

Nasal Dorsum Reconstruction With 11th Rib Cartilage and Auricular Cartilage Grafts

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Abstract: We present a review of international literature on the topic of nasal dorsum reconstruction with 11th rib cartilage and auricular cartilage grafts, analyzing 123 patients selected from 653 cases of rhinoplasties performed between January 1990 and October 2007 at the Department of Plastic and Reconstructive Surgery of the University of Rome "Tor Vergata." We present our experience with the correction of deformities of the nasal dorsum using rib cartilage and auricular cartilage grafts. The majority of the time, nasal dorsum deformities are complicated defects to correct surgically. They can be a consequence of naso-ethmoid-orbital fractures and of surgical procedures in the nasal area where a loss of bone or septal cartilaginous support has occurred. After a review of the techniques employed in the reconstruction, we describe the advantage of the use of rib cartilage and our experience using this procedure. In the sample examined, 84% of treated patients showed cosmetic improvements, with satisfactory results to both surgeon and patient. A functional improvement has been achieved in 94% of the operated cases.

Key Words: nasal dorsum, reconstruction

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Defects of the nasal dorsum can occur in the osseous or in the cartilaginous portion, and can be associated with deformities affecting the facial middle third. The sinking of the cartilaginous portion is frequently observed following an excessive resection of septal cartilage, especially if the mucoperichondrium flaps have been torn, because, besides the loss of bony support, the contraction of the flaps while healing accentuates the depression of the dorsum. Cartilaginous depressions due to hematomas and infections of the septum with destruction of cartilage can also occur.¹ All the defects listed can be corrected through the use of cartilage grafts obtained from the ribs and auricle. We present our experience with the correction of nasal dorsum through grafts of costal cartilage and auricular cartilage. A review of international literature on the subject is also provided, analyzing a sample of 123 patients selected from 653 cases of rhinoplasties performed between January 1990 and October 2007 at the Department of Plastic and Reconstructive Surgery of the University of Rome "Tor Vergata."

MATERIALS AND METHODS

Of the most significant cases from all of the secondary rhinoplasties performed, 123 cases were selected for this study. In our experience, rib cartilage grafts have been used in 17.3% of rhinoplasty operations, choncal cartilage grafts in 33%, septum cartilage graft in 40%, and Medpor prostheses (Porex Surgical, Inc., Newnan, GA) in 9.7%. The sample was made up of 25 male and 98 female patients.

The age range was between 18 and 58 years. The diagnosis that the patients brought to our attention was deformity of the nasal pyramid of iatrogenic origin for previous surgical operations, with the presence of associated nasal obstruction. One case, described in detail, also involved a deformity of traumatic origin. In this patient we observed a failure of the projection of the nose pyramid and an insufficient projection of the tip caused by the retraction of the columella and the anterior nasal spine and lateral deviation of the pyramid.

The preoperative study was performed with a 3-dimensional clinical examination of the nasal pyramid and nasal cavities by means of anterior rhinoscopy, a photographic examination in 3 projections (frontal, lateral, and three-fourths), and x-rays of the facial mass. In addition, in the most complex cases, like those that resulted from major trauma or other associated pathologies like sinusitis, some high-resolution computed tomography scans were obtained with 3-dimensional imaging for a better view of the anatomic structures.

The technique used was "open tip" in 92.0% of the cases and 8.0% were the closed approach. The donor site of the cartilage was located in a thorax between the 8th and 11th rib and in the retroauricular region in the choncal zone (Fig. 1) The open-tip technique allows a better view of the anatomic structures, especially in secondary rhinoplasties, and is therefore preferred by the authors. Postoperative follow-up was performed after 2 and 6 weeks; 3, 6, and 12 months; and then annually for a minimum of 1 year and a maximum of 8 years.

RESULTS

In our experience, rib cartilage graft has been used in 17.3% of rhinoplasty operations, choncal cartilage graft in 33%, septum cartilage graft in 40%, and Medpor prostheses (Porex Surgical, Inc.) in 9.7%. The sample was made up of 25 male and 98 female patients. With a few exceptions, the patients had good postoperative recoveries without events of any notice.

We observed no infections, thanks to careful asepsis and to antibiotic coverage; there were 2 dislocations of the graft (1 case with rib graft and other with choncal graft) caused by a successive trauma, 4 dislocations without specific causes (3 cases with rib graft and 1 case with choncal graft), and a modest reabsorption in 3% of the all cases, suggested by small irregularities of the dorsum. There was no case of cutaneous necrosis and exposure of the graft (rib and ear), nor of septum perforation, while nasal obstruction beyond 6 months occurred in 8.9% of the patients.

Reoperations were performed in 11.3% of the cases: 6% for dislocation, 3% for resorption, and 2.3% for aesthetic dissatisfaction on the part of the patient. Among the patients of rib harvest, we observed two 3-day cases of thorax dolor after surgery.

Of the patients treated, good cosmetic results were obtained in 90%, with complete satisfaction on the part of the patient and the surgeon and excellent functional results in almost all of the cases (94%), with the resolution of the nasal obstruction.

CASE REPORT

A 31-year-old female patient came to our attention with an evident deformity of the nasal pyramid of iatrogenic origin 1.5 years after a previous cosmetic rhinoplasty (Figs. 2–4). The nasal obstruc-

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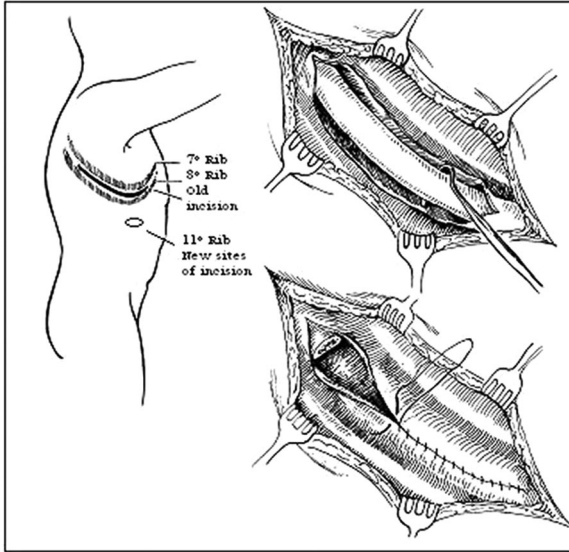


FIGURE 1. Donor site. 7° indicates 7th; 8°, 8th; 11°, 11th.



FIGURE 2. Preoperative image in frontal projection. Lateral deviation of the nasal pyramid and insufficient anterior projection of the nose.

tion that the patient complained about was almost total. After clinical exams, the patient was operated a first time with the use of a cartilage graft taken from the 11th rib (Figs. 5, 6). The postoperative recovery occurred without any problems, and the results from both cosmetic and functional points of view were satisfactory (Figs. 7–9). Later, the patient returned to us because of a nasal trauma suffered while playing basketball. During the clinical examination, a lateral deviation of the septum and a dislocation of the graft with monolateral respiratory obstruction was noted. A surgical operation, in March 2007, was again performed, during which the graft was removed from the nasal dorsum, and a retroauricular cartilage was harvested and covered by a segment of temporoparietal fascia and reimplanted.

In this way, the margins of the graft appeared more tapered and the result more natural. The postoperative follow-up showed



FIGURE 3. Preoperative image in 3/4 left projection. Insufficient anterior projection of the tip of the nose for retraction of the columella.

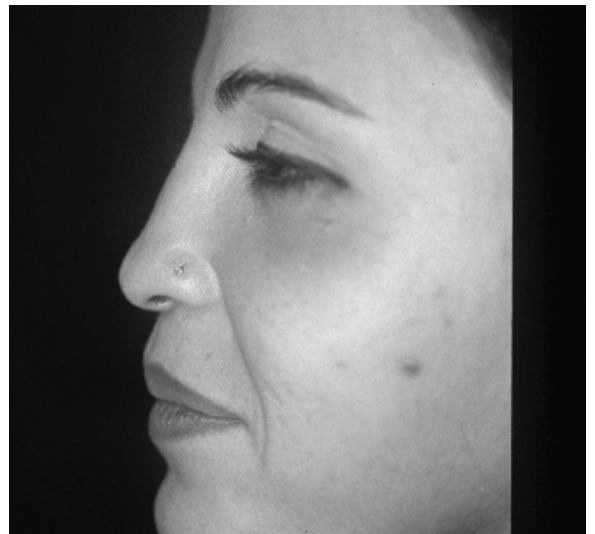


FIGURE 4. Preoperative image in left lateral projection. Evident deficit of the nasal spine with insufficient projection of the tip.

excellent cosmetic results and good re-establishment of respiratory functionality.

DISCUSSION

Gibson and Davis² have described a technique in which cartilage is cut according to a balanced, cross-shaped section, eliminating this deformity at least in part. However, even when this technique is carefully performed, a small portion of the graft can still tend to become deformed. Therefore, the only way to avoid any deformation is to not mold the graft at all. This is possible only with the use of cartilage grafts that have been taken from the 11th rib.

However, the molding should always be kept to a minimum, and the portion of cartilage that comes closest in shape and size for the intended purpose should be selected for the transplant. In our case, an incision was made that opened the rectus abdominis muscle and the inferior margin of the thoracic cage

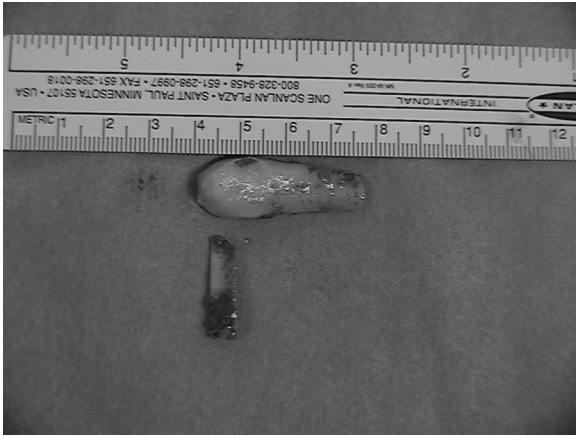


FIGURE 5. Intraoperative: rib cartilage graft.



FIGURE 6. Intraoperative: rib cartilage graft positioned in the nasal dorsum trough open-tip access.



FIGURE 7. Postoperative image in frontal projection. Correction of the deficit of anterior projection of the nasal pyramid.

was explored. Once the free cartilaginous end of the 11th rib was identified, after having detached the perichondrium and transversally incised the rib with a partial cut, we proceeded to remove it.

It is mandatory that an adequate irrigation of cold saline solution be used during this procedure to avoid compromising the bone integrity. We closed a thorax incision with Vicryl 3-0 (Ethicon, a Johnson & Johnson Co., Somerville, NJ), 4-0, and nylon 3-0. The cartilage at this level, which is short and free, is medially turned, first downward and then upward.

Contrary to what happens with the others, the 11th rib is not connected with the costal arch, and is therefore free. For this reason, the 11th and 12th ribs are called "floating ribs." The scar caused by skin incision at the level of the 11th rib, presents a better quality on the basis of 2 factors: 1) the 11th rib is small and fluctuates, allowing for a smaller incision; 2) as the position of the 11th rib is more medial and lower compared with the 7th or 8th rib allows the surgeon to make the incision further away from the sternal region, which is known to cause poor quality scars.

Bearing in mind that some time is needed before the maximum deformation occurs (about 30 minutes), it is advisable to let this time lapse before implanting the graft.

The general technique is based on the preparation of a subcutaneous pocket, supra- or subperiosteal, and supraperichondral, which can accept the fragment (or the fragments), and which are appropriately joined and overlapping, or prepared a mortiza with



FIGURE 8. Postoperative image in 3/4 left projection. Improvement of the anterior projection of the tip with columellar advancement.



FIGURE 9. Postoperative image in left lateral projection. Improvement of the profile with normal projection of the tip.

assembling sutures, and temporarily protected with Spongostan (Codman and Shurtleff, a Johnson & Johnson Company, Nordestedt, Germany).

We proceeded to operate with “open-tip” access, through transcolumellar incision as according to Rethi; creating a marginal incision.

Ungluing of the columellar, tip, and the dorsum of the nose; subperiosteal ungluing of the nasal dorsum. It is specified that the carried out total ungluing limited and is shaped for the retention of the graft, waves to avoid movements and spins of the same one. It proceeds to increase the projection of the pyramid, the saddleback, and the nasal tip through the rib graft, positioning the Columellar Strut to increase the projection of the nasal tip manufactured through sculpture of the graft.

We used nylon 6-0 for transcolumellar suture and to anchor the graft. We sutured the marginal incision with use of Vicryl 5-0 (Ethicon, a Johnson & Johnson company, Somerville, NJ).

The implant of a dorsal graft has produced increased tension of the external nasal valve, improving its caliber and consequently its capacity of dilating.

We did not observe the general complication pneumothorax or infection in this technique.

We used the retroauricular chonchal cartilage graft technique in 33% of cases because it is free and easy to harvest.

In this case, a skin incision was made in the retroauricular region, from the inferior margin of the chonca to the superior, and once the cartilaginous was identified, after having detached the perichondrium and transversally incised the extremity cartilaginous margin with a partial cut, we proceeded to remove it. We closed a margin with Vicryl 4-0 (Ethicon) and nylon 4-0.

CONCLUSIONS

For a first surgery, we prefer autologous costal cartilage, because it can be cut more easily than other types, it retains its thickness over time, and it is easily revisable. In a second surgery, we prefer retroauricular cartilage grafts. It does not present the complications of artificial materials and with respect to osseous grafts, it is elastic and flexible so it does not fracture. Another advantage is that it needs only minimal retouching in the time immediately following its removal, compared with the numerous remanipulations that must be performed with grafts taken from other places like the 7th or 8th ribs that are more frequently used; in addition, the absence of contact with the costal arch renders access easier at the time of the removal.

For many authors (Gillies, 1957; Brown and Mc Dowel, 1952; Sheen, 1978; Meyer, 1988)³ cartilage is a material of first choice for the reconstruction of the nasal skeleton. Since it nourishes itself through imbibition, it is resistant and remains vital, even if vascularization is minimal, as is often the case in the presence of scar tissue. Its main disadvantages are its low resistance to infection, the variable and unpredictable resorption, and the chance of dislocation, since it does not attach to the surrounding tissues. On the basis of the results obtained, we can recommend costal cartilage as an excellent option for the reconstruction of the dorsum and the nasal columella, and especially whenever there is severe saddling or loss of the sagittal projection of the nose, consequence of trauma, infection, septal bone and nasal bone necrosis, mycotic infection of the septum in immunodeficient patients, ethmoidal, midface and nasal pyramid traumas, and finally iatrogenic problem as a consequence of crushing of the cartilaginous septum in nasal surgery, because, more than other types, it can be easily cut, it retains its thickness over time, and it is easily revisable. We recommend retroauricular cartilage graft especially when there is need for multiple grafts, when the septal cartilage is inadequate, and in isolated dorsal spreader grafts, alar spreader grafts, and columellar strut.

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