Novel Techniques in Rhinoplasty

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20.1 Novel Techniques in Nasal Tip Surgery

Nasal tip surgery has been known as a complicated phase of any rhinoplasty operation due to the intricate anatomical structures of the nose tip, the medial and lateral lower cartilage elements arrangement, and variable skin thickness. Correcting malformation and contouring of the nose tip have been regarded as a modern technique in advanced rhinoplasty. Various versatile alar cartilage correcting methods are available to reposition, reshape, and reconstruct the nose tip. In this section, several novel techniques in nasal tip surgery are presented [1].

20.1.1 Three-Dimensional Cartilage Graft Technique

The basic surgical aim is to provide an approved esthetic contour as well as a practical external nasal valve in the nasal tip. Grafts have some disadvantages such as mobilization, displacement, warping, resorption, irregularities, and very rarely infection. Using sutures without grafts also has some disadvantages such as tearing, asymmetry, and distortion in the sutured structures. To address these problems, a different cartilage-grafting model called "three-dimensional pyramid cartilage technique" has recently been presented [1].

20.1.1.1 Surgical Technique

Schematic and illustrative operation details are given in Fig. 20.1. After the adequate septal cartilage tissue is removed, cartilage molding and shaping should be performed. The three-dimensional pyramid cartilage graft is prepared, and the new graft is sutured to the nasal tip with the 4/0 Polydioxanone sutures (Fig. 20.1f, g) [1].

20.1.1.2 Advantages of the Technique

- Graft structure is more sustainable than the other septal cartilage grafts because it is harvested from the bone and cartilage junction.
- Shape of the pyramidal graft is more suitable for the nose tip anatomy.
- Nasal tip contour may be more esthetically pleasing because of the shape of graft.
- The three-dimensional pyramidal graft model may be used in patients with both thin and thick nasal tip skin.

20.1.2 Lateral Crural Suspension Flap Technique

The nose tip position is associated with different interrelated factors. Nasolabial angle is used for assessing nose tip rotation. Nasolabial angle has shown to be improved by different techniques, like different suturing approaches, varied cartilage grafts, and nasal cartilage modification. Such methods are linked to some restrictions to modify and stabilize nose tip rotation [2].

Regarding lateral crural suspension flapping, the cephalic sections of the lower lateral cartilages (LLCs),

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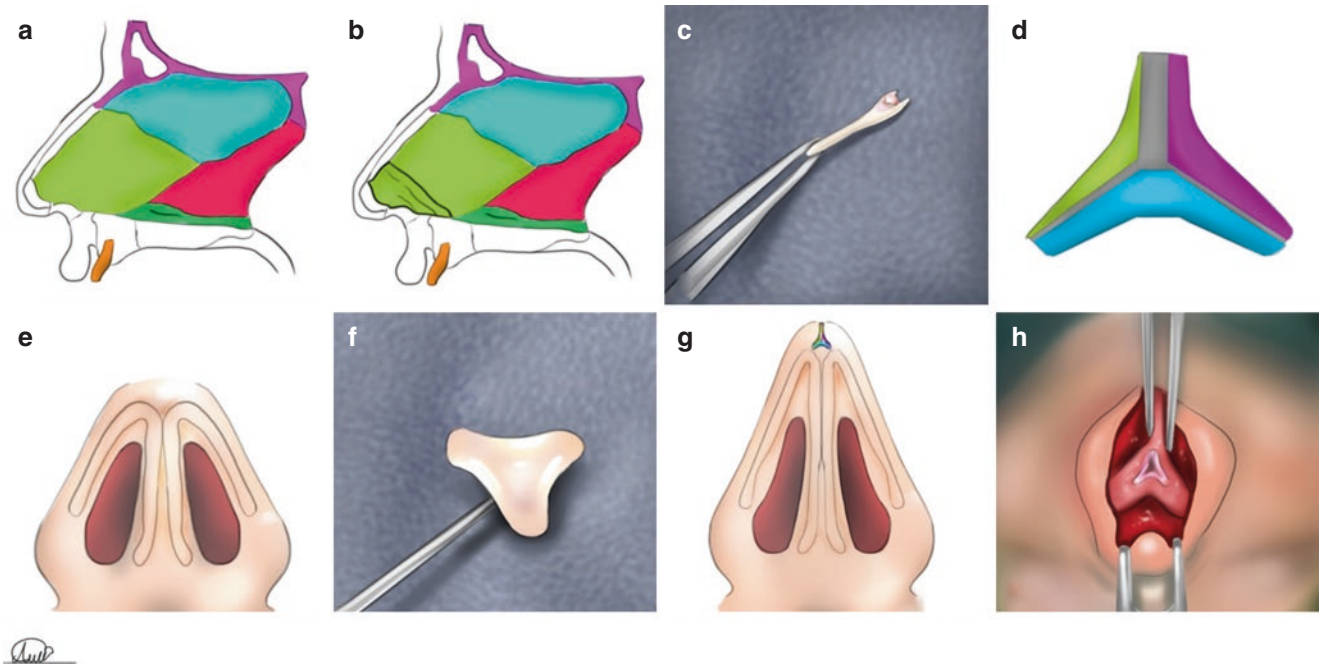

Fig. 20.1 (**a**) Nasal septum. (**b**) Resection and graft harvesting area. (**c**) Septal cartilage graft. (**d**) 3D pyramidal graft. (**e**) Droopy nasal tip. (**f**) The final shape of 3D pyramidal graft. (**g**) Augmentation of the nasal tip using 3D pyramidal graft. (**h**) Positioning and suturing of 3D pyramidal graft (Drawing by A. Babaei, 2021, reproduced with permission)

commonly resected in rhinoplasty operations, are divided into two flaps followed by suturing to the nasal septum. LLC's integrity in dome can produce a firm anchor for the new position of tip. It can be employed as an adjunctive technique or alone as other method in some rhinoplasty surgeries [2].

20.1.2.1 Surgical Methods

It is more appropriate following completion of dorsal operation and through tip plasty. A strip of 6 mm of the lateral crura in cephalic position is considered at the broadest spot of the lateral crura for simplifying the inserting sutures that are suitable aid for the rim. The line is tapered for preserving the original thickness of the dome, whereas it laterally passes the caudal line of the lateral crura. The cartilage is then cut using a #15 blade through the considered line from the medial toward the lateral direction; but, at least 3 mm of cartilage should not be shorten from the medial direction for preserving the cephalic sections' link to the lateral crura. The lateral crura in cephalic border are dissected as a flap from the lateral toward the medial direction (Fig. 20.2). The procedure is repeated again for the other side, and these flaps are applied for moving the nose tip. Each of them is located through the lateral area of the nasal septum. Following stabilizing tip in appropriate location, both flaps are sutured to the nasal septum (Fig. 20.3) [2].

20.1.2.2 Restrictions

The main limitations of this technique are as follows:

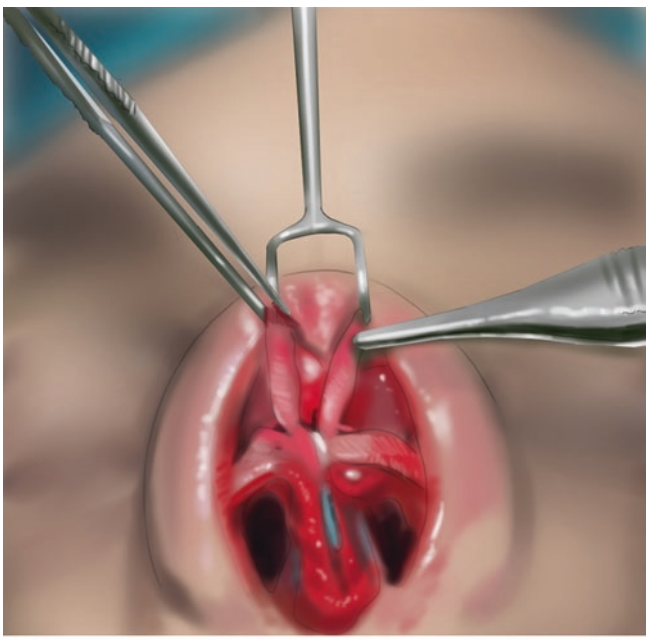

Fig. 20.2 The medial sides of the cartilages are still attached (Drawing by A. Babaei, 2021, reproduced with permission)

- Necessity of the wide lateral crural cartilage and the remarkable levels of cephalic resection from the lateral crural cartilages for using as a flap.
- In several secondary rhinoplasty surgeries and in some primary cases, such needs may not exist [2].

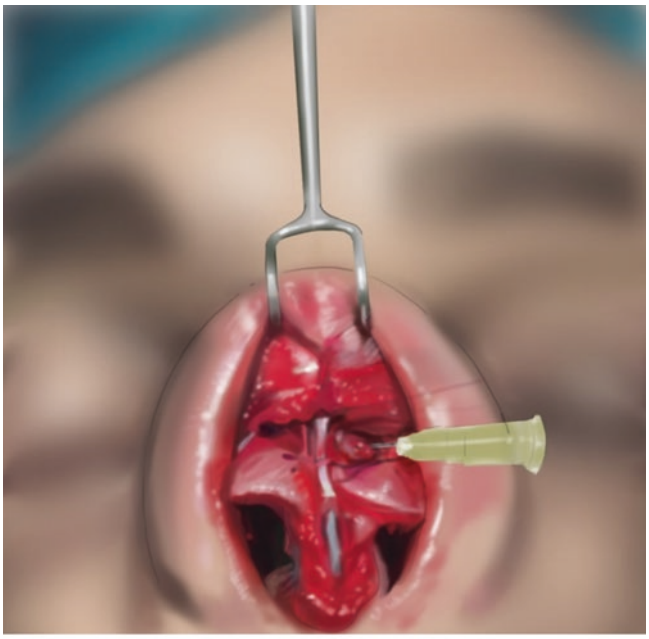

Fig. 20.3 After properly positioning the tip, suturing of flaps is done to the nasal septum (Drawing by A. Babaei, 2021, reproduced with permission)

20.1.3 Lateral Crural Transposition Flap Technique (LLC)

The LLC transposition flap, according to the posterior pedicle, has been known as a valuable method for overcoming the usual LLC abnormalities and is used in the rhinoplasty surgeons' armamentarium. It has widely modified via altering the LLC turnover flap considering an intact anterior perichondrium to an LLC transposition flap using a lasting posterior pedicle entered into the posteromedial aspect of the remnant of the LLC. Due to the preservation of posterior pedicle as expected, rapid healing and integrity can be achieved. The LLC turnover flap modifying is stable when the flap is inset in the more favorable location. The flap intrinsic vascularity can be reserved, and harvesting cartilage from another cartilage donor area is not needed [3].

20.1.3.1 Surgical Technique

The vestibular skin deep into the domes as well as lateral crura is infiltrated and hydrodissected by the local anesthetic; therefore, the cartilage is dissectible from its vestibular edge. The incision starts at the medial edge of the cephalic lateral crus border passing through the posterior site, to keep the alar cartilage integrity from the medial crus foot to the posterior edge of the lateral crus next to the piriform aperture (PA). By gradual dissection toward the posterior, the lateral crus cephalic segment is free to move further. Subperichondrial pockets are formed between the remaining medial aspect of rim strip and the vestibular skin, and the cartilage cephalic segment is entered in the pockets according to the posterior pedicle fixed by absorbable sutures in the favorable location (Fig. 20.4) [3].

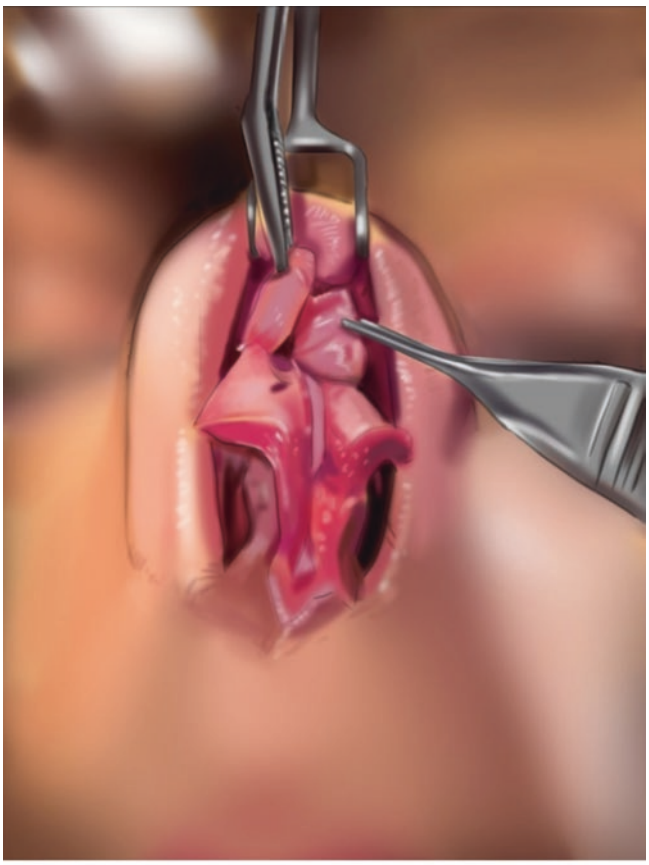

Fig. 20.4 The dissected lateral crura cephalic segment is transposable according to the posterior pedicles (Drawing by A. Babaei, 2021, reproduced with permission)

20.1.4 The Sandwiched Lateral Crural Reinforcement Graft

The sandwiched lateral crural reinforcement (SLCR) graft method uses the cephalic resection technique for achieving lateral crural amplification. The lateral crus dissected cephalic segment is relocated below the lateral crus, leading to a graft to provide a subperichondrial anatomic pocket to the strut graft. The lateral crural strut is then located linearly in the pocket. Accordingly, repositioning below the cephalic segment and locating a lateral crural strut graft, which are beneficial, can be achieved once. Thin lateral crural strut grafts inhibit further tissue bulk, which can stop the airway or be touchable to the case [4].

20.1.4.1 Surgical Technique

Bilateral dissection of LLCs is done and the cephalic excess of lateral crura is calculated, which then cut, and it is essential to keep the below mucosa's integrity. Thin lateral crura strut grafts are accurately provided from the septal cartilage (18 mm in length, 2 mm in width). The cephalic segment related to the remained caudal lateral crus's underlying mucosa is dissected equally toward the dissected lateral crus cephalic segment, which makes the incised cephalic portion easy to slide below the lateral crus. The dissected part is needed to extend toward the pyriform aperture between the lateral crus and underlying mucosa, creating a pocket for the lateral crural strut graft. The dissected cephalic portion is now located under the caudal lateral crus within the dissected region, and the lateral crural strut graft is located among the two cartilages. The cephalic borders of the superior as well as inferior lateral crura portions are then sutured using a 5-0 Vicryl suture by the crural strut graft put linearly among the cartilages. The strut graft suture into the cartilages is not essential, because in this method SLCR graft is kept in the provided pocket (Fig. 20.5) [4].

20.1.4.2 Advantages of the Technique

The SLCR graft method: [4]

- Provides an instrument to reinforce lateral crura among cases suffering from cartilage weakness/deficiency
- Empowers the lateral crura via reinforcement of the external valve
- Opens the internal nasal valve area without discarding the lateral crura's cephalic portion
- Increases the healing process because of the pocket anatomy
- Helps to make sure about a long-term, constant outcome after surgery

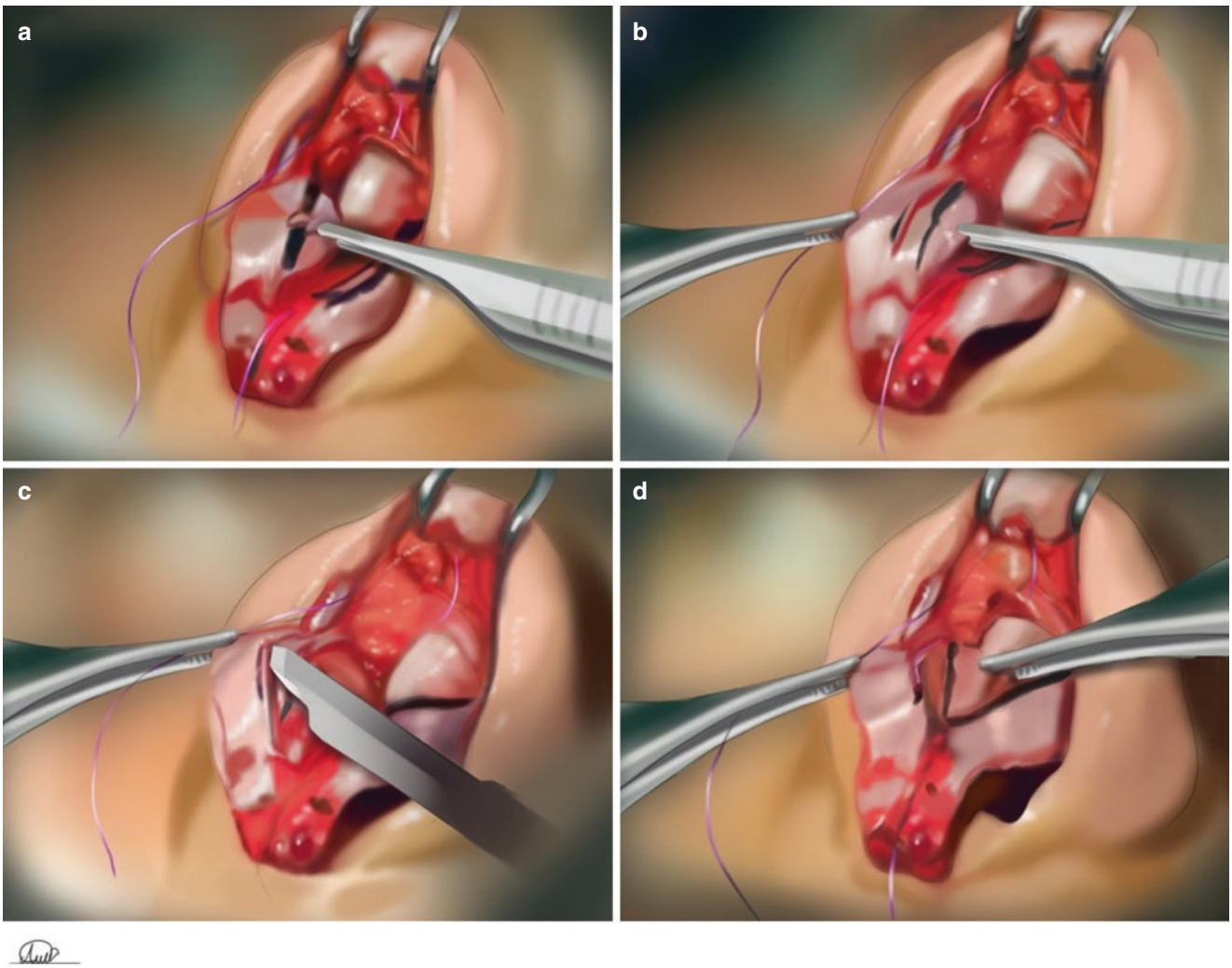

Fig. 20.5 (**a**, **b**) Incision of the lateral crus cephalic excess is done, whereas the below mucosa is preserved intact. (**c**) Equal incision of the mucosa is performed toward the incised lateral crus cephalic segment. (**d**) The sandwiched lateral crural reinforcement (it is not available in the figure) is located into the pocket among the two cartilages (Drawing by A. Babaei, 2021, reproduced with permission)

20.1.4.3 Restrictions

SLCR method is time-consuming and unpleasant to most of the surgeons. SLCR is associated with considerable challenges for surgeons regarding the secondary patients, since they may not have proper crural strut graft material and/or lateral crural cephalic excess [4].

20.1.5 Transcutaneous Alar Rim Graft (TARG)

Alar rim graft has been known as a cartilage graft inserted through a pocket in the alar rim. Preventing and correcting alar concavity is generally managed by the placement of an alar rim graft, a technique described by Troell RJ in 2000. The transcutaneous alar rim graft (TARG) technique is a simple and effective method for alar rim graft which can help surgeons achieve more precise placemen of the graft [5, 6].

20.1.5.1 Surgical Technique

At first, alar base resection is completed. Thereafter, before suturing the alar base, a pocket is created through the alar fibrofatty tissue which crosses the alar up to near the dome, and a cartilage graft is inserted into the tunnel (Fig. 20.6). Cartilages from the nasal septum or concha cavum are good options for rim grafting as they have high resilience potency. This technique could be done in three effective types: short, normal, and extended alar rim grafts (Figs. 20.7 and 20.8) [6].

20.1.5.2 Advantages

TARG technique [6]:

- Could be done through an alar base incision, eliminating the need for any additional incision
- Is directly placed in the alar rim
- Is quick and simple
- Adds a stable base, increasing the strength of the graft

20.1.6 Vertical Alar Folding Technique

The vertical alar folding (VAF) method is an alar plasty method associated with favorable outcomes. It can be applied in different tip plasty techniques and leads to a practical structure for esthetic appearance of the lateral crura and also

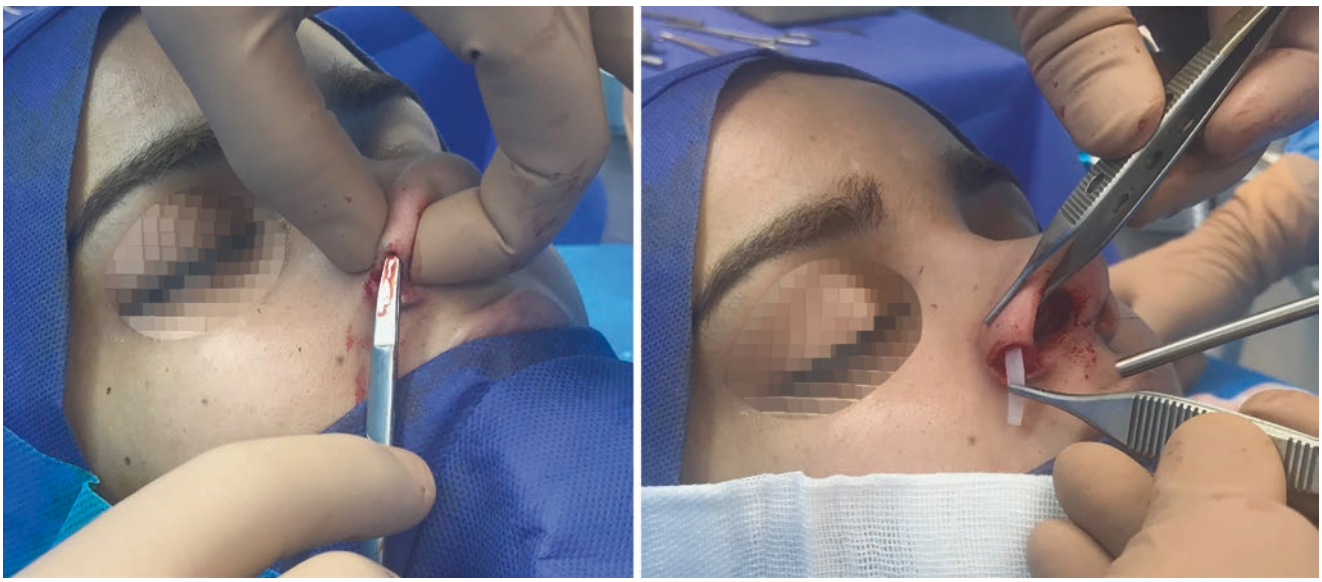

Fig. 20.6 Intraoperative view of inserting TARG

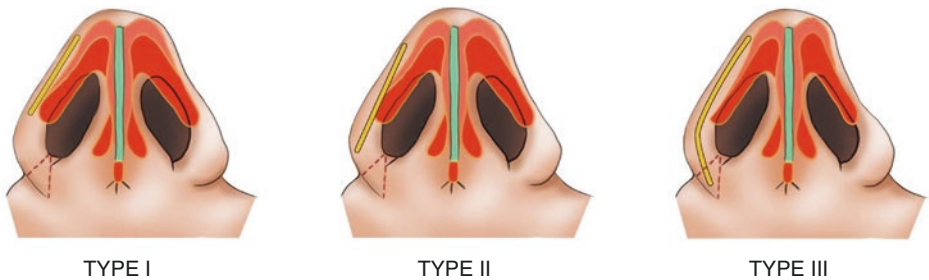

Fig. 20.7 Transcutaneous alar rim graft type I (short), II (normal), and III (extended) (Drawing by A. Babaei, 2021, reproduced with permission)

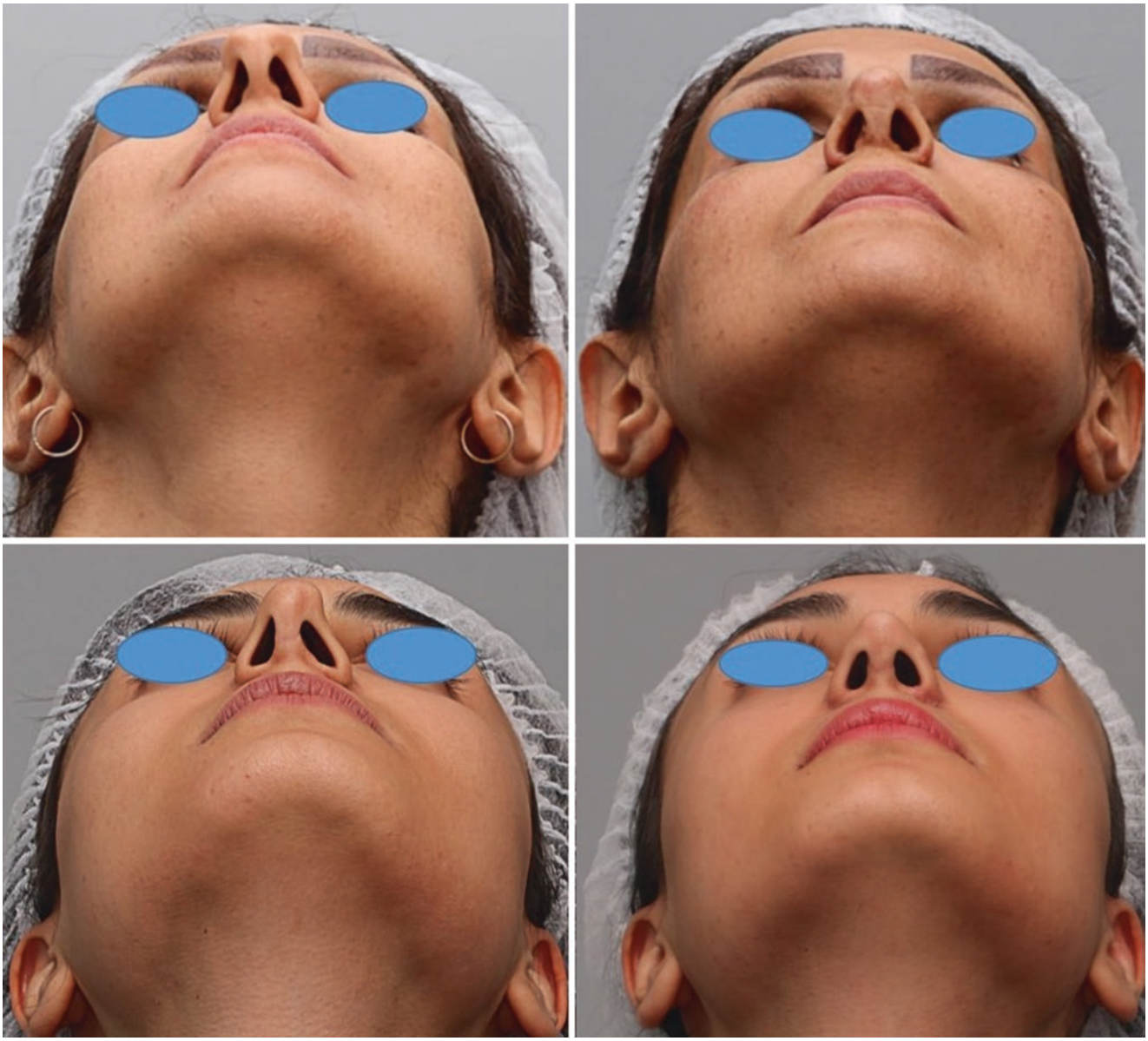

Fig. 20.8 Before and after TARG type III

is helpful for flexibility, symmetry, and refinement of the nose tip, managing its rotation and projection. Furthermore, VAF is a better option than dome division and vertical alar resection (VAR) in other patients. It also makes a potent external valve that prevents from collapse. Moreover, VAF is multipurpose and is also usable alone or in combination with other techniques [7].

20.1.6.1 Surgical Technique

Figure 20.9 shows VAF method. The surgery is done under general anesthesia. Following the cephalic resection of the LLC, using the pen, we can mark the present dome points followed by performing a vertical dome division (VDV) with cutting the caudal terminal of the lateral crus using scalpel blade (no. 15). The incision track is calculated; therefore, a proper upward rotating is probable for the nasal tip following suturation. The dissection is started from the dome incision, from the lateral crus cartilage incision edge to the below skin (preserving the skin) passing through twice the size of the lateral crus cartilage that is going to folded back. The incised domal cartilage with its both separated ends indicates the novel appropriate required tip projection and rotation, since the proper length of the cartilage to be folded is determined. The lateral crus are folded back as an overlay (commonly) or underlay flap on the lateral crus body. The cartilage commonly folds through the lateral crus long axis; however, it is better making an angled fold by another triangular piece of the cartilage folding at its

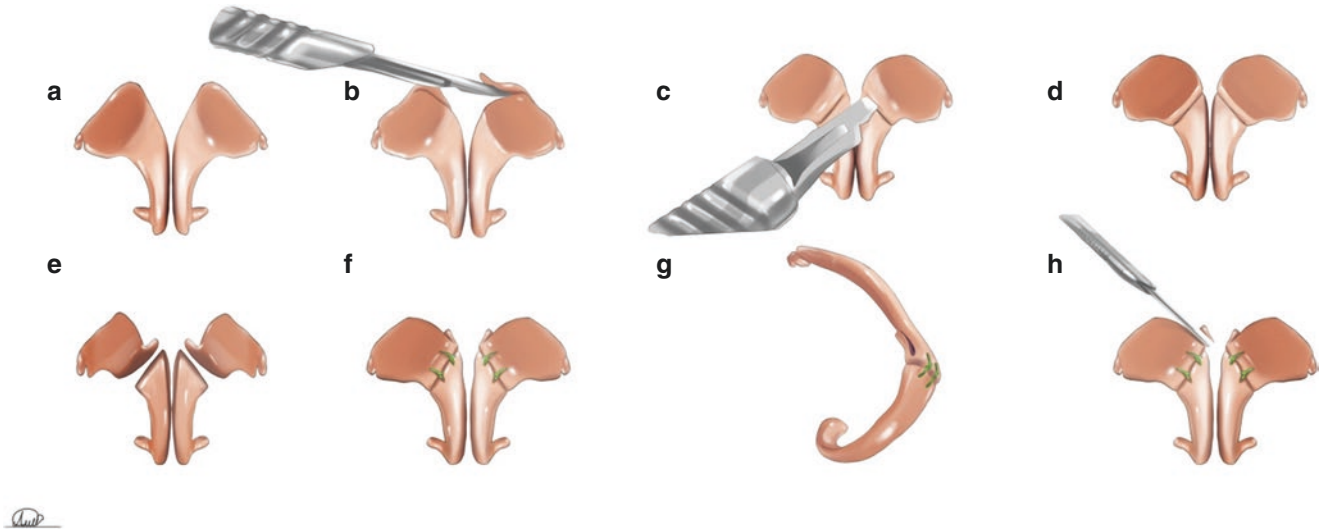

Fig. 20.9 VAF method. (**a**) Lateral crura concavities, (**b**) cephalic resection, (**c**) favorable incision, (**d**) the caudal size of cartilage for folding, (**e**) VAF, (**f**) forming the last dome using sutures, (**g**) side view, and (**h**) manipulations on the new dome (Drawing by A. Babaei, 2021, reproduced with permission)

base on the lateral crus cranial rim at the dome, which leads to an extra cartilage stump needed for trimming at the lateral crus caudal rim. This angled folding makes it possible to correct divergence as well as obtain favorable plane regarding the lateral crus. This folded section is then stabilized by the overlay or among the lateral crus and the skin below using two or three 6–0 Polydioxanone sutures, for making sure about the well adhesion. Then, suturing the lateral crural cartilage can be done toward the below separated skin using 5-0 Vicryl rapide mattress sutures to eliminate dead spaces. The new dome is produced by the new, folded powerful terminal of the lateral crus and the upper terminal of the ipsilateral medial crus using two 6–0 Polydioxanone mattress sutures. We can attach a tip graft into the new dome to obtain the favorable height. It will be finished by placing camouflage grafts, particularly in patients with thin skin, similar to VAR.

20.1.6.2 Advantages

The VAF technique advantages are as follows: [7]

- It allows two procedures to be performed simultaneously: the lateral crus as well as dome improvements.
- When LLC is controlled, a soft, potent, natural, and flexible dome area is achievable.
- The divergence of the dome sides can be controlled.
- Through VAF, the thin lateral crura stability is doubled and flattens concavities.
- It produces a lateral crura with two layers characterized by the accurate strength plus maintaining the integrity at the tip area.
- It provides a soft transition for the tip region, which is lost by performing dome division.

20.2 New Methods in Lateral Osteotomy

The lateral nasal wall osteotomy has been necessary in rhinoplasty, which is used for reshaping the nose, realigning the nasal dorsum, narrowing the broad nasal base, widening the narrow nasal base, straightening deviated nose bones, or closing the open roof abnormality [8, 9]. Nasal osteotomy is external or internal and is done at three levels, including low to low, low to high, and double. Such categorization shows the rout of the osteotomy line from the pyriform aperture toward the medial canthus [8]. This section introduces various new methods in nasal osteotomy.

20.2.1 The Intraoral Approach Using Diamond Burr in Lateral Osteotomy

Most osteotomy methods conclude blind manipulation and leave the outcome greatly associated with the surgeons' experience. It is a fine method linked to the wall width and sometimes needs extensive force for perforating the thick bone. Perforating with an osteotome can result in nasal mucosa laceration or atypical fracture lines leading to difficulties in positioning the lateral wall that yields an esthetically suboptimal outcome [9]. The diamond burr internal osteotomy is done under direct visualization that makes a precise incise line. Light pressure breaks the nasal wall accurately through the osteotomized line [9].

20.2.1.1 Surgical Technique

First, the osteotomy line is highlighted as the favorable on the skin. The mobile mucosa in the anterior region of the upper jaw vestibule should be cut (nearly 2 cm). Using a

periosteal elevator, a subperiosteal tunnel all over the pyriform aperture across the suggested highlighted lateral osteotomy route is created. Using a 1.5 mm diamond burr, the lateral nasal wall across the osteotomy path is thinned out, whereas the periosteal elevator supports the soft tissue. The thin blade of the bone is used for protecting the nasal mucosa [9].

20.2.1.2 Advantages of the Technique

❖ It is well controllable and can be predicted and is also associated with lower trauma.

❖ It is easy for learning leading to desirable outcomes, even when it is done by a surgeon with lower experience.

❖ It lasts for 10–15 min from incision, osteotomy, and in-fracturing (5 min more than other techniques).

❖ The mucosa remains intact which reduces complications and enhances the optimal esthetic as well as functional results [9].

20.2.2 Internal Osteotomy with Piezoelectric Surgery

It has been tried to decrease damages to the soft tissue in rhinoplasty. An accurate and consistent lateral osteotomy has been shown essential for rhinoplasty. Piezoelectric ultrasonic device is helpful for performing more accurate bone operations and avoiding soft tissue damages. It converts electric current into ultrasonic waves followed by transmitting toward the chisel placed at the handpiece tip. The piezosurgery osteotomy result is more favorable than other traditional techniques for lateral osteotomy [10].

20.2.2.1 Surgical Technique

A short incision (3 mm) is used to approach the lateral bony wall across the end of the pyriform aperture. Following creating a tunnel, osteotomy is performed via insertion of the piezo tip to the tunnel through the osteotomy line via an accurate digital control (Figs. 20.10 and 20.11) [10].

20.2.2.2 Advantages

The advantages of piezoelectric internal osteotomy are as follows [10]:

- Makes the surgeon able to cut bone along with maintaining soft tissue and vital structures, like nerves, vessels, and mucosa
- No hemorrhage or soft tissue injuries resulting in lower incidence of postoperative morbidities
- May reduce edema and ecchymosis after rhinoplasty during osteotomy due to lowered soft tissue injury

20.2.3 Splint-Guide Method in External Osteotomy

Nasal osteotomy is crucial in cosmetic rhinoplasty, but it can be associated with difficulties for inexperienced surgeons. It is often challenging for inexperienced surgeons to perform the external osteotomy. A novel splint-guide technique has been developed, which is helpful for inexperienced surgeons performing a safe and reliable external osteotomy [8].

20.2.3.1 Surgical Technique

Prior to osteotomy, using a marker, its line is drawn. A sterile aquaplast splint is located into bath filled with sterile hot water to make materials soft as well as pliable, and they are hardened after cooling. The soft splint is molded over the nose followed by trimming by scissors across the osteotomy tracks. Making a stab incision is done on the nasofacial skin, which is commonly placed midway across the osteotomy line. In the next step, inserting a sharp osteotome can be done via the incision from the mid segment of the bony nasal pyramid at the inferior orbital rim as well as nasofacial connection along with horizontal surface of the maxilla. Osteotomy originates from the pyriform aperture, under the inferior edge of the splint moving to the medial canthus in the favorable form (low-low, low-high, etc.) just under the splint inferior edge (Fig. 20.12). An external splint can be used as a

Fig. 20.10 Internal osteotomy by using piezoelectric surgery

Fig. 20.11 Piezoelectric internal osteotomy. Pre- and postoperative photographs on 1-year follow-up

lead to continue the osteotome across the right osteotomy line to let the surgeons keep the right path. After completing bilateral osteotomies, performing a managed, two-sided greenstick fracture can be done by a slight pressure between the thumb and forefinger to mobilize nasal bones and relocate them into the favorable location [8].

20.3 New Methods in Nasal Dorsum Surgery

20.3.1 Docile Splay Graft

Several methods are used for reconstructing an incompetent internal nasal valve or preventing valve complications after surgery. Spreader and splay grafts and also autospreader flaps have known to reinforce the internal nasal valve. However, docile splay graft is a new technique that helps to prevent dorsum over-widening, dorsal abnormalities, important dorsal esthetic lines in thin skin, the needs for significant level of straight septal cartilage regarding spreader grafts, and the needs for conchal graft for harvesting regarding splay grafting [11].

20.3.1.1 Surgical Technique

Septal cartilage is moderately crushed to decrease the elasticity of the cartilage. Such crushing is similar to the level 2 of the crush ranking by Cakmak and Buyuklu for making a thin, homogeneous, and flexible segment of cartilage that is trimmed and tailored for providing a rectangular graft. The graft is located on the dorsal septum among the two ends of the upper lateral cartilages (ULCs) (Fig. 20.13). The skin

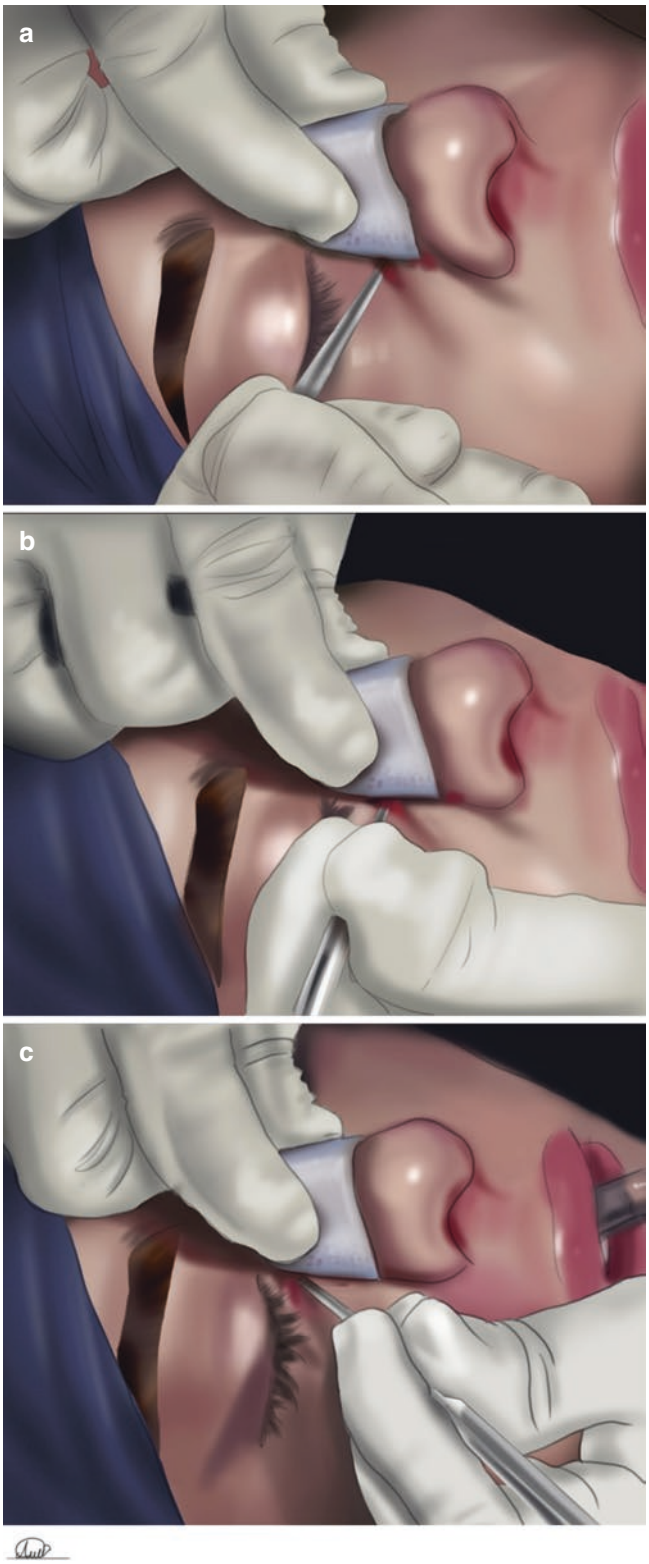

Fig. 20.12 Dotted osteotomy that is repeated every 2–3 mm to the medial canthus. (**a**) Placing the splint, (**b**) and (**c**) transcutaneous osteotomy (Drawing by A. Babaei, 2021, reproduced with permission)

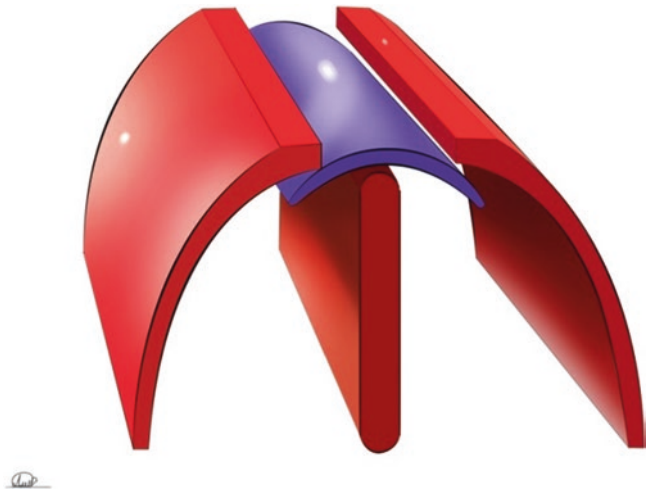

Fig. 20.13 The inserted dorsal graft. ULCs and septum are in red and the graft is in blue (Drawing by A. Babaei, 2021, reproduced with permission)

flap is folded back and the surgeons are able to check the esthetic outcome. Finally, the ULCs are gently reapproximated using a 5-0 Polydioxanone suture [11].

20.3.1.2 Advantages of the Technique

Using the docile splay graft technique, soft squashed cartilage is applied for reconstructing and reinforcing the internal valve. The mentioned cartilage segment is located under the ULCs; therefore, unlike spreader grafts, lower amounts of the midvault region are filled with the graft. The top lateral cartilages are gently elevated to widen the airway. The last final modifications and corrections of this method are simple with a lower graft extrusion risk. Crushed cartilage forms a smooth dorsal area to reconstruct the middle vault; the esthetic brow lines cannot be exaggerated in all nose forms. This technique can be used in several primary as well as secondary patients with adequate short-term outcomes [12].

20.3.2 Diced Cartilage Grafts Wrapped in AlloDerm

AlloDerm is an acellular human tissue matrix from cadaveric tissue that is widely used in craniofacial and esthetic operations. AlloDerm is particularly appropriate for rhinoplasty cases that need dorsal camouflage (surface deformities) or size elevation and is applied for nasal dorsal augmentation. The technique has shown ease in carrying out optimizing dorsal augmentation in challenging secondary/tertiary cases [12].

20.3.2.1 Surgical Technique

This corrected method includes packing thin AlloDerm (2 × 4 cm and thickness of 0.79Y1.78 mm) over delicately diced (1 × 1 mm) cartilage grafts (Fig. 20.14). The vertical positioning almost extends from the glabella toward supratip; however, it can be moderated accordingly. Firm, external splinting for 7–10 days leads to an important immobility, by which there is no need for internal fixation [12].

20.3.2.2 Advantages of the Technique

- It improves the esthetic contour as well as improper amount of the nasal dorsum.
- Easy tailoring for lateral asymmetries (in cleft cases and traumatic saddle nose abnormalities following comminuted nasal fractures).
- A bioabsorbable plate can be included in the wrap for more structural strength [12].

20.3.3 Spreader Graft Placement Without Dorsum Resection

Through nearly three decades, spreader grafts were used by rhinologists as well as plastic surgeons for addressing the dorsal esthetic lines and preventing mid-nasal vault collapse in rhinoplasty. There may be a need to widen a narrow internal nasal valve angle with no hump reduction in classical (closed) septoplasty operations. Unlike open method, managing a narrow internal nasal valve angle is complicated in classical type. This part introduces a recent technique for this approach in cases with a deviated septum including a thin internal nasal valve angle [13].

20.3.3.1 Surgical Technique

During septoplasty, the elevation and protection of the mucoperichondrium is done toward the superior lateral and septal cartilage junction. Using a 5-0 absorbable suture, suturing of the collected spreader grafts is performed at each edge of the graft. Following graft preparedness, the superior lateral as well as septal cartilage junction is sliced from the septal cartilage using a scalpel for making a space for inserting the spreader graft (Fig. 20.15). Using fingers, the nose dorsum tissue is elevated to protect it against incision. The spreader connections are located among the sliced ULCs and the septum. Needles pass the skin and pull above followed by placing graft among the ULCs and the septum. There is no elevation in nose dorsum; therefore, movements to the upper side are impossible. Accordingly, attaching the grafts via suture into the septum and ULCs cannot be expected. Transseptal sutures entered immediately under the spreader graft are essential to maintain the grafts. Pulling the sutures superiorly, when transseptal sutures are created, is the vital phase for obtaining optimal graft connection. Following connection, graft sutures are incised. Other phases are like the classical septoplasty [13].

20.3.3.2 Advantages of the Technique

- The displacement of the graft is minimized as it is affixed immediately under the spreader grafts.
- It has the ability of shortening the surgery time, gaining autologous septal graft materials and securing the columellar architecture [11].

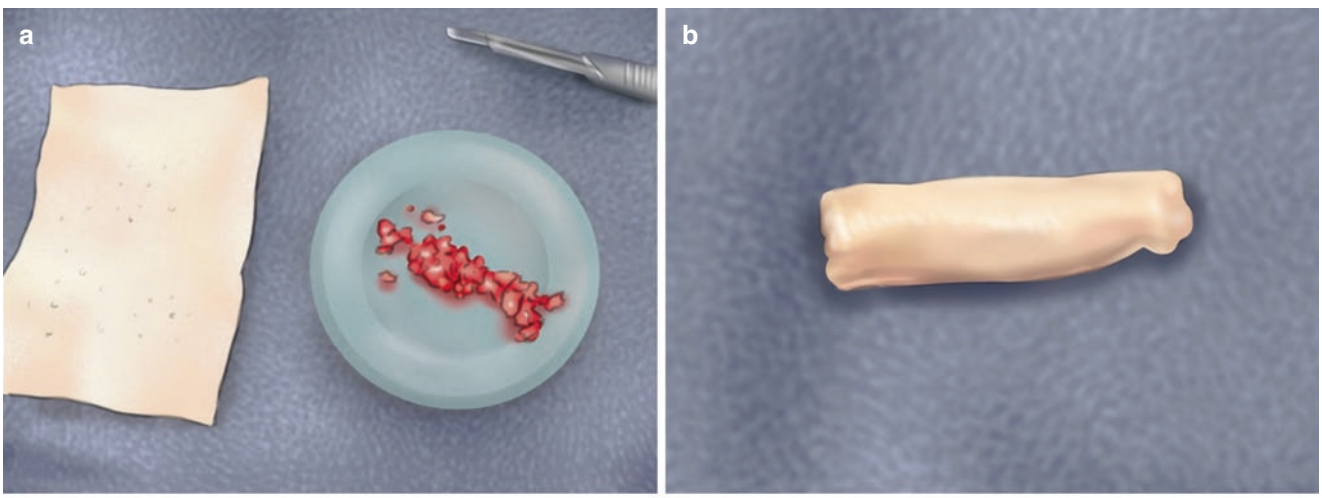

Fig. 20.14 (**a**) AlloDerm and diced cartilage. (**b**) Diced cartilage wrapped in AlloDerm before placement (Drawing by A. Babaei, 2021, reproduced with permission)

Fig. 20.15 Graft positioning (Drawing by A. Babaei, 2021, reproduced with permission)

20.3.4 Endonasal Spreader Graft Method Through Barbed Suture

Spreader grafts have shown effective to improve the dorsal esthetic line, prevent middle vault collapse, and increase the nasal valve length. Its positioning in a correct, thin septal flap pocket across the septum dorsal end is challenging. Many methods have been reported to fix endonasal spreader grafts, such as tight-fitting septal pockets, using adhesives, transcutaneous suture techniques, and endonasal suturing. Therefore, this method through a barbed suture is beneficial for securing grafts in the right location. The recently developed barbed suture reduces the need to tie knots. It also can enhance the spreader graft secured to the septum and also the reattachment of the ULCs into the spreader graft-septal complex [14].

20.3.4.1 Surgical Technique

The septal or other cartilages are collected while spreader grafts are formed based on the favorable models, size, width, and thickness. The soft tissue retraction is done trying to locate the spreader grafts below the original middle vault.

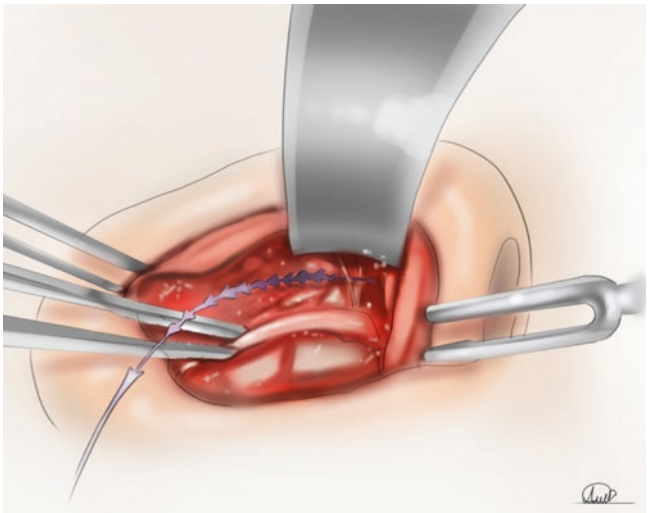

Fig. 20.16 Securing spreader grafts using barbed suture in closed rhinoplasty method (Drawing by A. Babaei, 2021, reproduced with permission)

No favorable alteration is usually achieved in the middle vault shape. Hence, the ULCs are separated from the septum using a scalpel. The spreader grafts are temporarily protected toward the cartilaginous septum dorsal end by hollow-bore needles. The running horizontal mattress suture method protects the grafts toward the septum using a barbed suture (3-0 V-Loc). The spreader grafts as well as dorsal septum are carved more to ensure the exact dorsal contour. A barbed suture (3-0 STRATAFIX™ Symmetric PDS) can be applied to reattach the ULCs into the spreader graft-septal set in a running horizontal mattress suture placement (Fig. 20.16) [14].

20.4 Recent Advances in Nasal Base Surgery

The nasal base has been essential because of its intricate anatomic structures consisting of cartilages, skin, connective tissues, and ligaments. Nasal base makes the external nose valve play a key role in airway performance.

20.4.1 Alar Release and Medialization

First, this method is utilized for correcting wide flat nostrils in normal rhinoplasty patients. The revival of this technique goes back to 2008, when a comprehensive anatomic study on the pyriform area was performed and the role of the pyriform ligament in translating shape and position of alar walls was explained. The pyriform ligament plays the main role in spatial positioning of alar walls and should be released when massive medialization is required [15].

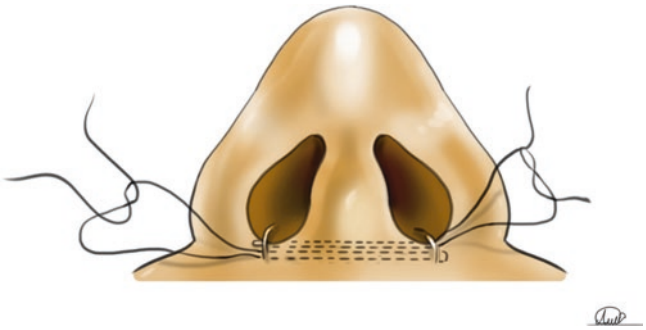

Fig. 20.17 In alar release and medialization, classic sill incisions are made; two circumferential sutures are used to medialize the alars (Drawing by A. Babaei, 2021, reproduced with permission)

20.4.1.1 Surgical Technique

Alar release and medialization is commonly done by sill incisions. Following creating incisions into the nasal base, dissection is done to gain access to the pyriform aperture. Then, a periosteal elevator is inserted to detach the pyriform ligament both inside and outside of the pyriform aperture and anterior maxilla. Each alar wall is medialized by a circumferential suture that starts from the dermis of the alar incision, goes though the nasal base and columella, and enters the other sill incision site before returning to the original site. The same steps are done for the other alar wall, and lastly, the sutures are gradually tightened, medializing the alar walls (Fig. 20.17) [15].

20.4.1.2 Indications

1. Remarkably broad nasal basis. Releasing the alar can decrease the level of resected tissue, which decreases the risk of scar and deformation.
2. Alar lobule with vertical orientation. In such cases, usual techniques possibly form a convergent lobule as well as deform the nasal basis [15].

20.5 Novel Techniques in Asian Rhinoplasty

Asian cases have a quite inadequately formed dorsal tip height, thicker skin, and small nasal radix. Therefore, augmentation rhinoplasty has been known as the most common conducted rhinoplasty in Asia. Nasal tip projection is the first phase in this method through septal extension grafts. Also, an alloplastic compound, like silicone, has been mostly applied to augment nasal dorsal due to its positioning below the thick skin, simple handling, and cost-effectiveness. Reported alloplastic consequences due to implant are infections, skin atrophy, displacement of the implant, and contracture resulting in short-nose abnormality. Autologous costal cartilage (ACC) is secure with many features related to a proper graft material regarding augmentation rhinoplasty but has not been an appropriate option because of possible consequences. Many of cases in Asia need substantial dorsal augmentation that is not possible to be performed by septal/auricular cartilage. Several methods are available for minimizing the carved ACC warping; however, they are not thoroughly preventive against warping [16].

20.5.1 Modified Septal Extension Graft (SEG)

Several improved methods are available for a SEG, such as a one-sided or two-sided SEG as well as a symmetrical/asymmetrical SEG. The grafts applied for the SEG method are septal cartilage, conchal cartilage, homologous costal cartilage, alloplastic compounds, and bone. A SEG has been shown as a beneficial method for tip plasty, due to its firm structural support for the tip. Among the cases in Asia, the septal cartilage has been weaker, thinner, and lower compared with Caucasians, leading to deviation of the available caudal septal cartilage and the SEG toward the opposite direction of the graft positioning. For solving these problems, a modified SEG is utilized. It provides lasting, firm nasal tip support. It helps to set the existing caudal septum and the septal extension grafts precisely at the anterior midline and decrease the deviation of the nasal tip [17].

20.5.1.1 Surgical Techniques

While harvesting the septal cartilage, the septum one-sided mucoperichondrium is lifted toward the connection among the ULCs and the septum. For cases with lower amount of harvested septal cartilage, the auricular conchal cartilage can be used, as well. The harvested septal cartilage is sliced into two segments that are applied for the SEG (Fig. 20.18a, b). In some cases, by achieving efficient collected septal cartilage, the cartilage is sliced into three segments, of which two segments are applied for SEG while one segment is employed for the tip (Fig. 20.18d). Smaller collected septal cartilage is just applied for the triangle SEG [18]. The auricular conchal cartilage can be harvested and sliced into two segments: one segment for the stripped graft and another for the tip graft (Fig. 20.18c). The stripped extension graft thickness is 4–5 mm similar to the dorsal edge of the triangle extension graft. In increasing graft firmness, SEGs are needed to be long for attaching into the dorsal septum as well as superior lateral cartilage; however, they should not be extended over the middle connection of the dorsal septum as well as superior lateral cartilage cephalically, since it widens the midvault. The SEGs expand caudally over the caudal border of the L-shaped available septum to the region among the medial and intermediate crura. It is preferred to leave the grafts gently more than estimated. Grafts are trimmed fol-

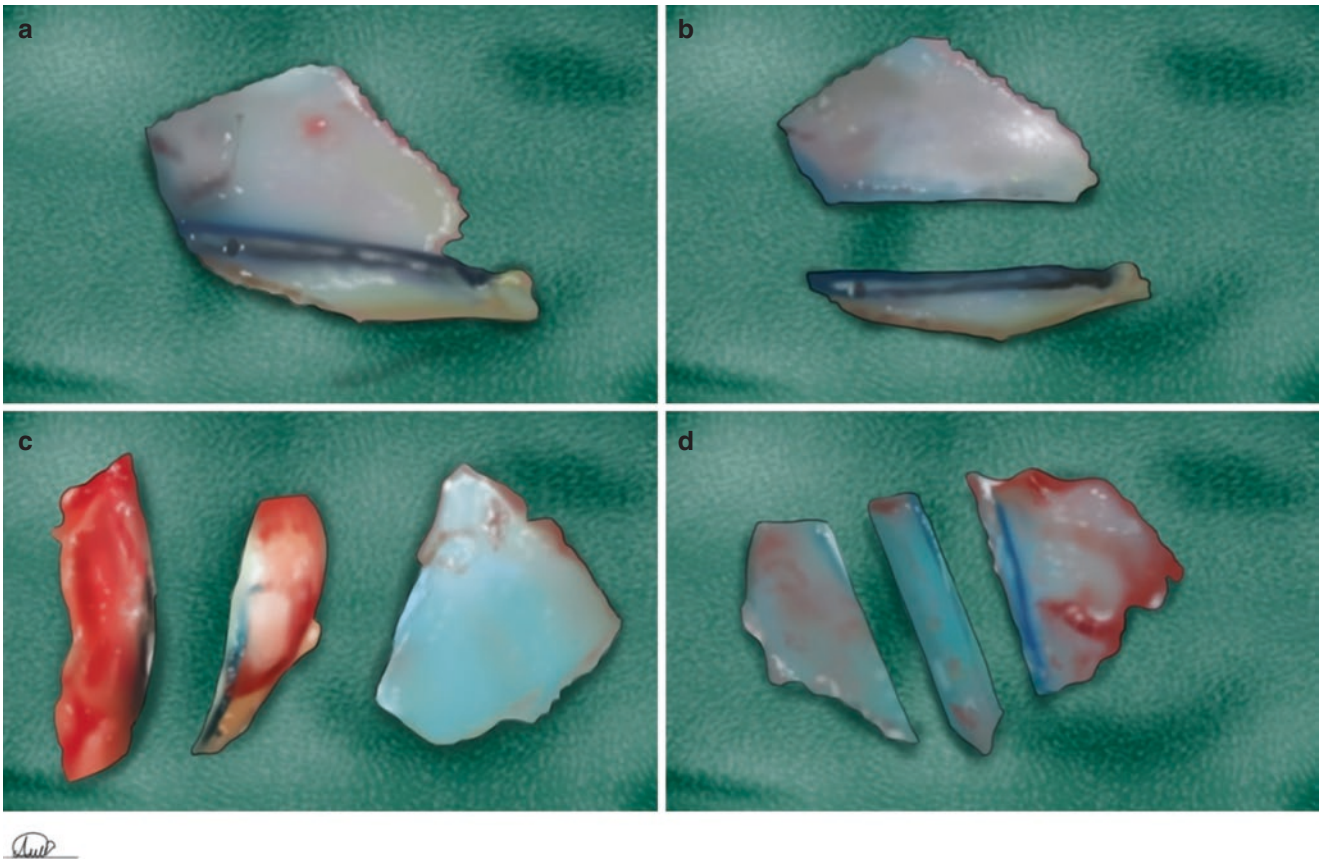

Fig. 20.18 (**a**, **b**) Septal graft. The cartilage is sliced into two pieces for SEGs. (**c**) Collecting two segments of conchal cartilage (a stripped SEG and the tip graft). (**d**) The septal cartilage is cut into three pieces, so that two segments of cartilage are applied for the SEG and a segment for the tip graft (Drawing by A. Babaei, 2021, reproduced with permission)

lowing suturing into the position. The initial suture is applied for fixing both SEGs into the dorsal septum, whereas the second one is attached in the triangle SEG into the available caudal septum. Prior to the second suture, the angle among the dorsal septum margin as well as the triangle SEG is set for obtaining optimal nose length, tip projection, and proper nasolabial angle (Fig. 20.19). The ULCs are needed to be fixed into the septum; therefore, the SEGs are sutured together. Securing the available septum as well as both SEGs should be considered at the nose esthetic midline. If needed, the graft location is improved for preventing deformity [17].

20.5.1.2 Advantages

The advantages of modified SEG are the following [17]:

- Provides a considerable stable available caudal septum as well as SEGs.
- No need for considerable level of septal cartilage and needing a lower level of cartilage.
- Applicable for patients who need a SEG.
- Two grafts positioning lead to elevate the tip stability.

20.5.2 Hybrid Nasal Dorsal Graft

20.5.2.1 Nasal Tip Projection Using SEGs

The initial phase of augmentation rhinoplasty is nasal tip projection by SEGs. The SEGs involve a dorsally expanded spreader graft and a caudal SEG, which can make the inverted V shape. A segment from caudal septal extension graft (CSEG) is tightly secured into the caudal basis septum using 5-0 Polydioxanone in an overlapping model. For stabilizing the caudal SEG, a segment from the dorsally expanded spreader graft is used one-sidedly opposite to the caudal SEG direction leading to making a new anterior septal angle. The LLC's middle crura are secured to the new septal angle using a 5-0 Polydioxanone suture for concurrently increasing the nasal length as well as tip projection; the tip is located ideally with slight caudal rotation (Fig. 20.20) [16].

20.5.2.2 Hybrid Autologous Nasal Dorsal Grafts

The hybrid autologous grafts are the second phase, which include costal cartilage grafts with a solid boat-formed portion to bony dorsal augmentation and diced cartilage grafts

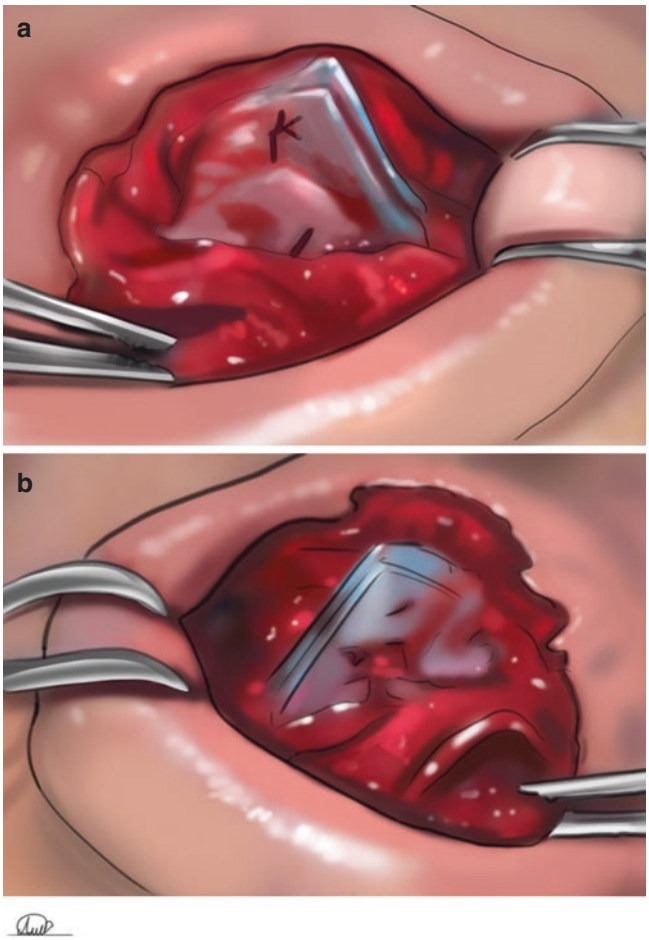

Fig. 20.19 Triangle and stripped SEGs. (**a**) Triangle SEG. (**b**) Stripped SEG (Drawing by A. Babaei, 2021, reproduced with permission)

wrapped in fascia to the cartilaginous dorsum. The costal cartilage straightest segment is carved to a solid boat-formed graft (2–3 cm), and its inferior layer is carved using a concave curvature formed for fitting the original dorsum. Realistic 3D face modeling based on computer can be used to carve the costal cartilage. The deep temporal fascia (TF) can be one-sidedly collected via a vertical temporal skin incision, and the rest of the segments are applied as diced cartilage for facilitating optimal cartilage control followed by storing the diced cartilage within a 1 mL syringe. Suturing the deep TF is done toward the solid boat-formed costal cartilage graft (Fig. 20.21a) followed by wrapping over the 1 mL syringe including diced cartilage (Fig. 20.21b). Suturing the fascia is done by a 6-0 Monocryl suture in forming a tube. Using gentle injecting, the diced cartilage is entered to the fascial tube by removing the 1 mL syringe. The tube caudal terminal is sutured to create a hybrid graft (Fig. 20.21c). To stabilize nasal radix and augment slightly, wrapping the deep TF can be done over the cephalic terminal of the solid boat-formed costal cartilage graft (Fig. 20.21d).

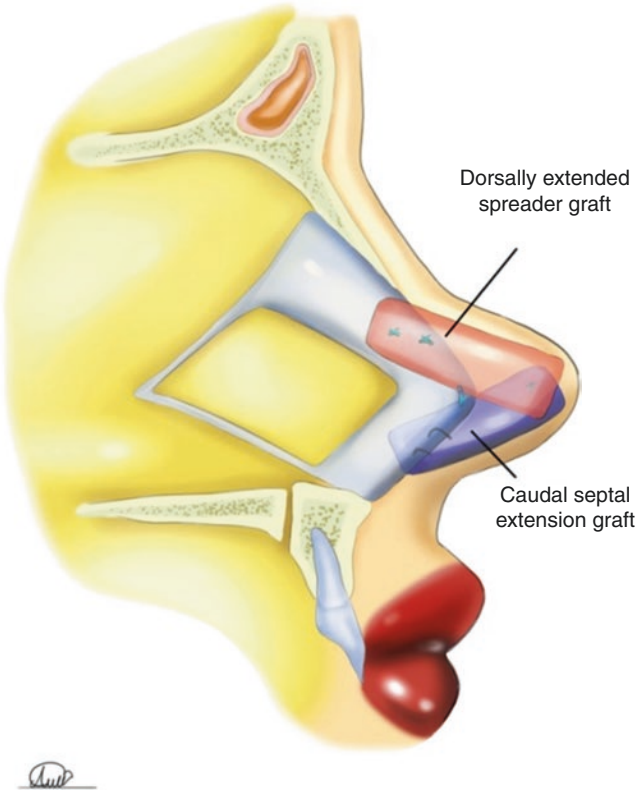

Fig. 20.20 The SEG including the dorsally extended spreader graft and caudal SEG, resembling an inverted V (Drawing by A. Babaei, 2021, reproduced with permission)

The hybrid dorsal grafts are entered to the dorsal dissection area (Fig. 20.21e). Fixing is performed at the cephalic terminal using a transcutaneous pullout suture. By digital manipulation, more refinements are possible for obtaining the favorable form of the cartilaginous nasal dorsum [16].

20.5.2.3 Advantages

- Preserving tip movability.
- Safe control over the tip location and figure.
- Reconstructing a new anterior septal angle is possible, but just lower septal cartilage amount is need.
- The solid dorsal grafts are smaller.
- Using deep TF smoothens dorsal abnormalities and camouflage minor bony movements [16].

20.5.2.4 Restrictions

The disadvantages of this technique include the need for multiple donor sites and time-consuming surgery. Complications of solid boat-shaped costal cartilage grafts include graft visibility and graft warping. A potential complication of diced cartilage grafts is graft resorption, which makes it difficult to predict the final results. Possible complications of septal extension grafts include decreased projection, nasal tip deviation, and infection [16].

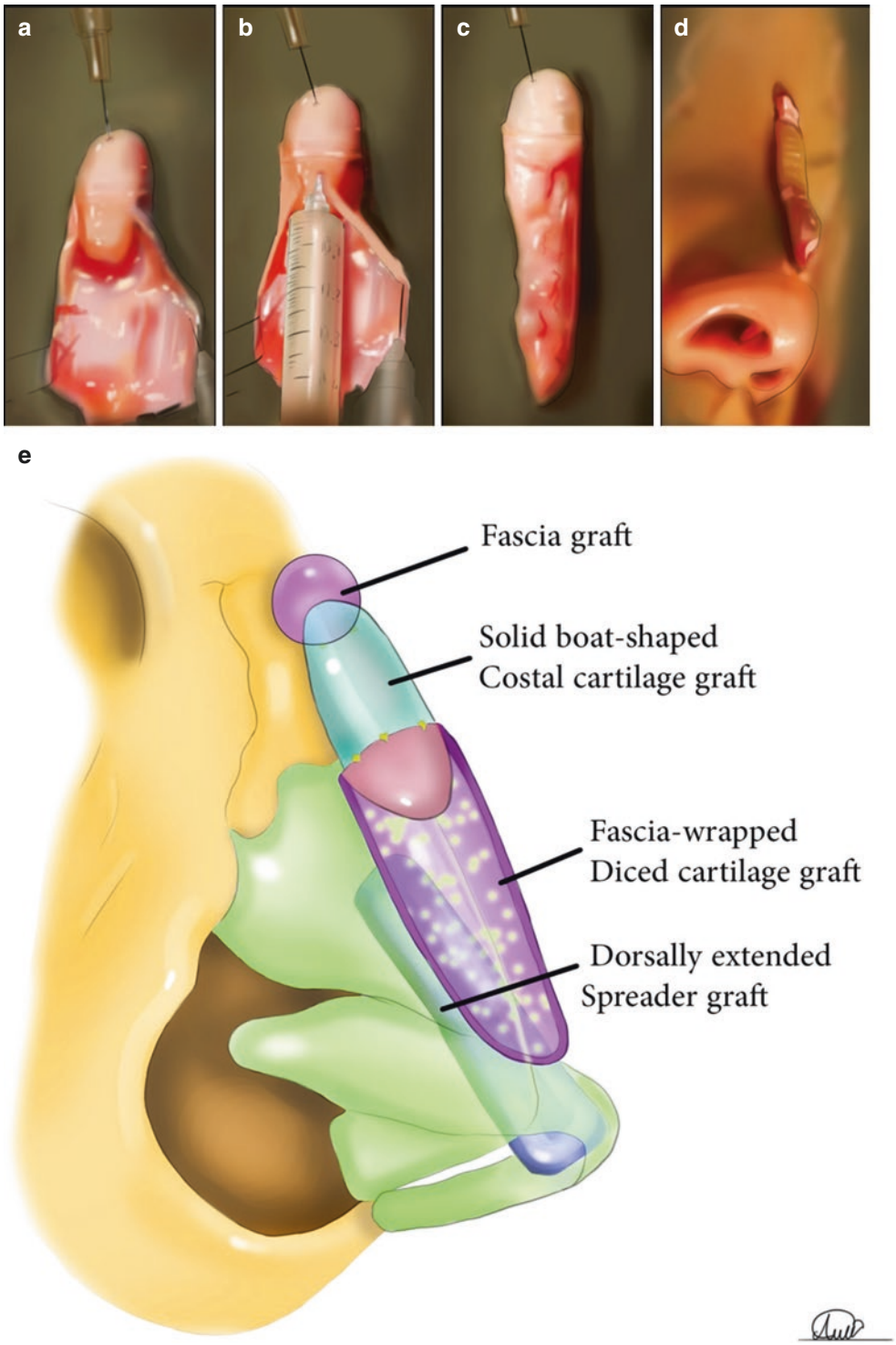

Fig. 20.21 Hybrid nasal dorsal graft technique. (**a**) Suturing the TF toward the solid boat-formed costal cartilage graft. (**b**) Inserting the diced cartilage to a 1 mL tuberculin syringe followed by wrapping with TF. (**c**) Wrapping the solid boat-formed costal cartilage graft plus the diced cartilage graft in deep TF. (**d**) Wrapping the cephalic terminal of the solid boat-formed costal cartilage graft into deep TF in reducing graft visibleness. (**e**) Hybrid nasal dorsal grafts (Drawing by A. Babaei, 2021, reproduced with permission)

20.5.3 Modified VDD Technique

VDD is an adaptable method to refine the nasal tip location with no need for columellar grafts and is applicable in different nasal abnormalities, such as overprojection, suboptimal rotation, no equal lobule proportions, and a wide/asymmetric tip. It is also beneficial in Asian cases characterized by thick tip skin as well as partial LLCs with complete development. However, sometimes gaining the favorable nasal tip refining by only VDD among Asian cases is challenging. The improved VDD method is featured by division of the domal areas and ordinary use of a tip graft for properly refining the tip. Dome cut is done for borrowing a great deal of cartilage of the caudal border; therefore, the medialized cartilage lat-

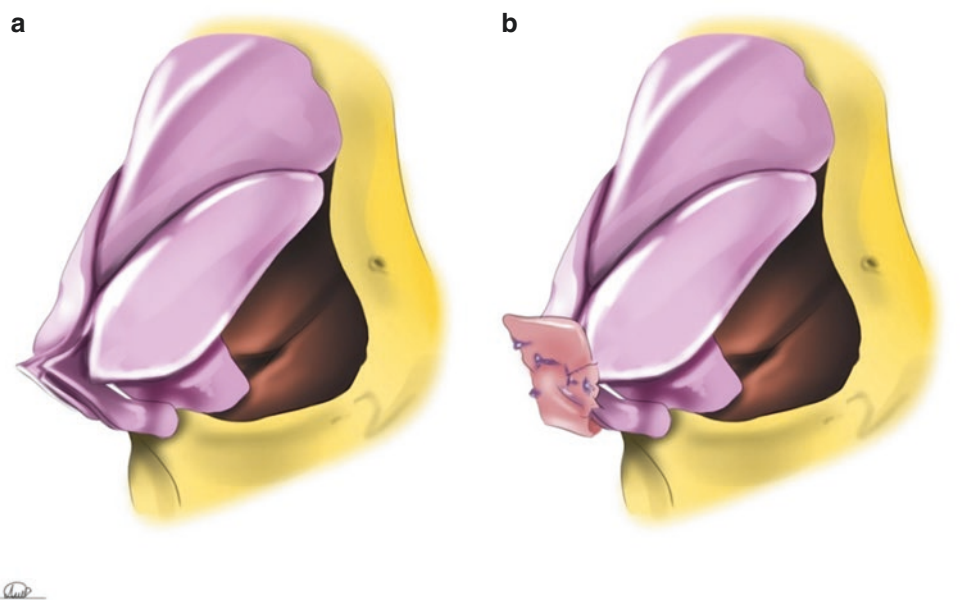

Fig. 20.22 Modified VDD method. (**a**) Cuts on both domes. (**b**) Placing a shield tip graft exactly against the newly formed cartilage-strut set. Adjusting the graft based on the favorable tip projection (Drawing by A. Babaei, 2021, reproduced with permission)

eral looks triangular in an antero-caudal side. In modified VDD, placing more tip grafts, like a shield or onlay graft, is simpler. The triangular form medial limbs cannot just elevate tip exposure; it can fix the shield graft, because the borrowed domal cartilage is like the blocking graft [18].

20.5.3.1 Surgical Techniques

After exposing the lower third of the nose and completion of the septal work, VDD is carried out. Incisions are performed on two domes, taking a large amount of cartilage from the caudal border, leading to the triangular exposure form from the medialized cartilage lateral vision in the antero-caudal side. Through widespread undermining along the medial as well as lateral crura surface, the vestibular skin can be kept. A cartilage strip, which is formed as a columellar strut, should be located among both sides of the cuted dome, suturing by the medialized domal segment of the LLCs (Fig. 20.22a). A shield-shaped tip graft is located exactly against the novel produced cartilage-strut set. The shield tip graft leading border is fixed based on the novel tip expected height (Fig. 20.22b) [18].

20.6 Preservation Rhinoplasty (PR)

Lothrop (1914) first developed the dorsal preservation concept in rhinoplasty when Lothrop achieved a functional and esthetically pleasing outcome in a patient with tension nose. It includes "nasal impaction" using fundamental phases: (1) resecting a high strip of septal cartilage as well as perpendicular plate of ethmoid, (2) triangular bony cuts of the frontal processes of the maxilla, and (3) direct radix percutaneous osteotomy [19].

20.6.1 Dorsum

Dorsal preservation maintains the dorsal structures along with removing the dorsal hump by septal resection and then osteotomies for reducing the dorsal line height. Therefore, modifying the dorsum is possible without endangering its natural anatomy. Hence, there is no need for midvault reconstruction and the dorsal esthetic lines are preserved [20].

20.6.2 Alar Cartilages

PR improves tip surgery more with preservation of the whole alar cartilage that improves the performance and decreases possible challenges. Moreover, reforming is easier. The subperichondrial projection and preservation of an entirely intact alar cartilage result in some considerable improvements in PR [20].

The fundamental aim is replacing resection with preservation and excision with manipulation. PR is built on recent anatomical investigations, modern tip suture methods, and surgical method improvements [21]. Two techniques have been developed for dorsal preservation: the pushdown operation (PDO) method and the letdown operation (LTO) method. Two procedures are introduced to manage the lateral bony wall: (1) osteotomy with just pushdown to the fossa (PDO) and (2) lateral bony wedge incision by pulling down the bony pyramid into the frontal process of the maxilla, letdown operation (LDO). PDO includes downward compression of the well-mobilized nasal pyramid, which is used in cases with humps lower than 4 mm, whereas LDO includes a maxillary wedge incision, which is done in cases needing lowering over 4 mm (Fig. 20.23) [19].

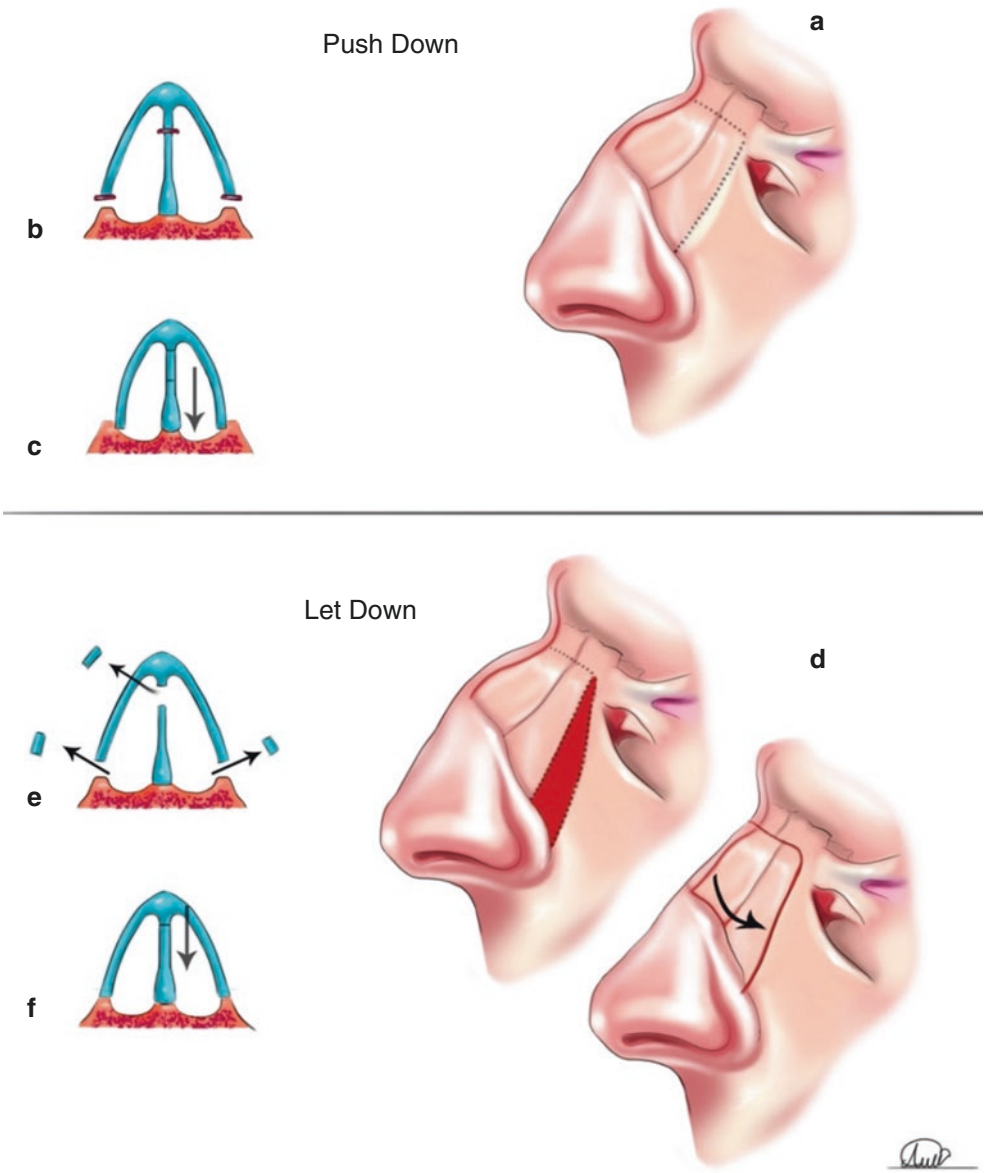

Fig. 20.23 Dorsal preservation techniques. (**a**–**c**) Pushdown operation (PDO). (**d**–**f**) Letdown operation (LDO) (Drawing by A. Babaei, 2021, reproduced with permission)

20.6.3 Pushdown Operation (PDO)

Dorsal resection has been known as the most important part of conventional rhinoplasty that can destroy the keystone region and needs quick mixing of osteotomies and midvault reformation. Nowadays, dorsal reconstruction among secondary patients mostly results in several rib graft reconstructions [21]. Cottle et al. (1946) introduced the PDO, which was a more physiologic procedure for managing hump noses. In such cases, the nasal dorsum continuousness is maintained via compressing the bony as well as cartilaginous hump over the keystone site [19–22]. Saban then evaluated PDO for simplifying the Cottle's pushdown technique via resection of a high subdorsal septal strip that flattens the dorsal convexity [20]. It aims at preserving the keystone area (K-area) and cartilaginous vault continuousness [19]. PDO decreases immediate midvault repair requirement in primary patients and allows minor refinements compared with many of the secondary rib grafts [21]. Severe physiologic as well as anatomical complications can be eliminated in PDO. Additionally, PDO lowers the nose dorsum and removes prominent bony humps, which is because of the chondro-osseous connection flexibility among the nasal bones and the cartilaginous vault (K-area) (Fig. 20.24). The septum, ULCs, and bones are joined in this area. The connection has a hinge-like performance, which allows the straightening of the dorsum as well as hump reduction. The septum is the key to PDO, and thorough knowledge of its normal and abnormal anatomy is imperative [22]. This conservative approach prevented the ULC's collapse and valve area closure, with its negative effects on respiration and the dorsal esthetic lines. Moreover, lowering the original cartilaginous

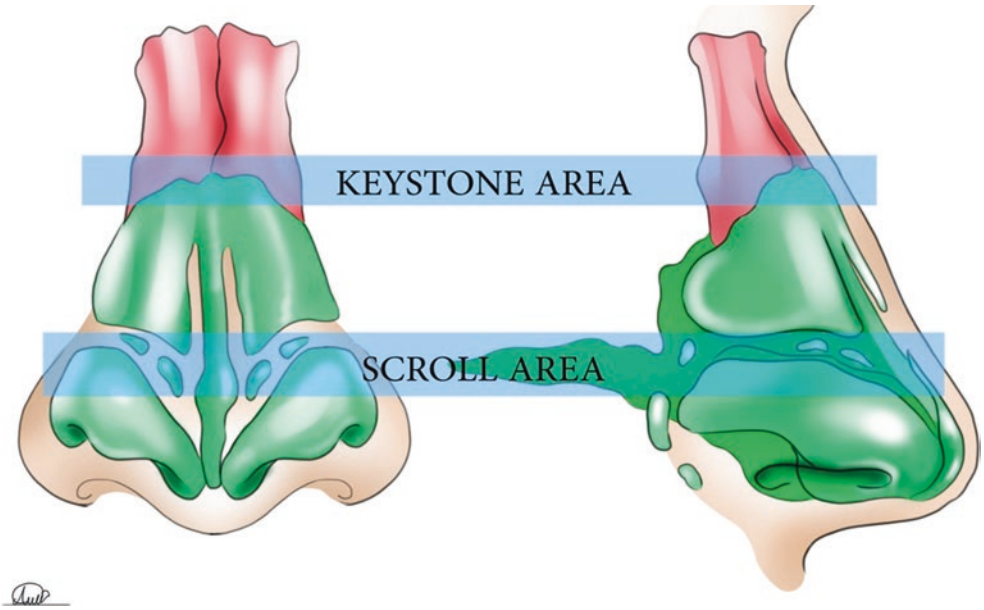

Fig. 20.24 The keystone and the scroll area. Restoration of the K-area anatomy through the primary rhinoplasty preventing open roof and inverted V malformations (Drawing by A. Babaei, 2021, reproduced with permission)

vault through the PDO leads to a vertical vector downward on the scroll region connection among the ULCs and LLCs that results in the LLC's cephalic rotation [19].

In PDO, the nose dorsum is straightened and the dorsum/hump convexness disappeared, which is due to overlapping of one-third of the bones and cephalic border cartilaginous vault in the K-area. Separation of the bones is achieved via a thin, precise, and one layer of fused perichondrium and periosteum for forming a real chondro-osseous connection with flexibility and hinge quality. Following the septum and the pyramid full mobilization, the connection potentiates by PDO and the bony hump disappeared [22].

In a tension nose with excessive projection, the relative width is compromised. It can be very thin with a normal width. Through PDO, a tension nose relative width is increased via lowering the dorsum, which preserves the dorsum as well as dorsum relation to the lobule. By distending the lateral lamina and its movement to outside or to the lateral side, the superior lateral cartilage and the lateral crus of the lobular cartilage are moved laterally, as well, which can widen the thin valve angle commonly to normal [22]. In tension noses, the PDO relieves tension via lowering the dorsum and making tip relaxation and rotation possible. An ordinary hump removal cannot mitigate tension, since the tip cannot be relaxed or rotated. Several cases with tension nose will have esthetic and functional tip using PDO. Using PDO, slit-like nostrils become rounded, and for several cases, the tip can find a physiologic as well as esthetic form without lobular cartilage modification. On the other hand, ordinary hump removal does not change tip anatomy and usually needs lobular cartilage modification for changing the appearance, which results in valve weakening and breathing difficulties [22].

In a further development of PDO, new variations were added. A strip incision from subdorsal septal cartilage should be performed close to the dorsal beam and exactly under the bony cap that makes lowering of the dorsum possible to a made space. The cartilaginous strip incision height is linked to the favorable dorsal lowering. Higher convexity of dorsal vault results in more septal resection. In traditional hump lowering, removal of the arch with M-form is done, and ULCs turn semimobile "flying wings," which cannot articulate with the septum anymore. Therefore, the ULCs fall down to the septum leading to functional and esthetic concerns. Accordingly, spreader grafts as well as spreader flaps can be used for reconstructing the anatomic part. But, preservation is seemingly far superior to any reconstruction [19].

20.6.3.1 Surgical Techniques

In the current DP method, the following procedures are done: (1) endonasal method; (2) removing the septal strip in the subdorsal region with the form and size evaluated before surgery; (3) complete lateral, transverse, and radix osteotomies; and (4) dorsal reduction utilizing either a PDO or LDO [19].

The endonasal method is used for the primary rhinoplasties. The open method is addable, however, just regarding patients with difficult tips or according to the surgeons' preference. Following the caudal septum exposure, a one-sided submucoperichondrial undermining should be performed on the right direction by the tip of Converse scissors/Cakir's subperichondrial elevator. Then, we make a superior tunnel on the contralateral left direction followed by continuing the septum projection to reach the K-area. Undermining of soft tissue around the dorsum is done from the anterior septal angle toward the glabella and laterally toward the maxilla. Therefore, the "degloving" portion of the procedure is com-

pleted, while connection is maintained at the scroll region via the vertical scroll ligament. Then, the nose skeleton can be seen, and the septum/ULC's connection with Y form is free in three regions: the superficial soft tissue as well as the right and left submucoperichondrial below, which makes visual evaluation of the septal anatomy plus accurate surgical management possible.

Resection of Septal Cartilage

Subdorsal septal resection extent and form seems so crucial, since it defines the level of septum to be remained, and this is associated with height and form of the expected dorsum (Fig. 20.25). Using direct or endoscopic visual image, the cartilaginous resection begins exactly under the ULCs/septal connection close to the anterior septal angle. Through scissors with V tips, the incision can move at the anterior septal angle below the dorsal vault to reach a bony contact at the ethmoid perpendicular plate under the cap. The saddle deformity of the middle third now will appear that should be evaluated for avoiding extra cartilaginous septal resections. Next, another incision is done under the initial one at a lower degree. The septum intervention extent and form is associated with the plans considered before surgery. Generally, the superior slicing is subdorsal that indicates the dorsal abnormality contour/convexness. The lower incision is relatively straight defined by the suggested extent of hump lowering. The cartilaginous strip can now be removed. Then, Blakesley direct endonasal forceps (4 mm) is used to remove a portion of the ethmoid bone from the freed septal area exactly under the dorsal vault. Such incision is applicable with no risk, since it is not near to the lamina cribriformis or the skull base. It makes the surgeon able in obtaining a significant hump lowering plus dorsum preservation [19].

Bony Pyramid Mobilization

Bony mobilization can be divided according to the surgeon's preference to full osteotomies by pushdown regarding small humps or lateral wedge cut regarding larger humps. For all patients, the whole bony mobilization is done by separating the bony pyramid from the frontal processes of the maxillary bones as well as the nasal spine of the frontal bone. The process needs full lateral and transverse osteotomies. PDO and LDO should be distinguished (Fig. 20.23). For small humps and/or minimal reduction, full lateral osteotomies are possibly done percutaneously. Then, nasal spine is transected percutaneously at the frontal bone by pushing a 2 mm osteotome across the skin at the nasion. At this stage, cross-root osteotomy is achieved. More transverse incisions are achievable from cephalic edge of lateral osteotomy to the nasion. Nasal pyramid is completely mobilized making the transverse movements possible. For more extensive nasal pyramid lowering (over 4 mm), the LDO is used through a triangular bony wedge resection of the maxilla frontal processes [19].

Such excision should be done extremely low to the lateral (nasofacial groove), in avoiding the palpable/visible step. The frontal processes of the maxillary bone wedges are cut on two sides at the facial plane level. Such resection is possible via accurate osteotomies directly observed or bone rongeur forceps or piezoelectric tools. After bony wedge resection, the pyramid is able to settle independently to rest on the maxilla [19].

Dorsum Reduction

The septum is divided from the dorsum and its height is reduced based on the plans considered before surgery. Moreover, the lateral bony walls are separated and the whole pyramid is movable. The bony and cartilaginous dorsum is lowered or impacted among the facial bones by following steps:

1. Transversal mobilizing the whole nose isolated from the face
2. Pinched bony vault symmetrically
3. A downward pyramid movement to the nasal fossa

Meanwhile, the bony-cartilaginous vault is placed down on the remained septum. Checking the upper septum exactly under the K-area is crucial for avoiding the rocker impact.

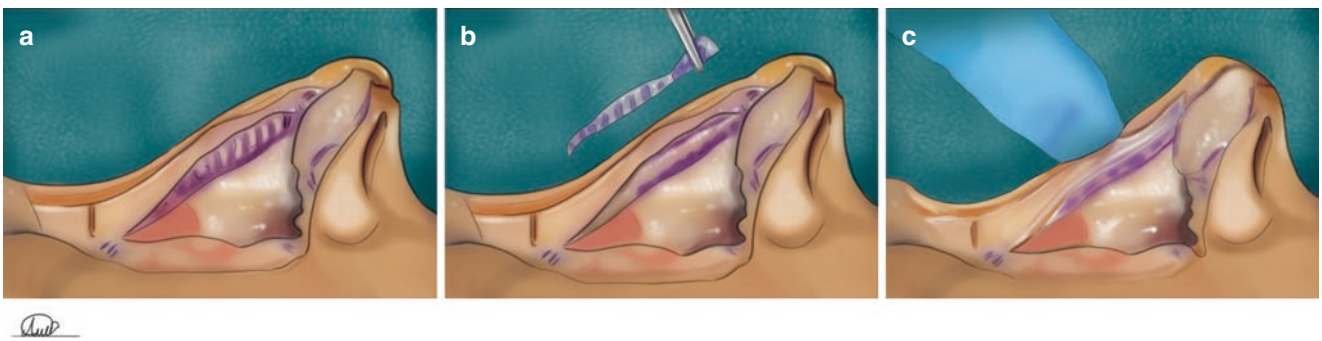

Fig. 20.25 Septal strip resection. (**a**) Location of excision exactly under the keystone connection. (**b**) The septal excision amount. (**c**) Impaction of the dorsum downward (Drawing by A. Babaei, 2021, reproduced with permission)

For fixing the dorsum, one or two sutures (Vicryl 4-0; circle needle) are placed among the dorsum and the below septum close to the anterior septal angle. If needed, tip plasty should be considered. In cases including a high convex dorsum, vault reduction can open the K-area resulting in a longer dorsum based on the simple mathematics rules. The surgeon should split a part of the new anterior septal angle for allowing tip rotation.

20.6.3.2 Advantages of the Current DPO

Advantages of the current DPO [19, 22]:

- Esthetic lowering of the dorsum by eliminating the hump and providing the modified functional airway
- Preserving the dorsum and maintaining the normal relationship between the bony vault, the cartilaginous vault, and the lobule while reducing dorsal hump 2–8 mm in height
- Widening/opening of the angle among the lateral wall as well as septum
- Improving the nasolabial angle
- No need for deep/extensive septal operation with a shorter surgery length plus a faster recovery and favorable results
- Is simplified, making it a more efficient procedure to the surgeons (especially unexperienced)

20.6.4 Autospreader Flap Technique

According to the advanced cartilage conservation technique, the autospreader flap turning method is used if dorsal lowering is essential. Autospreader flaps seem effective in preventing nose obstruction after surgery, segmental (inverted V) form, axial asymmetry of the midface, and overdone supratip break. When utilizing autospreader flaps, the superior lateral cartilage as well as septum can be preserved. The duration of surgery is decreased plus keeping the dorsal aesthetic lines as well as internal valve performance [21]. It is not complicated and is beneficial to shape the dorsum along with keeping the internal valve performance in primary cases. Nasal framework subperichondrial dissection by preserving the dynamic musculoaponeurotic system and managed manipulating and also repairing the ligaments with no disruption of the covered soft tissue makes aesthetic lines to be reshaped [23].

20.6.4.1 Indications and Contraindications

In cases characterized by long noses, prominent dorsal hump, shorter bones, and low LLCs, autospreader method is appropriate. A dorsal hump lowering of 3 mm or over is needed. Hence, cases characterized by a deviated dorsal septum, asymmetric dorsal esthetic lines, and improper size of ULCs at the caudal terminal of the septum cannot use this method. They should consider conventional spreader grafts collected from the septum, probably mixed with autospreader flaps (Fig. 20.26) [23].

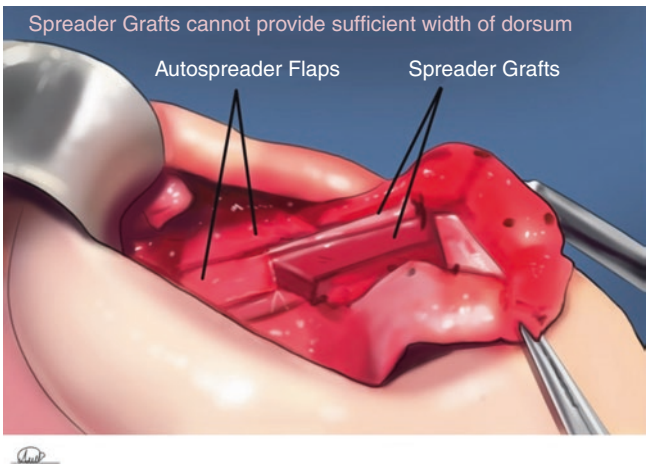

Fig. 20.26 Combined application of spreader grafts (Drawing by A. Babaei, 2021, reproduced with permission)

20.6.4.2 Restrictions

The most common problem with this technique is its lack of proper dorsal wideness than spreader grafts. Autospreader flaps are not sufficient to offer proper sustainability at the presence of bony sidewall collapse. Accordingly, conventional spreader grafts extending over the keystone should be used. When autospreader flaps are not effective in offering appropriate wideness from the anterior septal angle, it can be supported by spreader grafts [23].

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