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AUTOGENOUS RIB GRAFT FOR NASAL RECONSTRUCTION, PANORAMIC REVISION

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SUMMARY

Introduction: *It is remarkable the increase in the last decades of rhinoplasties for aesthetic and functional reasons. Some congenital, iatrogenic or traumatic etiologies originate a deficient or deformed nasal dorsum that needs correction with a dorsal augmentation. A deficient osteocartilaginous dorsum is the most frequent drawback requiring augmentation with graft material.*
Objective: *to detail the current information related to autogenous rib grafting for nasal reconstruction.*
Methodology: *a total of 33 articles were analyzed in this review, including review and original articles, as well as clinical cases, of which 24 bibliographies were used because the other articles were not relevant to this study. The sources of information were PubMed,*

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SciELO, Google Scholar and Cochrane; the terms used to search for information in Spanish, Portuguese and English were: graft, autologous, rhinoplasty, costal, nose, deformity.
Results: *Costal cartilage is a remarkable material in reconstructive septorhinoplasty, mainly in revision surgery because it requires large amounts of tissue. This autologous material presents a low incidence of complications. With increasing age it is more likely that this cartilage is calcified, so its procurement and manipulation will be more complex. The most commonly used cartilage is the septal cartilage, however, in several cases the septal cartilage may not be sufficient for the intervention, it may be very deteriorated or absent, so the costal cartilage is an essential support for very damaged noses or in case of secondary surgeries.*
Conclusions: *the graft of choice is the septal cartilage due to its simple procurement and physical elastic properties, however its ration is scarce. Rib cartilage is a graft that provides a lot of material. The costal cartilage graft is a fruitful tool when facing complex surgeries or nasal reconstructions. Autologous rib cartilage graft is a viable alternative in reconstructive septorhinoplasty. The surgical technique is not complicated and has a low complication rate.*
KEY WORDS: autologous graft, rhinoplasty, nasal aesthetics, nasal deformity.

INTRODUCTION

The increase of rhinoplasties for aesthetic and functional reasons is remarkable in the last decades. Some congenital, iatrogenic or traumatic etiologies originate a deficient or deformed nasal dorsum that needs correction with a dorsal augmentation. With the constant increase in the number of surgeries, the surgical technique is evolving, with the passage of time the need to optimize the structure and contour of the tip of the nose in this kind of rhinoplasty has been understood. Likewise, we are faced with a constant and complex need for structural augmentation to improve the contour of the nasal structures. A deficient osteocartilaginous dorsum is the most common problem requiring augmentation with graft material. An attempt should be made to provide the patient with a symmetrical, smooth, stable and desired nasal dorsum that complies with the requirements of function and shape. Although alloplastic implants provided an excellent alternative, many individuals had complications such as infection, pain, translucency of the implant, thinning of the skin over the implant, extrusion and displacement. Even when this treatment at the beginning generated an increase in the height and projection of the dorsal part of the nose, it was not feasible to maintain it for a period of time. Some studies show that with correct carving and careful construction, augmentation rhinoplasty using costochondral material can generate successful effects.

We speak of deformity when there is distortion of the costochondral graft (CCG) resulting in a latent deformity of the dorsum and/or nasal tip. As there are several studies about the dynamics of the deformity, the effect of age on the level of costochondral cartilage calcification has been evidenced. Currently, it has been reported that there are no statistically significant alterations in the GCC material with aging. However, the effect of the affected individual's years and deformation needs further study(1-5).

METHODOLOGY

A total of 33 articles were analyzed in this review, including review and original articles, as well as cases and clinical trials, of which 24 bibliographies were used because the information collected was not of sufficient importance to be included in this study. The sources of information were Cochrane, PubMed, SciELO and Google Scholar; the terms used to search for information in Spanish, Portuguese and English were: graft, autologous, rhinoplasty, costal, nose, deformity.

The choice of the bibliography exposes elements related to autologous costal graft in rhinoplasty; in addition to this factor, a panoramic review of the subject and the surgical technique is presented.

DEVELOPMENT

Rhinoplasty is one of the surgeries of the nose that is responsible for improving nasal aesthetics, nasal function or both, ranging from minimal changes to remarkable reconstructions. In order to achieve the best functional aesthetic result, several types of grafts can be used, such as autografts, allografts and synthetic grafts. The difference of the autografts only lies in being grafts from the same individual so it is the most biocompatible graft. Fascia, bone and cartilage can be used. Generally, septal cartilage, auricular shell cartilage and costal cartilage are usually used.

Allografts are called those that originate from another living being of the same species, so they need some special treatments, an example would be the irradiated costal cartilage, in addition to the Alloderm®. With regard to synthetic grafts, some have been used such as Silastic®, Gore-tex®, restylane, Medpor® and others. The perfect graft should not cause morbidity at the graft site, in addition to being easy to handle and maintain its shape in the host site with an optimal balance between flexibility and rigidity. It should also be non-extrudable, inert, non-carcinogenic and resistant to infection, in addition to other peculiarities.

The graft of choice is the septal cartilage due to its simple procurement and physical elastic properties, however its ration is scarce, so it is not usually not present in revision surgeries. On the contrary, the costal cartilage is a graft that offers a lot of material for the elaboration and presents similar characteristics to the septal cartilage, however, it tends to deform with the passing of time, besides sometimes becoming calcified. There is scientific information that has evaluated the histological and biomechanical properties of the costal cartilage, perceiving a lower cellular content and a higher portion of collagen, a lower elasticity with a higher tensile strength. The characteristics presented will change according to the place of the cartilage used, either center or

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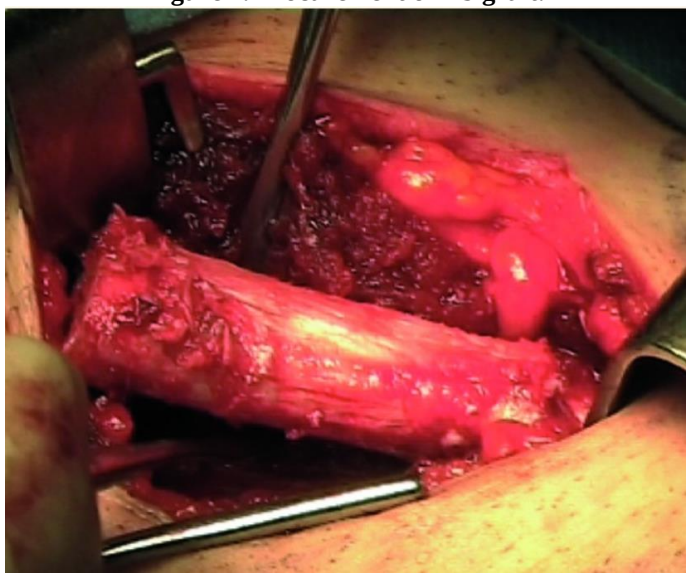
periphery, in addition to the thickness. Therefore, it is indicated to use the center of the costal cartilage and thicknesses less than 1.5 mm, making the costal cartilage present greater similarity with the septal cartilage. This graft is especially used in interventions that compromise the nasal dorsum, laterorrhinias, internal and/or external nasal valve dysfunctions, saddle nose, minimal nasal projection, as well as in revision rhinoplasties(6-13).

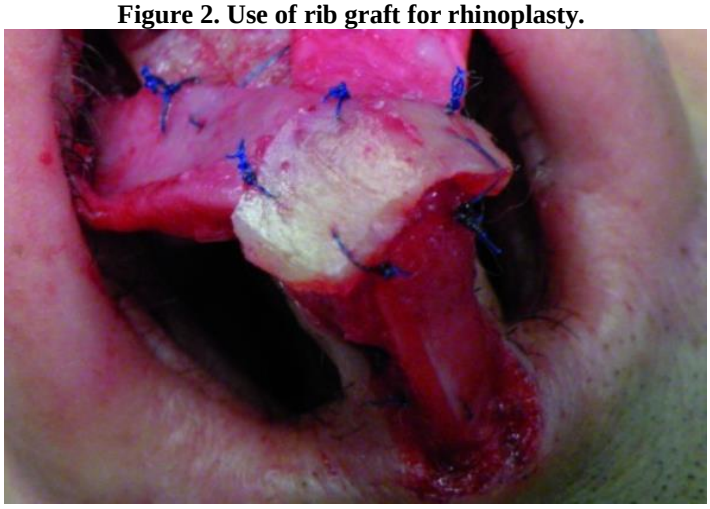
Figure 1. Procurement of rib graft.



Source: Moretti A, Sciuto S. Rib grafts in septorhinoplasty(14).

Autogenous cartilage has often been considered the gold standard graft material in reconstructive septorhinoplasty for volume filling and structural support. In nasal skeletal restructuring, autogenous cartilage may be removed from the nasal septum in addition to the atrium or rib, however, costal cartilage is viewed as the best graft component in individuals needing remarkable reconstruction. Rib cartilage is a notable material in reconstructive septorhinoplasty, primarily in revision surgery when large amounts of tissue are needed. This autologous material presents a low incidence of complications such as resorption, infection and extrusion when compared to homografts and alloplastic implants(14).

Figure 2. Use of rib graft for rhinoplasty.



Source: Moretti A, Sciuto S. Rib grafts in septorhinoplasty(14).

Surgical Technique

To obtain the costal cartilage, one can start with the marking of the 5th, 6th or 7th costal cartilage, depending on the cartilage that one decides to use, the costal cartilage can be extracted from either the surgeon's side or the opposite side as long as the surgical equipment is available. After marking, topical anesthetic is infiltrated in the site to be operated, giving way to the incision that can be from 1.5 cm to 5 cm depending on the amount of cartilage required and the surgeon's skill. In women the cut is made 5 mm above the inframammary line with a maximum of 5 cm and should not be extended beyond the limits of the inframammary line medially, avoiding aesthetic sequels in the place where the cartilage is obtained. If the patient presents breast augmentation, the entrance to the capsule of the breast implant must be avoided. Next, the dissection of the subcutaneous and muscular planes is performed with the use of the electroscalpel, exposing the costal cartilage by its superior and inferior margins, as well as up to the costochondral and chondrosternal connection. Subsequently, the perichondrium is incised longitudinally along the central axis of the cartilage, followed by the perpendicular incision at the costochondral and chondrosternal junctions. Subsequently, the sub perichondrium is dissected with the superior, inferior and lateral margins of the cartilage. The cartilage is removed and placed in a container with physiological saline.

Figure 3. First, subperichondrial dissection of the costal cartilage and second, costal cartilage.

Source: Ortega F G, Pio R G, Muñoz S D, Pinto C JL, Cardemil M F. Injerto costal para reconstrucción nasal(9).

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The next step is to irrigate the surgical site with saline and perform a valsalva maneuver to assess the existence of damage to the pleura. Ultimately it is closed in planes. If there is a pleural alteration or rupture, a drain should be placed and then closed by planes around the drainage area, then a valsalva is required to eliminate the air between the pleura and the pulmonary parenchyma, once this is done, the drainage is removed and the closure is completed. It is advisable to perform a radiographic control for the possible existence of a postoperative pneumothorax, in case this is present, the possibility of placing a pleural tube should be evaluated.

The bibliography suggests obtaining the sixth costal cartilage because it avoids flabbing the costal grill. Some other studies recommend starting the surgery with the extraction of the costal cartilage, to carve the graft with a cold scalpel in pieces of 1.5 mm thick and keep it as long as possible in physiological saline solution, supporting its molding and future deformations. Some authors report that postoperative prophylactic antibiotic therapy is not necessary, and that costal cartilage has proven to be an abundant, reliable and relatively accessible donor to support successful secondary rhinoplasty surgery(9,15).

Figure 4. First, an operative area without evidence of air leakage and second, carving of the costal cartilage.

Source: Ortega F G, Pio R G, Muñoz S D, Pinto C JL, Cardemil M F. Injerto costal para reconstrucción nasal(9).

Cartilage grafts are very useful when aesthetic and/or functional surgery of the nose is required. The most commonly used cartilage is the septal cartilage, however, in several cases the septal cartilage may not be sufficient for the intervention, it may be very deteriorated or absent, so the costal cartilage is an essential support against very damaged noses or in case of secondary surgeries. In addition, this cartilage has a low incidence of complications, as well as infections, reabsorptions and extrusions(9,14).

When considering the use of costal cartilage, the age of the individual should be taken into account, because with increasing age it is more likely that this cartilage is calcified, so its procurement and manipulation will be more complex.

Some studies evaluated the level of calcification according to age and sex in Asian population, showing that men younger than 60 years old present lower levels of costal cartilage calcifications, on the contrary women show higher calcification after 30 years of age. In addition, a computed tomography can be performed to support the diagnosis. Some different studies suggest that the use at early ages could have greater deformities of the costal cartilage graft in longer terms(16,17).

The literature recommends grafts less than 1.5 mm thick, as well as using the center of the cartilage and assessing the tendency of the graft to deform intraoperatively and keeping it as long as possible in physiologic solution. The best use of costal cartilage is for augmentation of the nasal dorsum, even more so in individuals with saddle noses. It has been proposed to use costal cartilage in aesthetic nasal surgeries in individuals with cleft lip and palate(18,19).

Something important to consider is the morbidity related to the harvesting of the rib graft. Several current studies have evaluated the complications in the donor and recipient site, noting that the rate of immediate and mediate complications, such as pleural rupture, pneumothorax, seromas and infections are low. However, pain is the most frequent complication, especially during the first 2 days, which is rapidly reduced(20,21).

Generally, autogenous grafts, especially those of the cartilaginous type, have been the gold standard due to their wide acceptance rate, resistance, virtual lack of immunogenic response, as well as their reduced rates of infection and extrusion. Autologous rib cartilage grafting is a viable alternative in reconstructive septorhinoplasty. The use of this graft is advised when septorhinoplasty requires a large volume of tissue with major structural defects where adequate septal tissue is not available(22-24).

CONCLUSIONS

The graft of choice is the septal cartilage due to its simple procurement and physical elastic properties, however its ration is scarce. Rib cartilage is a graft that provides a lot of material. The costal cartilage graft is a fruitful tool when facing complex surgeries or nasal reconstructions. Autologous rib cartilage grafting is a viable alternative in reconstructive septorhinoplasty. The surgical technique is not complicated and presents a low rate of complications.

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Conflict of Interest Statement

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