post-op

Fig. 15.40 Front view, profile view, base view. Pre-op/post-op

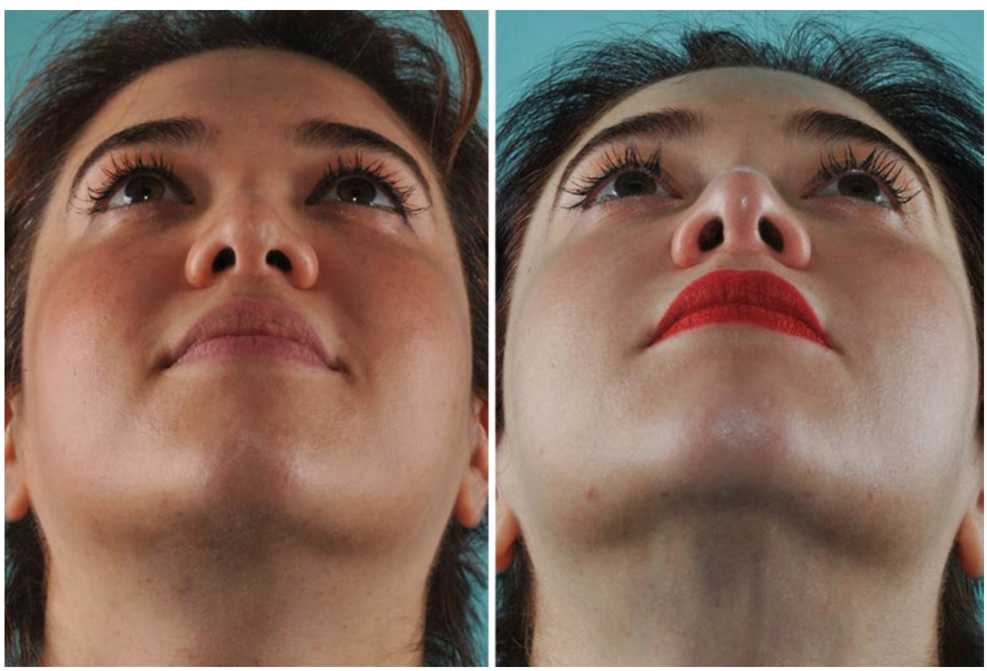


Fig. 15.41 Front view, profile view, base view. Pre-op/post-op

Suggested Reading

Aiach G. Atlas de Rhinoplastie et de la Voie d'Abord Externe. Paris: Editions Masson; 1993.

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