

Subtotal Septal Reconstruction by Using Conchal Graft

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Abstract

Loss of the cartilaginous nasal septum, a condition frequently encountered in the practice of nasal surgery, can vary in scale depending on its etiopathogenesis. Previous surgery, trauma, and infection can lead to subtotal absence of the septum with severe functional and aesthetic problems. Use of the auricular concha for reconstructive purposes proves an immediate and effective method making it possible to replace the missing tissue without involving operations of a more invasive nature. The fundamental problem in the use of the auricular concha is making this type of cartilage as similar as possible to the cartilaginous septum, endowing it with the structural strength and straightness required for support and the respiratory function. Surgical procedures with the use of figure-eight sutures and grafts of cartilage harvested from the concha prove capable of performing this major task of morphofunctional transformation. The article describes the phases involved in achieving the set objectives.

Keywords

- ▶ septal reconstruction
- ▶ conchal graft
- ▶ spreader graft

The importance of the cartilaginous nasal septum in determining an efficient respiratory function and harmonious aesthetic appearance has been known since the dawn of nasal surgery. Unfortunately, more often in the past but still quite frequently today, surgeons obsessed with the need to remove as much of the cartilaginous septum as possible end up causing the structural collapse of the lower two-thirds of the nose. On the contrary, the need must be borne in mind in every case to preserve a supporting L-shaped septal structure, which must not be removed in the event of deviation but only reshaped as required. Major loss of the cartilaginous septum can also be due to traumatic causes, which act in different ways, or less frequently to infection or malformation. One element common to all these conditions is the fact that the mucoperichondrial covering remains intact but no longer contains the cartilaginous tissue, thus creating major morphofunctional problems. Great importance attaches to this anatomical element in terms of reconstruction, as it differentiates this pathology from cases in which the mucoperichondrial covering is also absent and there is thus a perforation. The reconstructive surgical procedures are in

fact substantially different in these cases from those employed to repair perforations. Among the various possible materials for reconstruction of the cartilaginous nasal septum, the auricular concha is unquestionably more readily available than many others. On the one hand, this type of graft presents the difficulty of making an inherently curved and highly flexible structure straight and sturdy; on the other, its harvesting leaves no mark and entails no particularly high degree of manual dexterity. The most important task of the surgical procedure is therefore to adapt the auricular tissue after harvesting for reconstructive purposes by making it as similar as possible to the missing cartilaginous septum.

Etiopathogenesis

Loss of the cartilaginous septum is frequently due to its removal as part of an erroneous surgical procedure. The presence of a deviation of the cartilaginous septum that involves the caudal most (or also dorsal) portion can prompt surgeons to undertake excessive resection in an attempt to correct these flaws, failing to bear in mind that the supporting

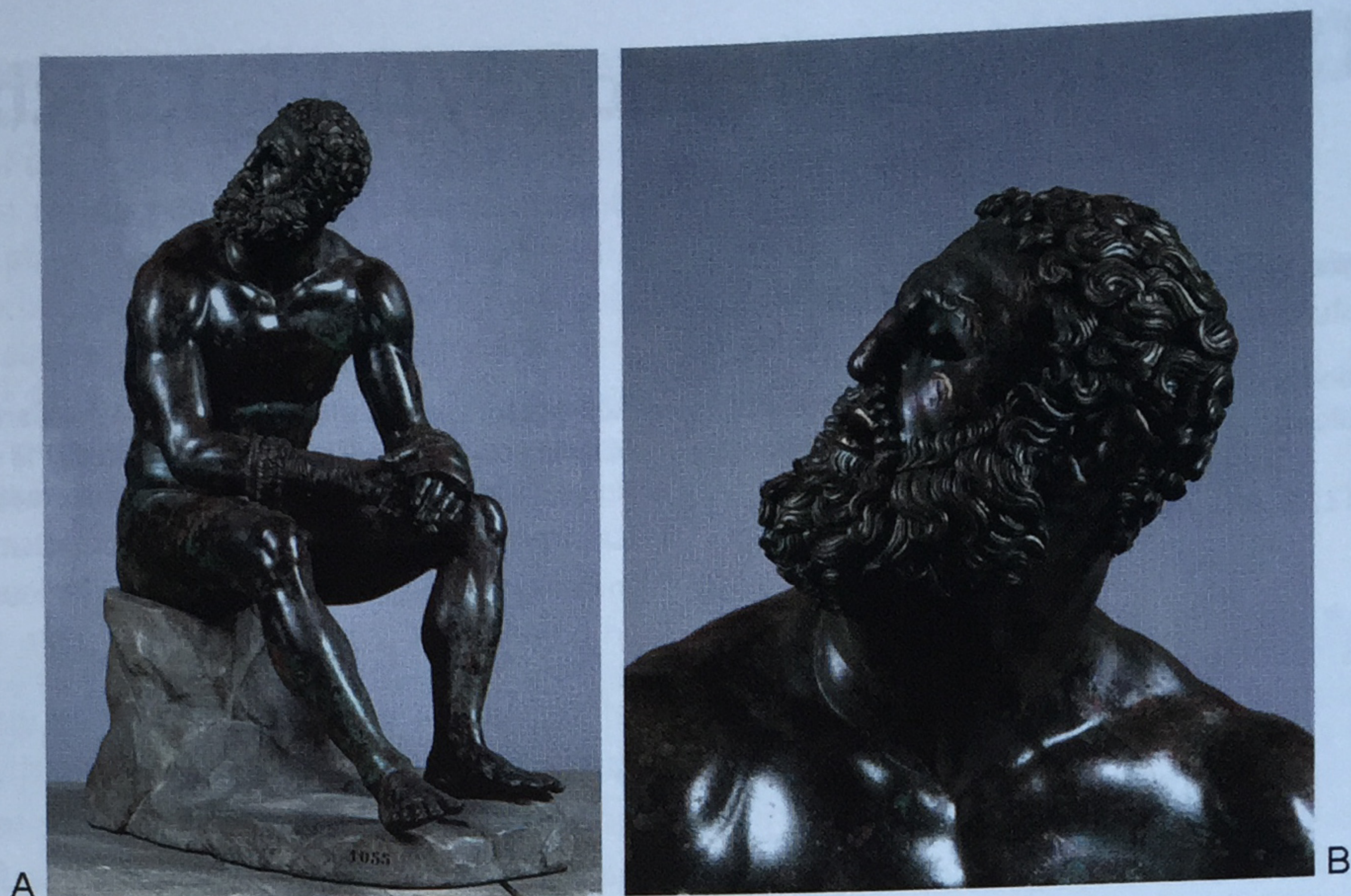


Fig. 1 (A) *The Seated Boxer*, bronze statue of the fourth century BC attributed to Lysippus (Rome, Museo Nazionale Romano). (B) Enlarged detail of the boxer's face showing the collapse of the lower two-thirds of the nose due to destruction of the septum as a result of repeated trauma.

function of the septum must always be preserved. It should also be pointed out that while deviation of the cartilaginous septum can lead to deviation of the nasal pyramid, total absence of the septum can lead just as well to deviation of the nasal axis. The correction of severe deviation of the septum involving also the dorsal and caudal pillar can be effected either through extracorporeal reshaping or techniques making use of spreader grafts. Removal must therefore always be undertaken with great prudence and it is advisable in any case to preserve a supporting L-shaped structure with a width of at least 1 cm in every part. When loss of the cartilaginous septum is due to traumatic causes, it is necessary to distinguish the modality of action of the event in question. It is possible to find severe maxillofacial traumas that determine the shattering and resorption of the cartilaginous septum or continually repeated traumas of a less severe nature. The latter occur in competitive sports and can even lead to collapse of the lower two-thirds of the nose, a phenomenon known also in ancient times (►Fig. 1A, B).

Another possible cause is the onset of a serious cartilaginous infection of the abscess-generating kind determined either spontaneously or subsequent to infection of a subperichondrial hematoma. In the latter case too, the origin can be a surgical or traumatic event. Finally, a more or less severe malformation of the cartilaginous septum since birth can be responsible for the absence of the septum, but such cases are unquestionably less frequent.

The consequence of subtotal absence of the cartilaginous septum, regardless of its cause, is collapse of the lower two-thirds of the nose with varying degrees of ptosis or drooping of the nasal tip. In esthetic terms, a further problem is generally constituted by the presence of a particularly acute nasolabial angle, a deformity found particularly distasteful by female patients. Saddle nose can also be present to varying degrees of severity. In frontal view, the nasal pyramid devoid

of adequate septal support has a flattened appearance with the axis often deviated to one side.

The respiratory function is seriously impaired in all patients presenting structural deficit of the cartilaginous septum in that the external and internal nasal valves are both collapsed and lack this major structural support for the passage of air.

Patient Analysis

The analysis of these cases rests largely on clinical and instrumental procedures capable of assessing the esthetic and functional damage precisely. As regards the esthetic aspect, importance attaches to the careful examination of preoperative photographs both to plan the precise degree of lifting of the lower two-thirds of the nose and to ascertain whether this type of reconstruction should be combined with other techniques of esthetic improvement. A small excision of the osseous hump can in fact often help also to make reconstruction of the nasal septum less onerous by facilitating realignment of the lower two-thirds with a less elevated upper third. Reshaping of the tip to increase projection by means of sutures or onlay grafts can also serve to complete reconstruction of the cartilaginous septum, and the use of simple plumping grafts can prove very useful to disguise a particularly acute nasolabial angle caused by the absence of the caudal septum.

In clinical terms, the first step is digital palpation inside the nasal cavities, which is the easiest way to assess the absence of the cartilaginous septum. Digital pressure on the nasal tip complex also helps identify subtotal absence of the septum (►Fig. 2). In cases where some doubt still remains, the application of pressure on the septal mucosa with a cotton swab combined with rhinoendoscopy offers a supplementary procedure of proven effectiveness.

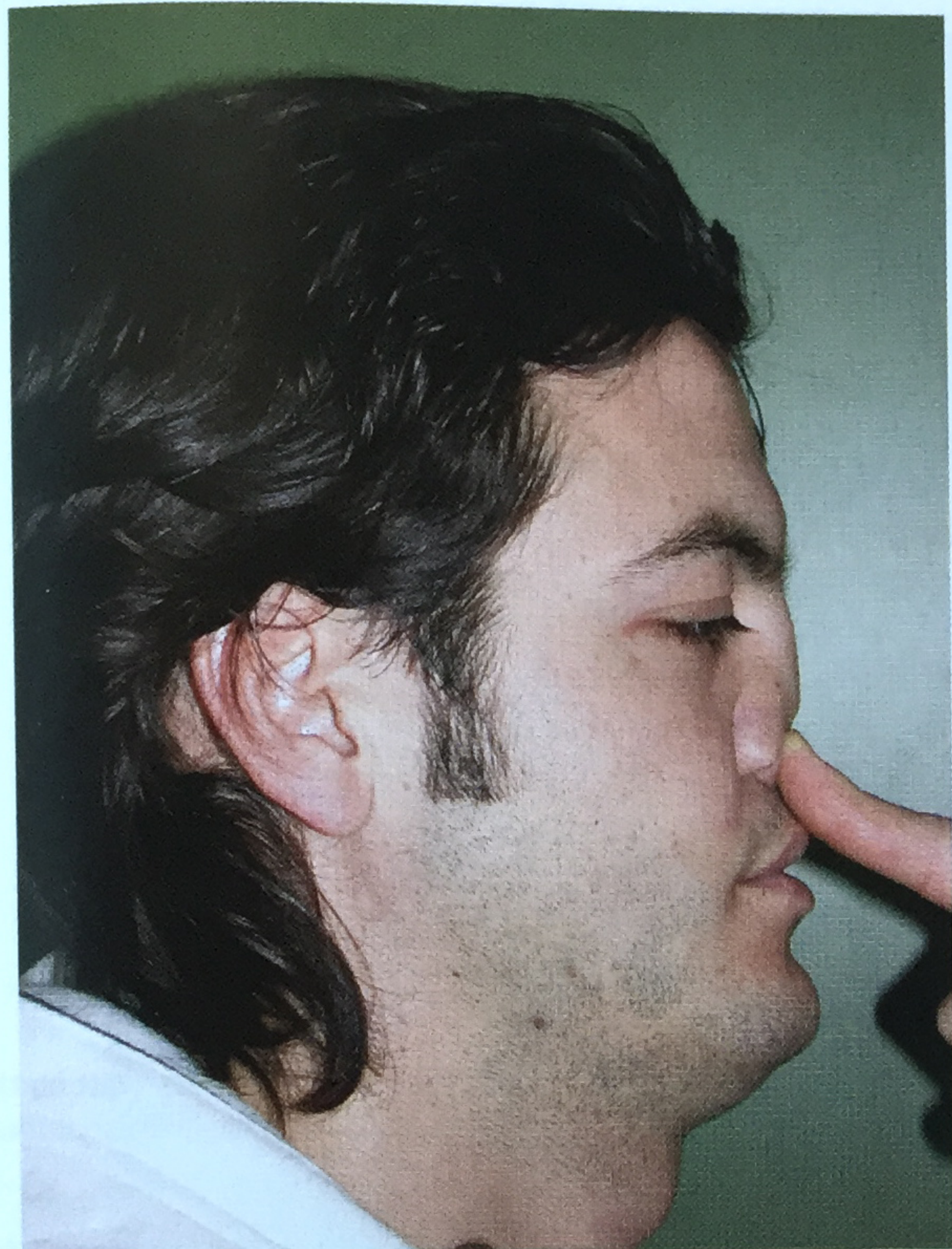


Fig. 2 Finger pressure revealing the absence of the cartilaginous septum.

Magnetic resonance examination of the nasal cavities can provide useful evidence of the absence of the cartilaginous septum. Among the instrumental examinations, particular attention should be drawn to active anterior rhinomanometry after decongestion by means of the Costantian-Clardy method.¹

Surgical Technique

Straightening of the auricular concha is achieved by means of incisions on the concave side combined with figure-eight sutures. The other objective of strengthening the dorsal side of the new septum and making it perfectly linear is attained by the insertion of one or two spreader grafts harvested from the concha. It is preferable to harvest conchal cartilage from the posterior surface of the auricular pavilion so as to avoid leaving a visible scar. Posterior detachment of the cartilage from the skin above can also be performed at the supraperichondrial level to obtain, if necessary, a perichondrium graft, which can be useful in completing the reconstruction. The posterior incision of the cartilage can be safely executed after marking out the line with needles or by running threads through from the anterior to the posterior surface of the pavilion (►Fig. 3A). This incision must leave the antihelix fold and the root of the helix intact so as to avoid any postoperative deformity of the pavilion (►Fig. 3B). The detachment of the cartilage from the skin in front should be performed at the subperichondrial level. The cutaneous incision can be sutured with 5.0 nylon or 5.0 Vicryl Rapide (Ethicon, Johnson & Johnson International),

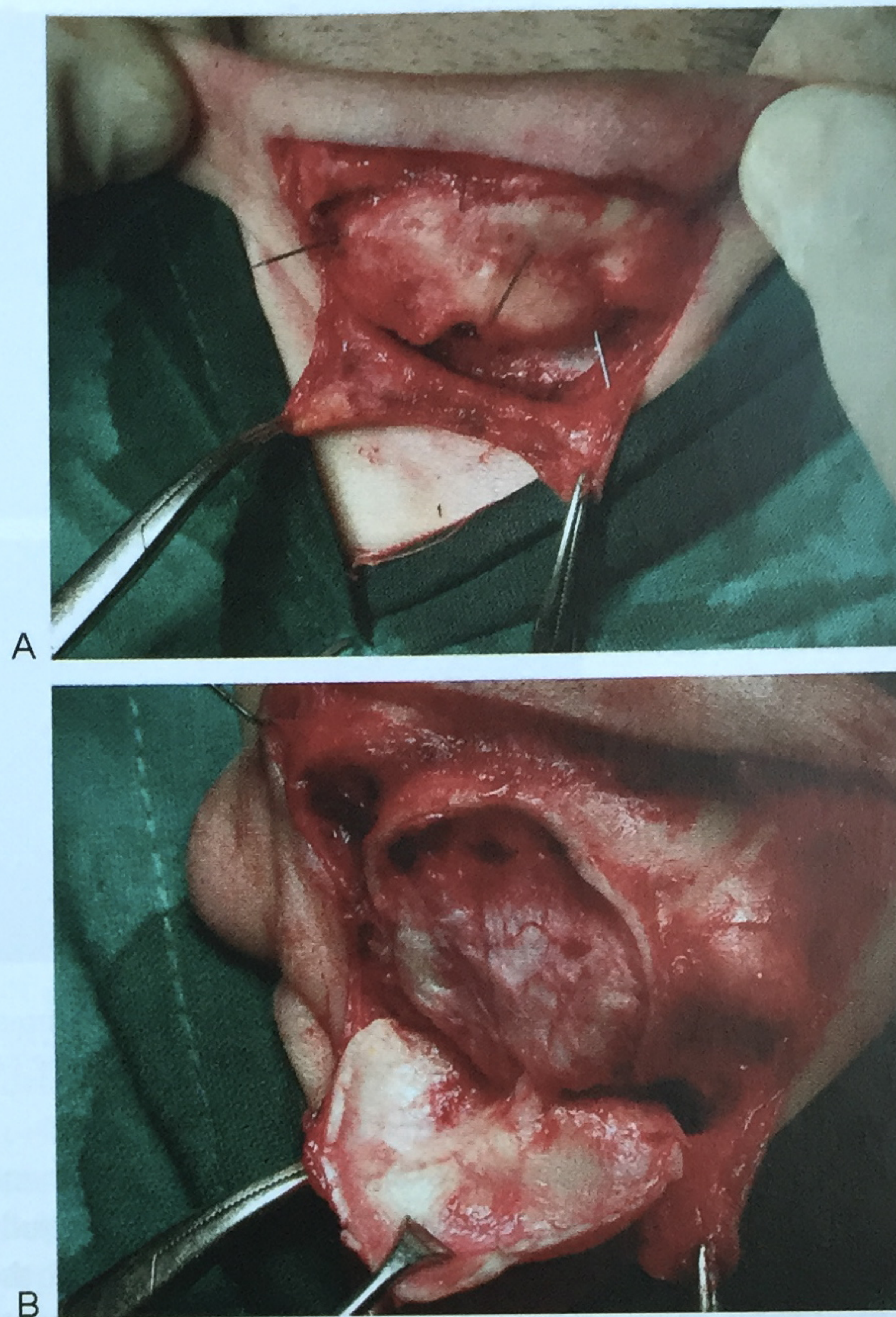


Fig. 3 (A) Positioning of needles for incision of the cartilage without altering the anatomical folds of the auricular pavilion. (B) Removal of the auricular concha so as to preserve the antihelix fold and the root of the helix.

thus avoiding any need for postoperative removal of the stitches. The cartilaginous concha can now be reshaped (►Fig. 4). Partial thickness incisions (4–5 on average) are executed on the concave side to weaken the cartilaginous spring. The maneuver is then completed with a figure-eight

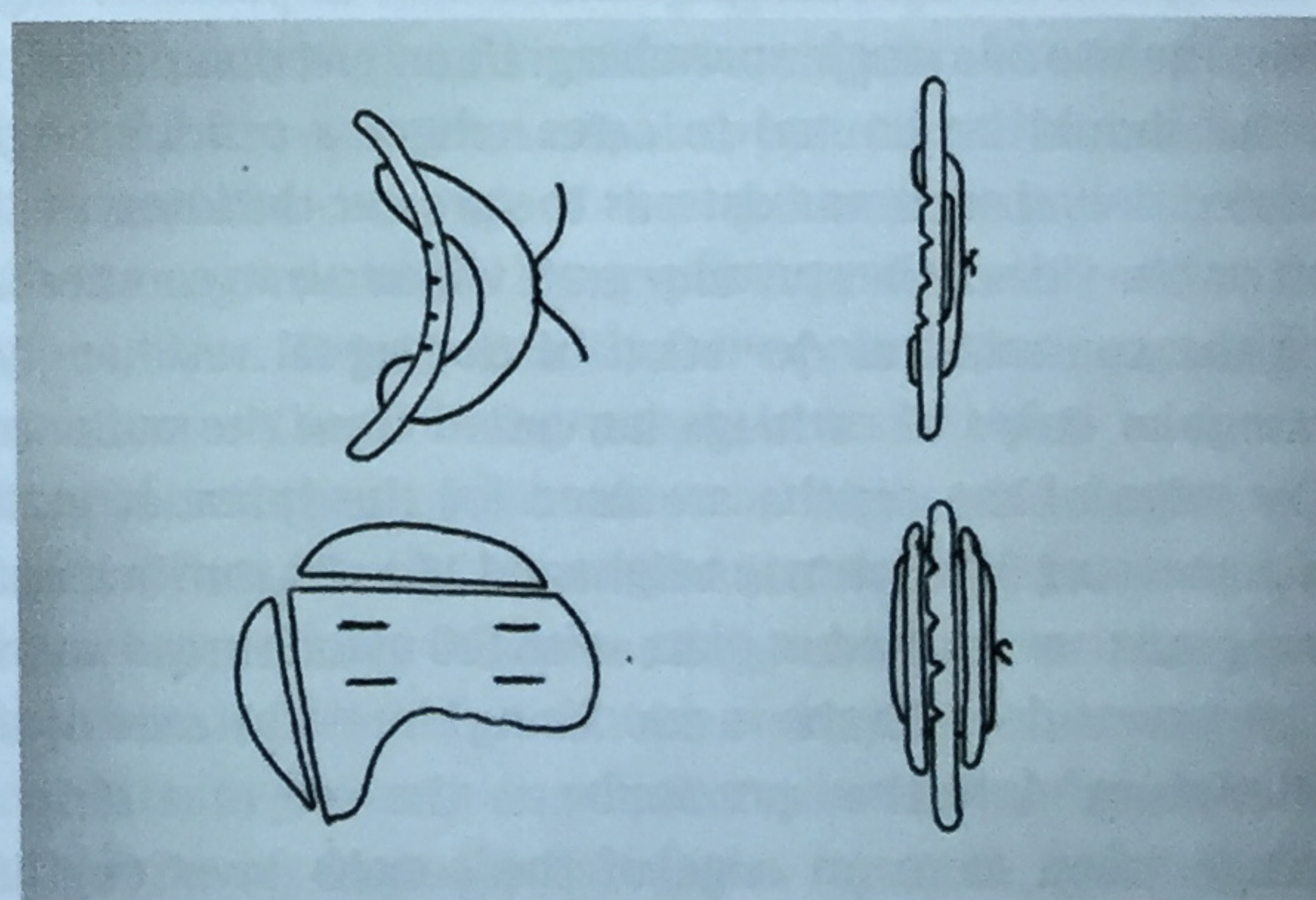


Fig. 4 Above left: incisions of curved conchal cartilage. Above right: figure-eight suture. Below left: harvesting of spreader grafts. Below right: placement of spreader grafts. (Reprinted with permission from Bocchieri).¹⁵

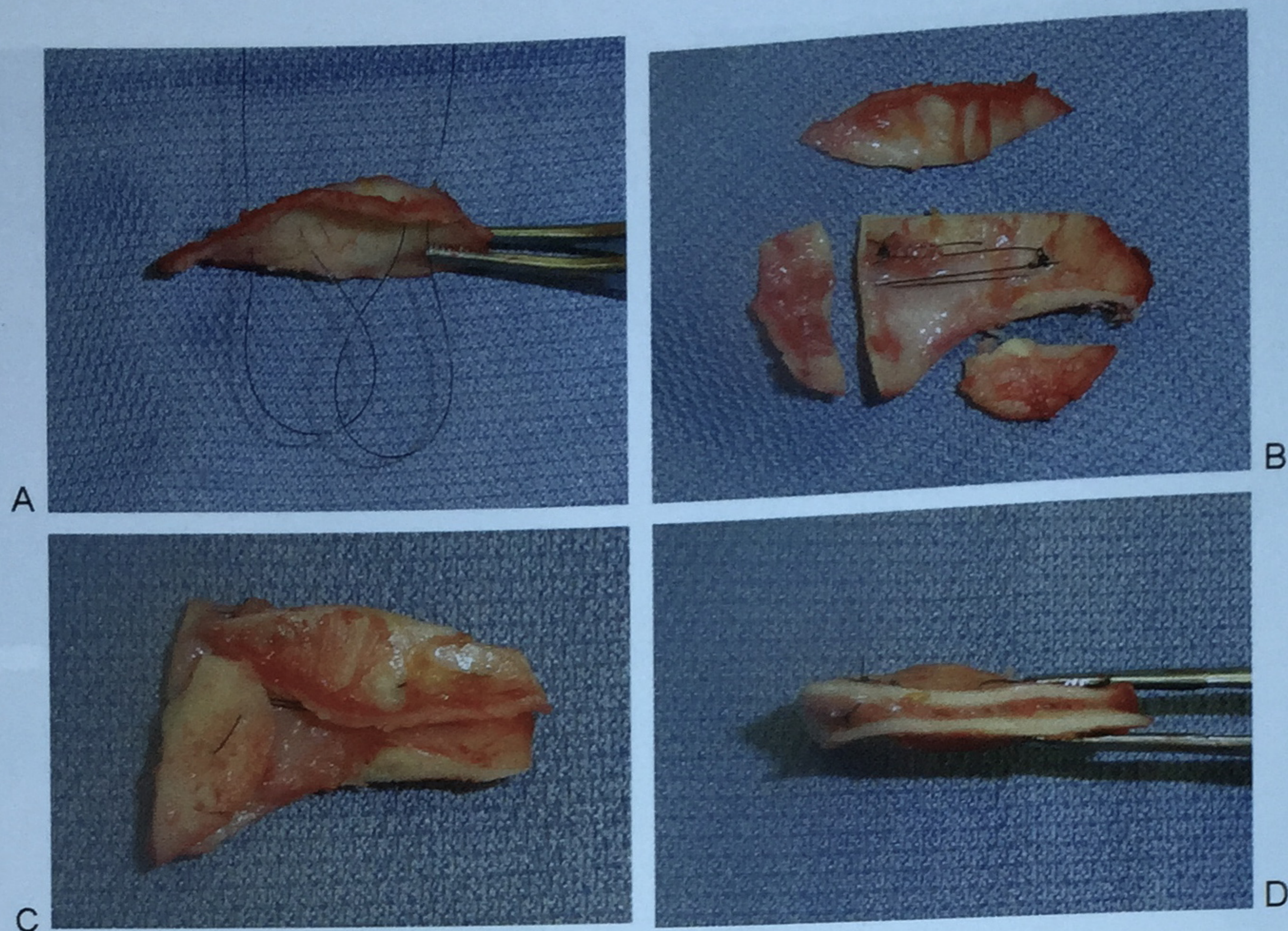


Fig. 5 (A) Placement of figure-eight suture. (B) Harvesting of three grafts from conchal cartilage. (C) Placement of one spreader graft on the dorsal portion of the conchal "neo-septum" and one graft on the caudal portion. (D) Helicopter view of the dorsal side of the "neo-septum."

suture, which opens the curve of the concha still further and secures it in the desired position. This step can be usefully simplified by making the needle enter the convex part at the most distant point, pass through the entire thickness to emerge from the concave part after approximately 3 to 4 mm, and reenter at a distance that can vary but will in any case reach the most distant edge of the convexity. Subsequently, also in this most distant portion, the needle will reenter from the concave to the convex side at a distance of 3 to 4 mm from the point of entry (► **Fig. 5A**). After this, in tying the knot, it is very important to modulate the intensity so that the curve of the cartilage can be realigned correctly without proving too much or too little. To be certain of attaining the set objective, it is advisable to make at least two figure-eight sutures and to use 5.0 nylon thread, which ensures a stable result over time (► **Fig. 5B**). The subsequent insertion of a spreader graft on one or both sides of the dorsal portion of the neoseptum serves to strengthen the conchal graft and further improve its alignment. The use of a single spreader graft on just one side of the concha should be limited to cases where a residue of the deviated dorsal septum exists, as the greater thickness of the graft on the side of the spreader graft will serve to counterbalance the contralateral deviation of the septal residue. Two rectangular strips of cartilage harvested from the outer and upper edge of the concha are used for the spreader grafts, which measure 3 to 6 mm in height and 15 to 25 mm in length. These grafts are sutured in place with 5.0 nylon thread so that the concave side is on the inside facing the dorsal side of the new septum. A further possibility is the use of a strip of cartilage taken from an edge of the concha to strengthen and straighten the caudal pillar of the "neo-septum" when this proves particularly weak and thin and/or crooked. Here too, the strip is sutured with 5.0 nylon with the concave part on the inside facing the caudal pillar (► **Fig. 5C, D**).

The open approach is very useful and indeed essential for the purposes of this surgical technique. The complex of the tip and the nasal dorsum is isolated in accordance with standard practice. In these cases, detachment of the two flaps of mucous membrane devoid of cartilage is particularly complex due to the absence of the septum and the presence of strong cicatricial adhesion. It can be facilitated by means of abundant infiltration of anesthetic solution with adrenalin to widen the plane of dissection. The operation must be performed with great care and attention starting with the separation of the two medial crura and continuing until posterior access is obtained to any residue of cartilaginous septum. The presence of a septal remnant is in fact very useful both to guide the line of dissection and as a point to which the conchal graft as a whole can be secured. In this connection, attention has already been drawn above to the utility of ascertaining the orientation of any septal residue as a factor affecting the placement of one or two spreader grafts and the positioning of the conchal graft as a whole. It is in fact clear that if the residue deviates to one side, the position and the thickness of the new septum must counterbalance this on the other. The last step consists of placing and securing the reshaped conchal graft between the two mucoperichondrial flaps (► **Fig. 6A, B**). The positioning maneuver presupposes the presence of a suitable pocket obtained during the previous operation of detachment. The graft as a whole is secured by suturing the new septum between the two alar cartilages by means of the tongue-in-groove technique, which also makes it possible to control the rotation and projection of the nasal tip. Two other types of suture are, however, necessary to ensure the stability of the graft as a whole. The first, which is easy to carry out with the open approach, secures the upper lateral cartilages, or what remains of them, to the dorsal part of the new septum. The second is a continuous quilting suture

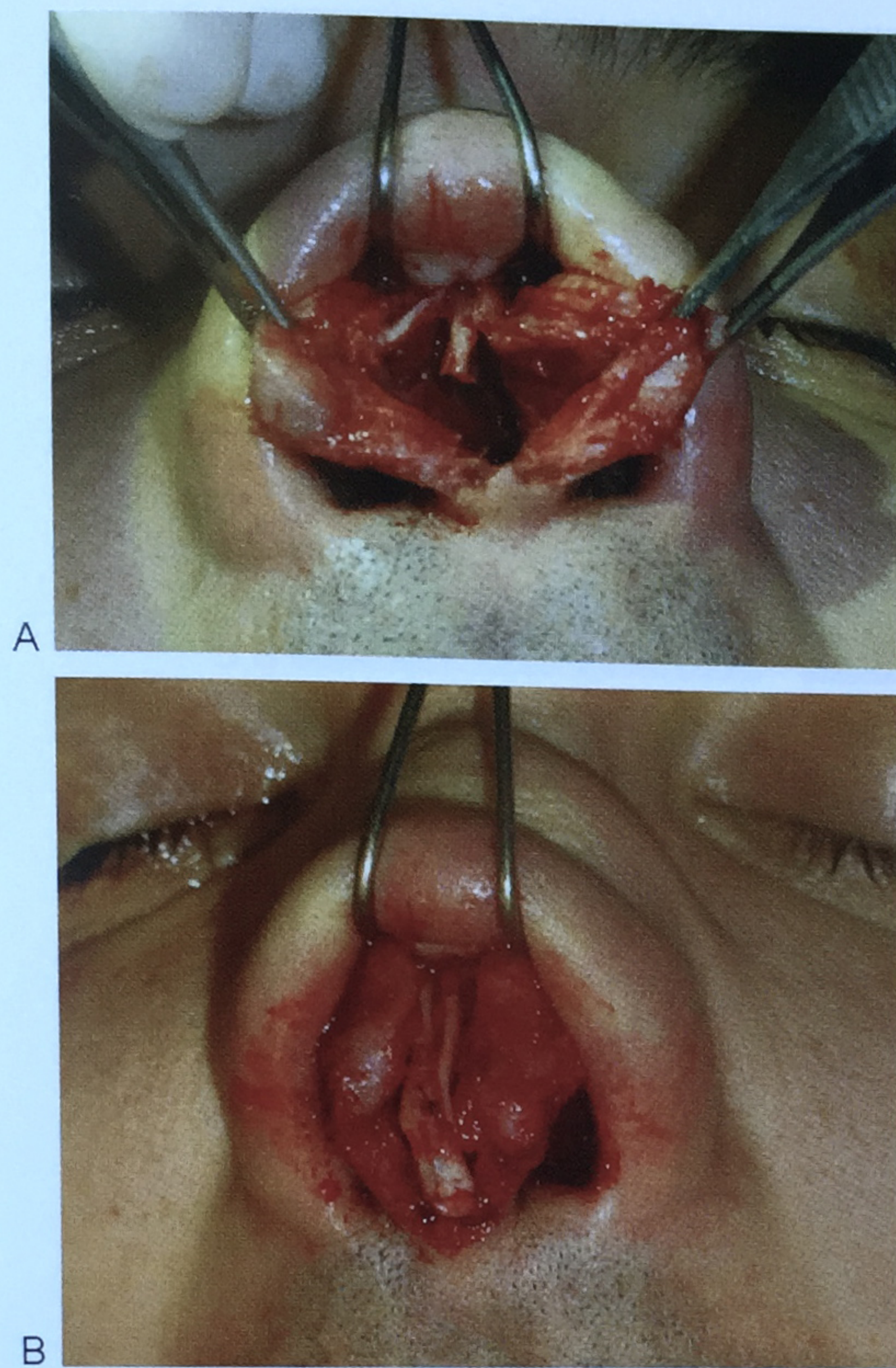


Fig. 6 (A) Absence of the septum. (B) Insertion of reshaped conchal graft between the two mucoperichondrial flaps.

with 4.0 Vicryl, which further secures the mucoperichondrium to the new septum and eliminates any empty spaces and possible hematomas. Any associated hump excision and osteotomies must be executed before insertion of the conchal graft, whereas other types of tip reshaping procedures and further placement of cartilaginous grafts can be executed subsequently with no contraindications.

Two typical cases of subtotal septal reconstruction by means of conchal graft are shown in ►Figs. 7 and 8.

Review

The use of the auricular concha for nasal reconstruction has a fairly long history. Peer pointed out the usefulness of grafts of auricular cartilage to correct the saddle nose deformity and demonstrated their resistance to resorption in 1941 and 1944.^{2,3} Auricular cartilage was in fact most frequently used to correct various degrees of saddle nose in the past. While Webster⁴ used it for less severe cases, Juri et al⁵ reported the use of both conchae to obtain a graft of greater thickness by superimposing various layers of cartilage. Other types of grafts obtained from the auricular concha for various purposes were described by Hage in 1975 (butterfly graft)⁶ and Falces and Gorney (gull-wing graft)⁷ to correct alar collapse. Muenker⁸ suggests the use of a two-layer sandwich graft of auricular concha to support the nasal tip and a three-layer graft for the dorsum. Following Juri, Endo et al⁹ suggest

the construction of a conchal graft with strips of cartilage, using incisions to release the tension and obtain a straight shape. This graft was used to correct the nasal deformities of no fewer than 1,200 patients over a period of 14 years. Arden and Crumley¹⁰ describe a technique to modify the natural curve of the auricular cartilage through morselization of the concave side and a figure-eight suture on the convex. For the purposes of reconstruction in cases of excessive resection of the septum, Farrior¹¹ proposes an L-shaped auricular graft to complete the caudal septum and replace both the columella and the nasal dorsum. Dyer and Yune¹² suggest a technique capable of providing effective support for the cartilaginous nasal skeleton and correcting a hyperrotated and underprojected tip with collapse of the nasal valve. The conchal graft involved consists of two layers of cartilage straightened by means of mattress sutures, incisions, and bending. The L-shaped graft of conchal cartilage described by Nakakita et al¹³ for the treatment of cleft lip and palate consists of two superimposed strips for the nasal dorsum and one strip to serve as a columellar strut. Neu¹⁴ proposes a combined graft of auricular cartilage and ethmoidal bone to ensure greater straightness and robustness. In the case of severe dorsal defects, the same author combines a graft of bone with an L-shaped conchal graft to reconstruct the cartilaginous component when the septum is absent. Bocchieri¹⁵ proposes an original technique for subtotal reconstruction of the nasal septum that combines a figure-eight suture with incisions on the concave side of the auricular concha to straighten the graft. The simultaneous use of two spreader grafts taken from the concha and secured to the same has proved effective to preserve the effect of straightening and reinforce the structure. Pirsig¹⁶ suggests reconstruction of the anterior nasal septum by means of a “back-to-back autogenous ear cartilage graft” harvested from the cavum concha, which proves effective in the correction of saddle nose. Koch and Friedman¹⁷ proposes a modification of this graft, which is used as a medial crura extension graft and also for reconstruction of the caudal septum.

Discussion

The absence of the cartilaginous septum constitutes a major functional and esthetic impairment of the nasal pyramid. Providing essential support for the middle nasal vault and the complex of the tip, the septum is indispensable as regards both the respiratory function and esthetic appearance. Together with the upper lateral cartilages, it constitutes the internal nasal valve and also ensures the normal stability of the alar cartilages and hence of the external nasal valve. Loss of the cartilaginous septum to any degree, especially in the caudal portion, gives rise to major problems of both functional and esthetic nature in that insufficiency of both nasal valves is combined with collapse of the lower two-thirds of the nose. In esthetic terms, drooping of the tip, columellar retraction, and an acute nasolabial angle constitute the stigmata of this pathological condition. As regards reconstruction, the nasal septum can be replaced with cartilage from the rib or the auricular

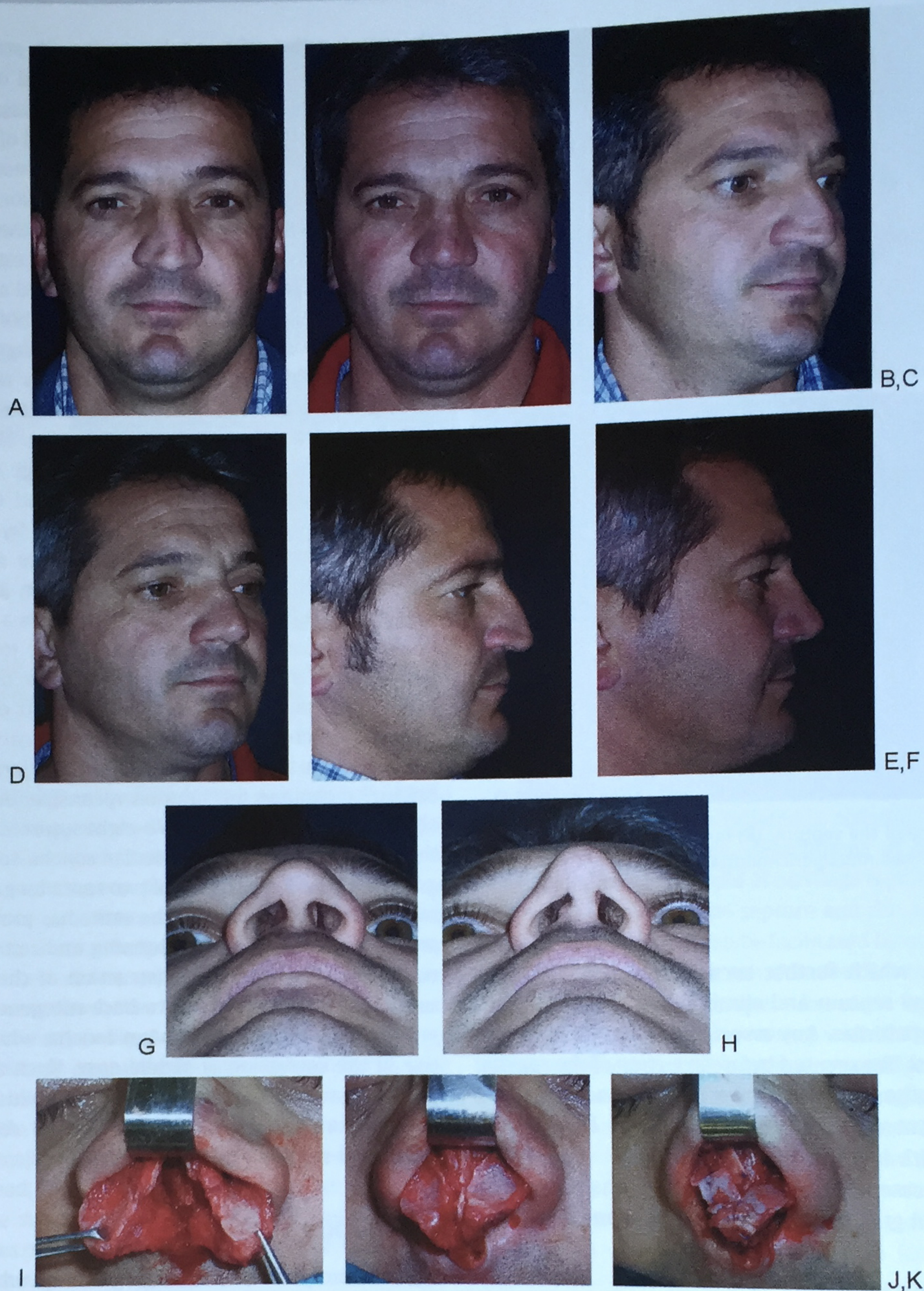


Fig. 7 A 42-year-old man with septal absence caused by a previous operation. (A,C,E,G) Preoperative views. (B,D,F,H) Postoperative views 3 years after surgery. (I) Intraoperative view showing the septal absence. (J) Intraoperative view: positioning of the conchal graft in place of the missing septum. (K) Other procedures were performed to correct tip projection and definition (shield graft), lateral crura concavity (barrel roll technique),¹⁹ and alar collapse (alar batten graft).

concha. Costal cartilage presents some negative aspects that make it second best as a choice. Apart from the visible scar left in the thorax, the greatest drawback of this type of graft is the tendency to warp over time. While numerous ways of avoiding this type of complication have been put forward, including incisions in some precise directions and the internal use of Kirchner thread, they fail to provide complete protection against this type of outcome. Moreover, the graft presents a certain degree of rigidity and fragility at the same time.¹⁸

The cartilage of the auricular concha is of the elastic kind and can be bent to a considerable degree without breaking, thus proving particularly suitable for insertion in the nasal pyramid, which is exposed by its very location to numerous stresses. Moreover, unlike costal cartilage, the conchal graft shows no tendency to warp over time. These positive elements are, however, unfortunately combined with some negative characteristics that make its use problematic. As is well known, the auricular concha is particularly curved rather than straight and tends to revert to its original shape.



Fig. 8 A 37-year-old woman presenting congenital subtotal septal absence. (A,C,E) Preoperative views. (B,D,F) Postoperative views 2 years after surgery.

Moreover, it is insufficiently robust to serve as an effective supporting structure. The techniques that employ it as a replacement for the cartilaginous septum must therefore necessarily address and correct these negative aspects. Among the methods put forward in the literature to adapt the auricular concha for replacement of the nasal septum, those that use grafts of ethmoidal bone attached to the auricular graft for purposes of positioning and reinforcement are certainly useful in some respects but open to criticism in others. The harvesting of ethmoidal bone is by no means easy in that it entails detachment of the mucous membrane in a very posterior area. Moreover, the superimposing of an osseous structure does nothing to preserve the precious elasticity of the auricular graft. The technique employed to reshape and strengthen the concha by means of figure-eight sutures and autospreader grafts makes the conchal graft particularly effective while preserving its natural flexibility. The incisions on the concave side of the concha interrupt the intrinsic forces of the cartilage and the figure-eight sutures serve to straighten it and keep it in the desired position. The spreader grafts harvested from the same concha and secured to the dorsal region of the new septum strengthen the graft and make it particularly straight. The experience of about a decade since the technique was first described has led to its evolution with the possibility of employing just one spreader graft for the same purposes but with greater facility. In some cases,

when the concha is sturdier and less curved, a single spreader graft can in fact perform the same functions perfectly well. Moreover, when residues of the dorsal septum are present in a posterior but lateral position, the greater thickness given by a spreader graft on one side of the graft can counterbalance the deviation and make the median axis of the nasal pyramid perfectly straight. Another important element to be borne in mind during the reshaping of the concha is the adaptation of one or both spreader grafts to the curvature of the concha in such a way as to balance concavity with convexity and obtain a compact, uniform element. To this end, a further cartilaginous graft can also be sutured to the part of the new septum corresponding to the caudal pillar, which will then be secured in place between the two medial crura, so as to strengthen and straighten it. The securing of the reshaped conchal graft is a particularly important surgical phase as regards protecting the result from any sagging or notching of the profile. The greater the number and the precision of the sutures to the surrounding structures, the greater the stability of the results over time. The insertion and securing of the conchal graft between the two medial crura constitutes the first step in this procedure of stabilization. The second is the suturing of the graft between the two upper lateral cartilages and to any existing residue of the posterior septum. The third important step is the quilting suture to secure the new septum between the two previously

separated mucoperichondrial flaps. In addition to avoiding possible empty spaces and hematomas, this suture helps to keep the conchal graft in place and prevent it from slipping downward in time due to gravity.

Conclusions

While replacement of a missing cartilaginous septum due to previous surgery, trauma, or malformation is not the only problem of reconstruction addressed in rhinoplasty, this procedure is always one of crucial importance. An effective pillar of support is in fact the prerequisite for valid employment of any other grafts and sutures. Particular underprojection of the tip can sometimes require further grafts of the Peck or shield type, which must necessarily have the support of a straight and sturdy structure. In other cases, pinching of the lateral walls of the nose requires the simultaneous application of alar batten grafts, which must again be positioned symmetrically with respect to a perfectly straight septal median structure. A particular degree of saddle nose can require a further onlay graft of conchal cartilage that will in turn require the support of a sufficiently sturdy and stable reconstructed septal structure. In the experience of the present authors and others, the auricular concha has proved a valid type of graft capable of performing the important task of reconstructing the nasal septum. The combination of partial thickness incisions on the concave side of the concha and figure-eight sutures has proved effective in straightening its natural curve. Moreover, the placement of one or two spreader grafts harvested from the same concha and secured in the area corresponding to the dorsum of the new septum has proved very useful to straighten and strengthen the graft. After reshaping, the structure of auricular cartilage attains the same qualities of robustness, elasticity, and flexibility as the cartilaginous nasal septum. The functional and esthetic improvement in the cases treated has always been more than satisfactory. In particular, the graft has proved valid in correcting collapse of the lower two-thirds of the nose, columellar retraction, and drooping of the nasal tip.

References

- 1 Constantian MB, Clardy RB. The relative importance of septal and nasal valvular surgery in correcting airway obstruction in primary and secondary rhinoplasty. *Plast Reconstr Surg* 1996;98(1):38-54; discussion 55-58
- 2 Peer LA. Fate of autogenous septal cartilage after transplantation in human tissues. *Arch Otolaryngol* 1941;34:696-709
- 3 Peer LA. Cartilage grafting. *Surg Clin North Am* 1944;24:404-419
- 4 Webster GV. Random reflections on rhinoplasty. *Plast Reconstr Surg* 1967;39(2):147-152
- 5 Juri J, Juri C, Elías JC. Ear cartilage grafts to the nose. *Plast Reconstr Surg* 1979;63(3):377-382
- 6 Hage J. Collapsed alae strengthened by conchal cartilage (the butterfly cartilage graft). *Br J Plast Surg* 1965;18:92-96
- 7 Falçes E, Gorney M. Use of ear cartilage grafts for nasal tip reconstruction. *Plast Reconstr Surg* 1972;50(2):147-152
- 8 Muenker R. The bilateral conchal cartilage graft: a new technique in augmentation rhinoplasty. *Aesthetic Plast Surg* 1984;8(1):37-42
- 9 Endo T, Nakayama Y, Ito Y. Augmentation rhinoplasty: observations on 1200 cases. *Plast Reconstr Surg* 1991;87(1):54-59
- 10 Arden RL, Crumley RL. Cartilage grafts in open rhinoplasty. *Facial Plast Surg* 1993;9(4):285-294
- 11 Farrior EH. Revision rhinoplasty for monographs in facial plastic surgery contemporary rhinoplasty. *Facial Plast Surg* 1997;13(4):299-308
- 12 Dyer WK II, Yune ME. Structural grafting in rhinoplasty. *Facial Plast Surg* 1997;13(4):269-277
- 13 Nakakita N, Sezaki K, Yamazaki Y, Uchinuma E. Augmentation rhinoplasty using an L-shaped auricular cartilage framework combined with dermal fat graft for cleft lip nose. *Aesthetic Plast Surg* 1999;23(2):107-112
- 14 Neu BR. Combined conchal cartilage-ethmoid bone grafts in nasal surgery. *Plast Reconstr Surg* 2000;106(1):171-175
- 15 Bocchieri A. Subtotal reconstruction of the nasal septum using a conchal reshaped graft. *Ann Plast Surg* 2004;53(2):118-125
- 16 Pirsig W. The auricle in the visual arts. *Facial Plast Surg* 2004;20(4):251-266
- 17 Koch CA, Friedman O. Modified back-to-back autogenous conchal cartilage graft for caudal septal reconstruction: the medial crural extension graft. *Arch Facial Plast Surg* 2011;13(1):20-25
- 18 Gunter JP, Clark CP, Friedman RM. Internal stabilization of autogenous rib cartilage grafts in rhinoplasty: a barrier to cartilage warping. *Plast Reconstr Surg* 1997;100(1):161-169
- 19 Bocchieri A, Marianetti TM. Barrel roll technique for the correction of long and concave lateral crura. *Arch Facial Plast Surg* 2010;12(6):415-421