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Subtotal Reconstruction of the Nasal Septum Using a Conchal Reshaped Graft

Armando Boccieri, MD

Abstract: The caudalmost section of the cartilaginous nasal septum performs the important function of supporting the middle and lower third of the nose. Its absence leads inevitably to deformation of the nasal pyramid and collapse of the internal nasal valve. The most frequent causes of its loss are iatrogenic and traumatic, and the mucoperichondrial lining remains intact in most cases. A graft of conchal cartilage constitutes the preferred method of reconstruction due to the capacity of the transplanted tissue to acquire characteristics of shape, elasticity, and strength closely resembling those of the original tissue to be replaced. The auricular concha differs in anatomic shape from the nasal septum and tends, when deformed, to return to its initial appearance due to cartilaginous memory. The auricular cartilage is also less robust than the quadrangular. The paper describes a surgical technique for reshaping of the conchal cartilage that makes it possible to obtain a practically straight conchal graft that will retain its stability over time with no risk of subsequent modification. The technique involves a double figure-of-8 suture together with incisions on the concave side of the graft for straightening purposes. The simultaneous use of 2 spreader grafts taken from and attached to the concha itself helps to maintain straightness and reinforce the structure. The graft is then placed in position via open access and secured between the 2 mucoperichondrial flaps after these have been carefully detached. The tissue and technique used make it possible to restore the original condition in anatomic and physiological terms, eliminating the esthetic impairment and regaining respiratory functionality.

Key Words: septal reconstruction, conchal graft, spreader graft

(*Ann Plast Surg* 2004;52: 000–000)

In the reconstruction of the nasal pyramid after operations or traumatic events, fundamental importance attaches to restoration of the supporting structure. The caudalmost section of the nasal septum, which physiologically performs this essential supporting function, is often erroneously removed during operations of septoplasty or rhinoplasty. The need to preserve at least an L-shaped supporting septal structure at the end of any operation is in fact now universally recognized.

Loss of the cartilaginous septum can also be caused by severe dislocation, crushing, and reabsorption processes stemming from traumatic pathology. This includes both severe traumas of the facial mass involving the nasal pyramid and traumas that are less severe but continually repeated over time, as can happen in some sports, for example. Absence of the cartilaginous septum due to malformation or phlogistic causes is less frequently observed in clinical practice.

This problem was often tackled in the past by means of techniques designed to camouflage the dorsal saddle with onlay grafts of different types, which offer little in terms of support and nothing at all in functional terms. More recent surgery uses grafts of costal or conchal cartilage to replace the missing structure in its original position. In addition to esthetic appearance and support, this way of addressing the problem also takes into account the inevitably associated problem of respiratory function.

Surgical Technique

The technique proposed for subtotal reconstruction of the nasal septum basically involves a graft of auricular conchal cartilage, reshaped by means of incisions and stabilizing sutures, and 2 spreader grafts, again of auricular cartilage, secured on either side of the "neo-septum" (Fig. 1). F1

Removal of the cartilage begins with careful infiltration of the anterior and posterior surfaces of the concha with Xylocaine plus a vasoconstrictor to facilitate subperichondrial detachment on both sides. A postauricular incision is preferred, as this leaves no visible mark. This is followed by subperichondrial detachment of a flap hinged at the rear, which leaves the posterior surface of the cartilage largely exposed. It is advisable at this point to mark the outline of the graft by inserting 4 or 5 needles into the anterior surface, taking care to leave the antihelix fold and the helix root in situ. The needles should emerge on the other side, thus making it possible to perform

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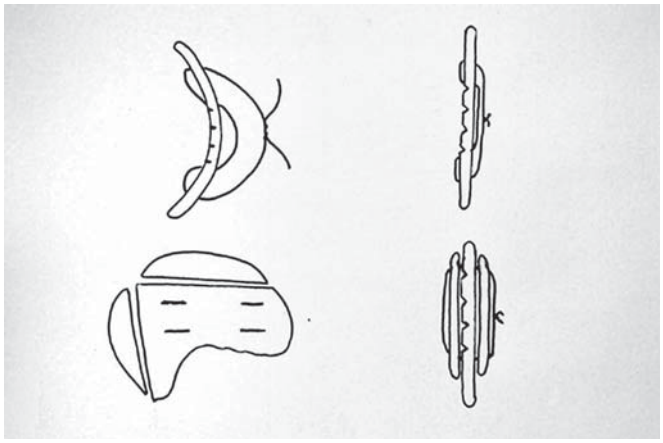

FIGURE 1. Above left, Incisions of curved conchal cartilage. Above right, Figure-of-8 suture. Below left, Harvesting of spreader grafts. Below right: Placement of spreader grafts.

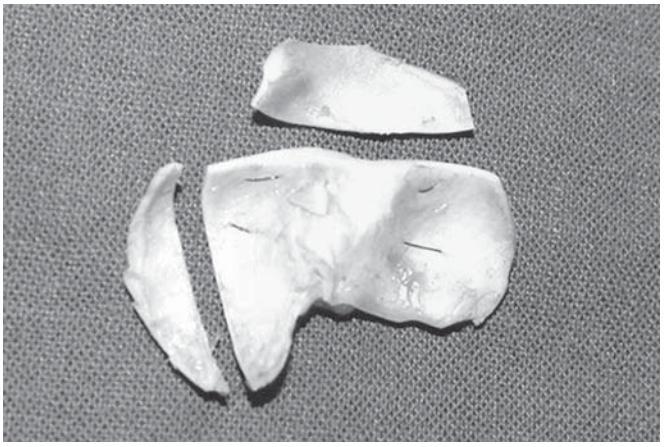

FIGURE 3. Harvesting of 2 spreader grafts from conchal cartilage.

incisions on the posterior surface of the conchal cartilage and leave all the anatomic creases of the auricular pavilion intact. The next step is the subperichondrial detachment of the anterior surface to the point where it is completely free and can be removed. The cutaneous incision is sutured with 5.0 nylon. The amount of cartilage thus obtained includes practically all of the concha. The conchal cartilage is then reshaped. A number of parallel incisions of partial thickness are made on the concave side of the cartilage, running perpendicular to the major axis of the graft. This is followed by 2 figure-of-8 sutures of 5.0 F2 nylon to straighten the curved piece of cartilage (Fig. 2). Two rectangular strips of cartilage are then removed from the graft measuring 3 to 6 mm in height and 1.5 to 2.5 mm in length, 1 from the outer edge of the concha and 1 from F3 the upper edge (Fig. 3). These roughly rectangular strips of cartilage are sutured with 5.0 nylon onto both sides of the concha itself, with the concave side facing inward to act as spreader grafts[1] (Fig. 4). F4

In the case of the small concha, the spreader grafts are useful in elongating the structure to be inserted. They can in fact be fixed so as to project posteriorly beyond the concha and thus extend one side to the degree required for reconstruction.

Nasal reconstruction is performed via open access, involving a columellar incision shaped like an inverted V and 2 marginal incisions. Careful detachment of the nasal dorsum makes it possible to expose and analyze the nasal structures still present. A remnant of dorsal-posterior septum can prove very useful to anchor the graft of conchal cartilage used to replace the missing septum. In any case, the medial crura must be divided and separated. The 2 flaps of mucoperichondrium, which no longer hold the cartilaginous septum, must

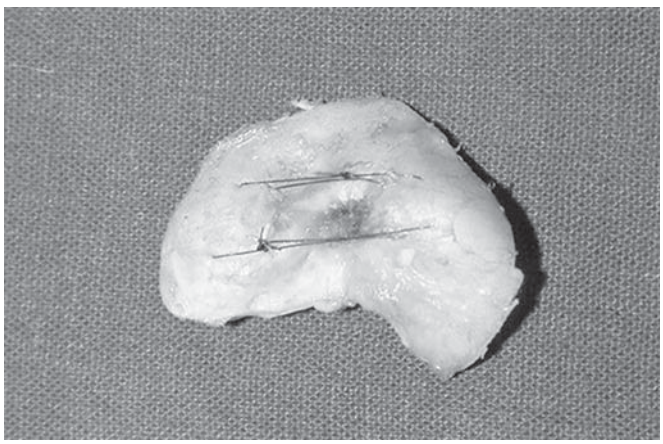

FIGURE 2. Placement of figure-of-8 suture on the convex side of the graft.

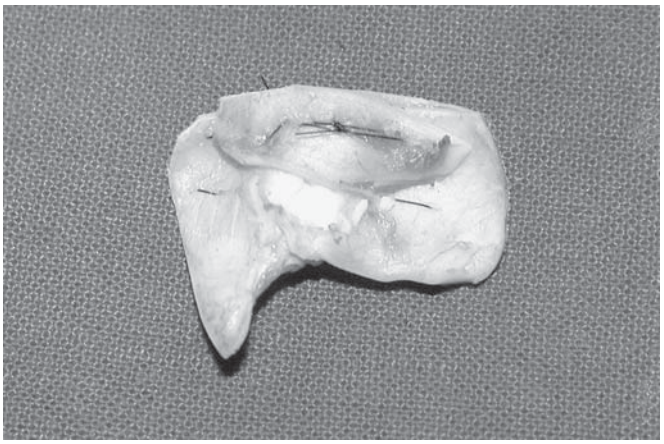

FIGURE 4. Placement of 1 spreader graft on the concave side of the concha.

also be separated, proceeding from the front to the rear. This operation is particularly difficult in that it is not possible to follow a preestablished anatomic plan and the 2 flaps stick stubbornly to one another. Separation can be facilitated, however, by means of abundant prior infiltration, the use of a scalpel, and progressive outward traction of the 2 flaps. It is advisable to proceed from downward from the top and backward from the front.

Once a suitable pocket has been obtained, the graft of conchal cartilage can be inserted between the 2 flaps of lining and secured to the surrounding structures (Figs. 5 and 6). Initial suturing can be applied to any existing remnant of the dorsal or posterior septum, and other sutures can in any case be used to secure the neoseptum to the triangular cartilages and inside the medial crura. In particular, the neoseptum is attached to the alar cartilages by means of buried sutures using the "tongue-in-groove" technique,[2] which also makes it possible to control the rotation and projection of the tip (Fig. 7). It is advisable also in this phase to use permanent sutures, ensuring greater stability over time. A continuous quilting suture of 4–0 Vycril secures the mucoperichondrium to the neoseptum and eliminates the dead space, thus preventing the formation of hematoma. Any associated excision of bony humps and/or osteotomies must be carried out before inserting the graft of conchal cartilage between the 2 mucoperichondrial flaps. On the other hand, it is preferable to correct deformities of the nasal tip after the septal structure has been rebuilt.

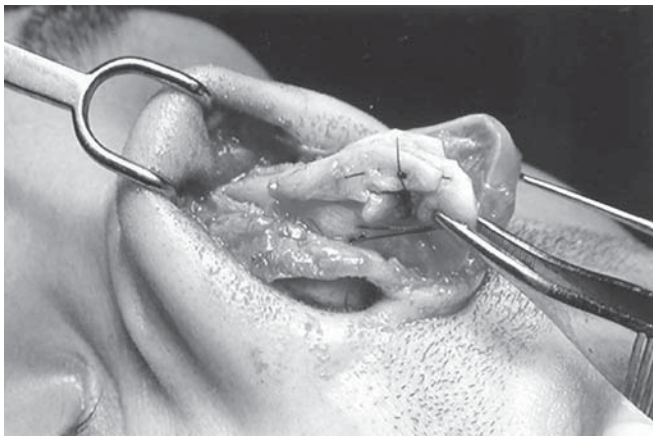

FIGURE 5. Insertion of reshaped conchal graft between the 2 mucoperichondrial flaps.

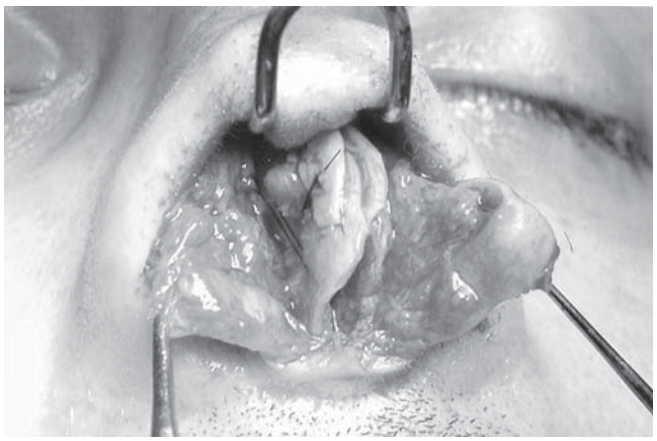

FIGURE 6. Positioning of graft in place of the missing septum.

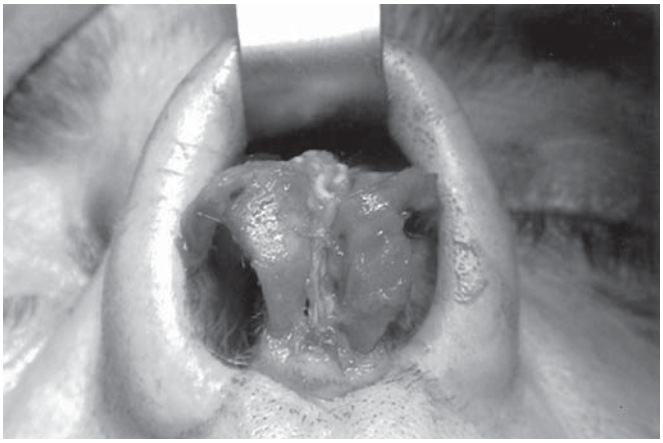

FIGURE 7. Suturing of graft between the 2 medial crura by means of the tongue-in-groove technique.

RESULTS

The technique involving a reshaped graft of auricular conchal cartilage together with spreader grafts was used with 24 patients: 15 male and 9 female. Of the 24 patients, 16 had undergone previous operations on the septum and/or rhinoplasty, 5 had suffered repeated trauma due to sporting activities (boxing and karate), and 3 severe maxillofacial traumas. All the cases presented severe loss of the cartilaginous nasal septum, with collapse of the middle and lower thirds of the nasal pyramid, saddle nose deformity, droopy tip, collapse of the internal nasal valve, and difficulty in nasal respiration.

It proved necessary in 5 cases to use a bilateral graft of auricular conchal cartilage to correct severe saddle nose deformity combined with loss of the caudal septum.

The follow-up ranged from 12 to 25 months (median: 18 months). Satisfactory results were obtained in 23 cases, in all of which the grafted cartilaginous structure proved useful in providing solid support for the nasal pyramid, harmonizing the profile and solving the functional problem.

Airway improvement was reported by the patients involved with a self-evaluation of nasal patency ranging from 0 (complete obstruction) to 10 (optimal airflow) in accordance with a protocol put forward by other authors.[3] Marked subjective postoperative improvement in the nasal respiratory function was registered in all the cases. The comparison of

preoperative and postoperative rhinomanometric measurements also showed substantial and objective improvement in nasal airflow for all patients. Anterior active rhinomanometry after decongestion was performed using the method described by Costantian and Clardy.[4]

A slight downward deflection of the septal graft occurred in 1 case together with slight unilateral difficulty in respiration, but no further operation was required. Revision proved necessary in only 1 case to correct a depression of the nasal dorsum caused by subsidence of the supporting structure over time. In this case, there was no posterior septal remnant to which the graft could be secured, and it was attached solely by means of sutures to the triangular and alar cartilages. In this corrective operation, the problem was solved perfectly by means of an onlay graft of controlateral conchal cartilage.

The clinical situations responding best to this method were in actual fact those characterized by the presence, however slight, of posterior-dorsal septal residues to which the conchal graft could be attached. In no cases was there subsequent and progressive shifting of the conchal graft such as to require a further operation to straighten and stabilize the cartilage.

Distortion of the donor site was registered in no cases, the utmost care having been taken during excision to leave the helix root and the antihelix fold intact.

The use of the conchal graft in reconstruction of the cartilaginous septum is illustrated in 2 cases. The absence of nasal septum was due in case 1 to prior septoplasty performed a few years earlier and in case 2 to a severe maxillofacial trauma that occurred 9 months before (Figs. 8-15).

F8-15

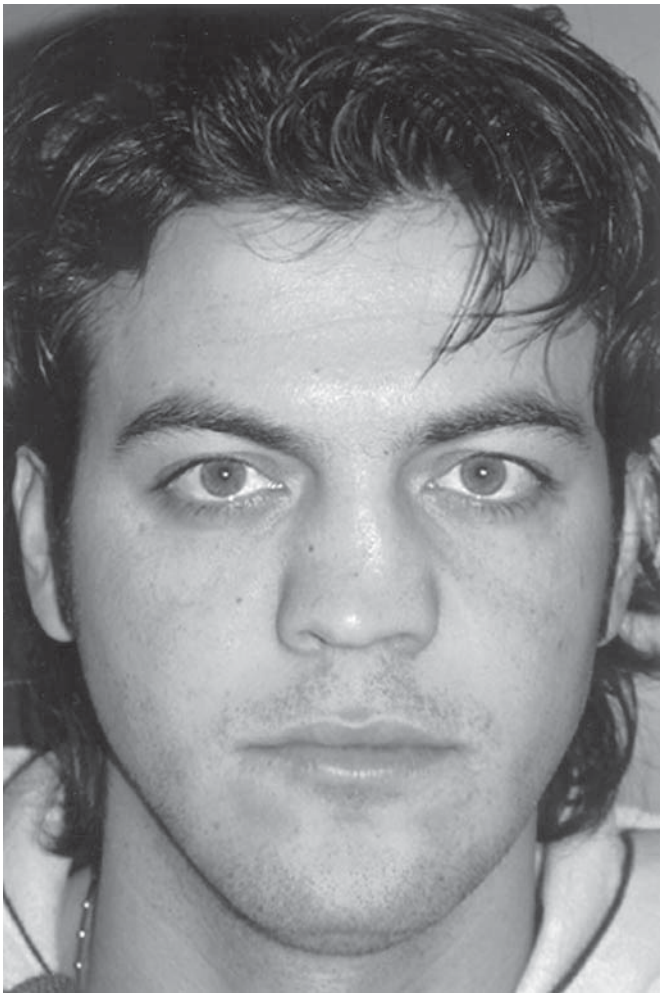

FIGURE 8. Case 1. Preoperative views.

DISCUSSION

Replacement of the cartilaginous septum constitutes a key stage in reconstructive operation on the nasal pyramid when this structure is absent. The nasal septum physiologically performs an important function of support not only for the middle nasal vault but also for the complex of the nasal tip. Together with the 2 triangular cartilages, it is also one of the constituent elements of the internal nasal valve, the integrity of which is essential with respect to respiratory functionality.

Loss of the nasal septum, and especially its caudalmost section, causes esthetic impairment due to depression of the nasal dorsum as well as droopy tip, columellar retraction, and a rather acute nasolabial angle.

Numerous techniques have been proposed over the years to restore the supporting structure of the nasal pyramid with grafts of costal or conchal cartilage.

In reconstructive operations where the caudal septum is missing, Meyer[5] uses open access, carefully separates the 2 flaps of the mucoperichondrium, and inserts between them the lower section of an L-shaped graft harvested from the costal cartilage. Kridel and Konior[6] describe the use of homografts of irradiated costal cartilage on no fewer than 117 patients and stress the low percentage of complications and negligible degree of reabsorption obtained. Gunter et al[7] propose a new technique with a Kirschner wire for the internal stabilization of autogenous costal cartilage grafts.

As an alternative to costal cartilage, Farrior[8] addresses cases of severe columellar retraction due to excessive septal resection by reconstructing the caudal septum and regularizing the septal angle with a large L-shaped graft of auricular cartilage, which provides both the nasal dorsum and the columella with effective support. Neu[9] focuses on the use of the auricular concha in rebuilding the nasal septum but regards its usefulness as limited because of its soft, elastic nature. He thus proposes a combined cartilage-ethmoid bone graft, which strengthens the cartilage of the graft while leaving it a certain degree of flexibility.

The cartilage of the nasal septum is of the hyaline type and presents characteristics of strength and elasticity that

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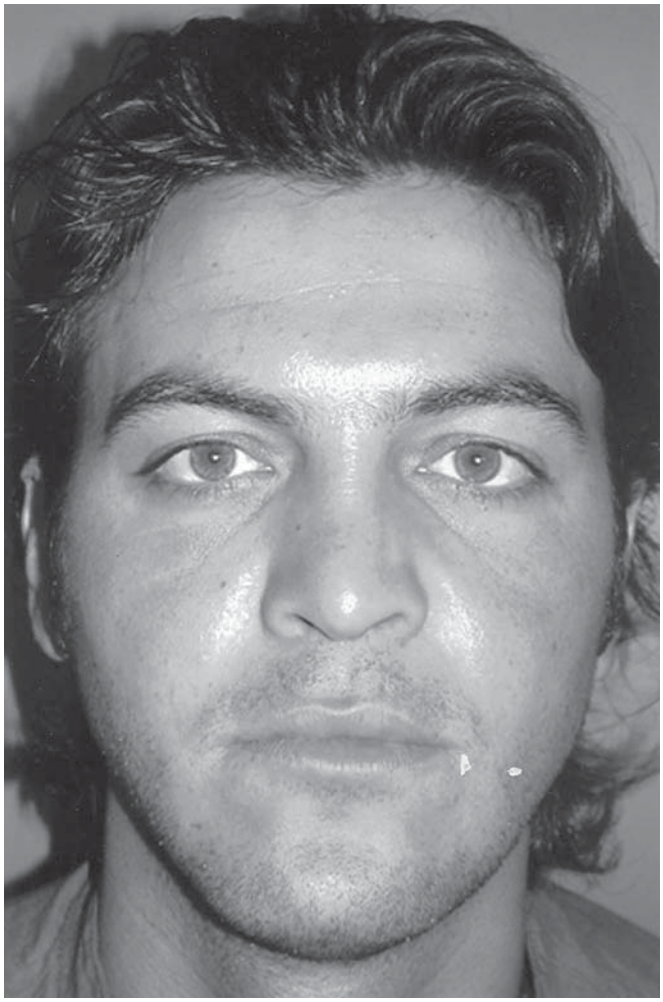

FIGURE 9. Case 1. Postoperative views.

FIGURE 10. Case 1. Preoperative views.

make it particularly suitable for the functions it is required to perform.

Though also of the hyaline type from the strictly histologic viewpoint, costal cartilage presents negative aspects that limit its validity as a replacement for the nasal septum. First, its harvesting involves not only an inevitable visible scar but also possible morbidity of the donor site. Second, it displays a particular tendency to warp over time, which can only be avoided by making incisions in certain precise spatial directions that restrict the possibility of reshaping.[10] In any case, it is difficult to handle and very rigid, while proving fragile due to its poor resistance to crushing. In older patients, it also presents calcification, which hampers reshaping.

The cartilage of the auricular concha is of the elastic type and can be bent to a considerable degree without splitting precisely by virtue of its matrix of close-packed elastic fibers. In addition to possessing this great degree of flexibility, it also lacks the tendency of costal cartilage to warp over time. Partial inclusion of the helical crus in the graft appears to play some part in preventing this complication.[11] On the other hand, it is typically curved in shape and hence very different from the straight nasal septum, and is not particularly strong for use as a supporting structure. The techniques in which ethmoid grafts are attached to a graft of conchal cartilage to strengthen the structure present a number of negative aspects. Attention should be drawn first of all to the difficulty of reaching the ethmoid in the posteriormost part of the septum in a situation in which the 2 mucoperichondrial flaps are closely attached to one another anteriorly. It should also be borne in mind that the overlying bony structure does not possess the same degree of elasticity as the cartilaginous structure to be replaced and is thus susceptible to splitting. Finally, grafts of this type have no effect on the functionality of the nasal valve.

The technique described here is designed to solve the dual problem of the curved shape and the limited strength of the conchal cartilage in such a way as to make this type of

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FIGURE 11. Case 1. Postoperative views.

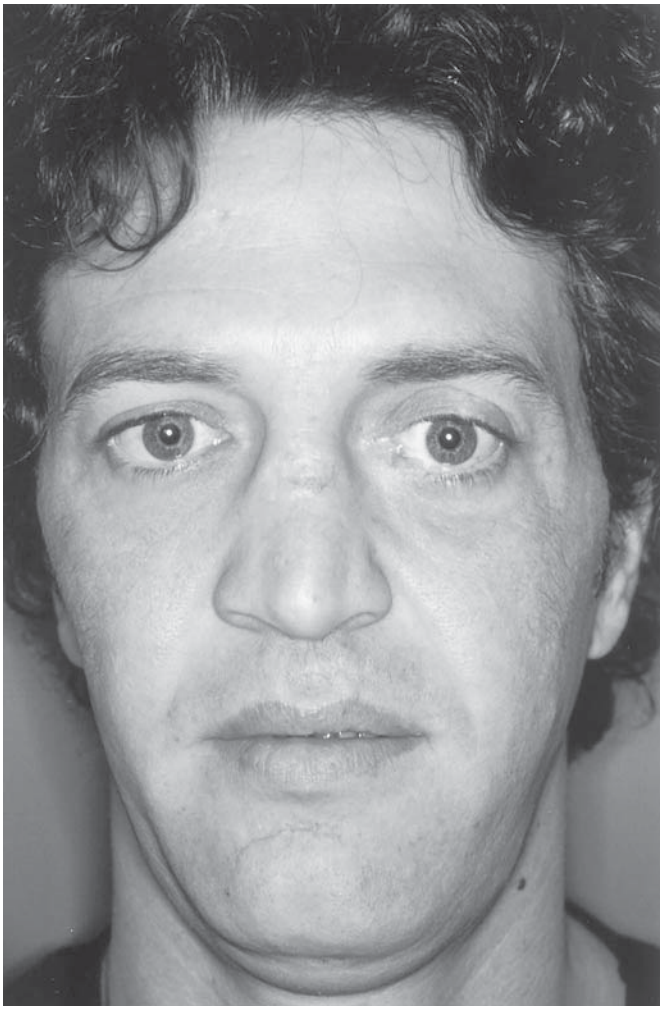

FIGURE 12. Case 2. Preoperative views.

graft the first choice in operations to correct defects of the nasal septum.

The incisions performed on the concave side of the concha serve to interrupt the internal stresses of the cartilage so that it can be opened, and the figure-of-8 suture is designed to ensure stable maintenance of the desired position over time until the cicatrization processes have been completed.

Obtained from the concha itself and attached to it in what corresponds to the dorsal position of the neoseptum, the spreader grafts help to keep the septum straight and counter the effects of the cartilaginous memory. In addition, however, they also reinforce the cartilage graft and enhance its effectiveness in providing support for the nasal pyramid. Many authors have, in any case, already recognized the usefulness of spreader grafts in straightening and reinforcing the residual L-shaped supporting septal structure in cases of crooked nose.[12–15]

The originality of the technique proposed here lies in the fact that spreader grafts are attached preventively to the graft of conchal cartilage in the same way as they are secured to the nasal septum to produce the same effects. With a view to achieving satisfactory results, importance attaches not only to the reshaping of the conchal cartilage but also to securing the graft to the surrounding structures in such a way as to stabilize it and ensure harmony with the various sectors of the nasal pyramid.

The relations between the graft and the triangular cartilages must also be assessed case by case according to the amount of the latter still present. Where little remains of the triangular cartilages, suturing to the spreader grafts already attached to the conchal graft will make it possible to restore these structures and hence the esthetic lines of the nasal dorsum.

In cases where the triangular cartilages are present to a considerable degree, it will instead prove necessary to attach the spreader grafts to the conchal cartilage in a lower position with respect to the septal plane so as to avoid any esthetic

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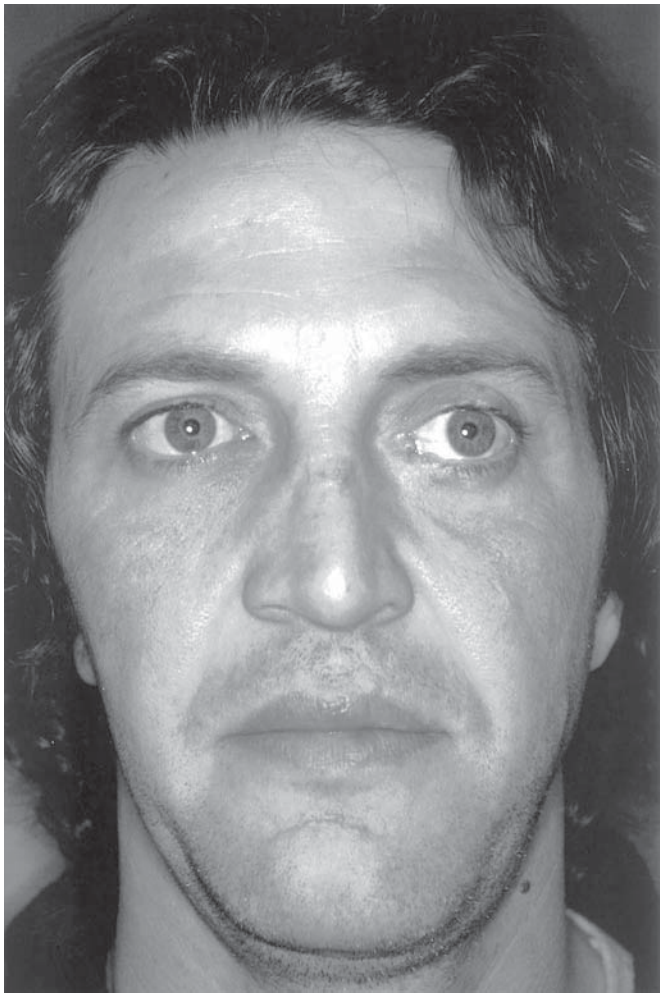

FIGURE 13. Case 2. Postoperative views.

FIGURE 14. Case 2. Preoperative views.

impairment of the nasal dorsum. Spreader grafts remain useful also in this case, however, as they provide firmer anchorage for the underlying triangular cartilages, which are thus supported and maintained at a higher level corresponding to their physiological position. In actual fact, longstanding absence of the nasal septum leads in most cases to a downward slippage of the triangular cartilages and, hence, to collapse of the middle nasal vault and the internal nasal valve.[16] The presence of spreader grafts is therefore useful in any case, as their function of establishing balanced relations between the rebuilt septum and the triangular cartilages fosters the expansion and restoration of the internal nasal valve. The overall result is considerable functional improvement and elimination of the difficulties in nasal respiration constantly afflicting these patients.

From the esthetic viewpoint, the graft of auricular conchal cartilage thus prepared and secured to the surrounding structures has demonstrated its ability to correct depression of the middle and lower third of the nose, columellar retraction, and droopiness of the nasal tip. If the helix root and the antihelix fold are preserved during harvesting, the donor auricular pavilion presents a completely normal appearance in morphologic terms with no visible signs whatsoever.

Finally, the grafted structure possesses characteristics of strength, elasticity, and flexibility closely resembling those of the cartilaginous nasal septum.

Summary

The paper describes a surgical technique for reconstruction of the nasal septum using a graft of cartilage from the auricular concha.

The graft is reshaped by means of a double figure-of-8 suture and a number of incisions on the concave side. Two spreader grafts taken from and attached to the conchal cartilage itself help to keep the graft straight and reinforce the structure.

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FIGURE 15. Case 2. Postoperative views.

The positive aspects of the technique are discussed, together with the results obtained with 24 hospital patients.

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