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Functional and Aesthetic Results After Augmentation Rhinoplasty

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Abstract

Introduction: Augmentation rhinoplasty could be defined as the method whose goal is to increase the dimensions of the nasal pyramid, both the dorsum and the tip. For a long time, surgeons have used different kinds of materials that have often been the object of discussion.

The aim of this study is to report our experience with augmentation septorhinoplasty, emphasising the type and nature of the grafts employed and the ensuing complications.

Materials and methods: This is a retrospective study describing the medical history of 188 patients who underwent septorhinoplasty surgery in our department over a period of 12 years, from January 1998 to April 2009. Of these patients, 42 underwent augmentation septorhinoplasty, which is the object of our study.

Results: In 66% of the cases (28/42), quadrangular autologous cartilage was the 'onlay' graft most widely employed; we used a single graft in 22 (85.7%) cases and a double one in the other 6 (21%).

In 14 patients, it was necessary to use grafts of synthetic material: in all the cases Gore-Tex® was chosen, in 12 (28.5%) patients as the only graft material and in 2 (4.7%) used together with septal cartilage.

Conclusions: Nasal dorsum reconstruction requires the knowledge of different methods and surgical procedures, as well as the use of different types of grafts according to the needs of each patient. The ideal graft, which exists only as a concept, would be the one combining biocompatibility, a low complication rate and results that remained stable for a long time.

At present, autologous cartilage, and more precisely septal cartilage, is still the first option for augmentation rhinoplasty. If septal cartilage is not available, we always turn to conchal cartilage grafts, from one or both sides depending on the amount of cartilage required.

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Resultados funcionales y estéticos tras rinoplastia de aumento

Resumen

Introducción y objetivos: La septorrinoplastia de aumento (SRA) podría definirse como aquella técnica cuya finalidad es conseguir un aumento de las dimensiones de la pirámide nasal, tanto del dorso como de la punta. A lo largo de los años, para conseguir este aumento se han utilizado múltiples materiales que han sido objeto de controversia.

El objetivo del presente estudio es mostrar nuestra experiencia con la septorrinoplastia de aumento, resaltando el tipo y la naturaleza de los injertos utilizados y las complicaciones acaecidas.

Materia y método: Se ha realizado un estudio retrospectivo descriptivo mediante la revisión de historiales clínicos de 188 pacientes intervenidos de septorrinoplastia en nuestro servicio en un periodo de 12 años comprendido entre enero de 1998 y abril de 2009.

Resultados: En 42 pacientes se realizó una septorrinoplastia de aumento, la cual constituye el objeto de nuestro estudio.

En un 66% de casos (28/42) se utilizó un injerto onlay de cartílago cuadrangular, en 22 pacientes (85,7%) una lámina única de cartílago y en 6 pacientes (21%) un injerto doble de cartílago cuadrangular.

En 14 pacientes fue necesario recurrir a los injertos de material sintético: en todos los casos se empleó el Gore-Tex®, en 12 (28,5%) pacientes como único material del injerto y en 2 (4,7%) pacientes conjuntamente con cartílago septal.

Conclusiones: La reconstrucción del dorso nasal exige el conocimiento de diferentes técnicas y recursos quirúrgicos, así como la utilización de diferentes tipos de injertos en función de las necesidades de cada paciente. El injerto ideal, que existe sólo como concepto, sería aquel que aúna biocompatibilidad, baja tasa de complicaciones y resultados estables a largo plazo.

En la actualidad, el cartílago autólogo, y más concretamente el cartílago septal, permanece como primera opción en la SRA. En caso de no disponer de cartílago septal, recurriremos siempre a los injertos de cartílago de concha, de uno o de ambos lados según la necesidad de material.

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Introduction

The basic principles of rhinoplasty have barely changed over the years, although the techniques have been refined through a greater understanding of nasal anatomy and morphology, as well as of facial balance and respiratory physiology.

Augmentation septrhinoplasty (ASR) could be defined as a technique whose purpose is to increase the size of the nasal pyramid, both the dorsum and the tip. Throughout the years, various materials have been used to achieve this increase and many have been the subject of controversy due to the problems that they caused.1

The final outcome of surgery is determined by a number of factors: anatomical, surgical procedures, scarring process and patient characteristics (race, skin type and consistency of cartilage).2 Due to this set of variables that can change our results, we must individualise each case and select the type of material to be used depending on the needs of each patient.3

The aim of this study was to show our experience with augmentation septrhinoplasty: the type and nature of the grafts used, the morphological characteristics of each case and the aesthetic and functional results in the short and long term.

Materials and Methods

We performed a descriptive retrospective study by reviewing the medical records of 188 patients operated at our Septorrhinoplasty Service during a period of 12 years between January 1998 and April 2009.

A total of 42 patients underwent augmentation septrhinoplasty, which is the subject of our study. The open rhinoplasty approach was used in all patients and all were operated on by the same surgeon.

Clinical data collected in the study were: age, gender, symptoms, medical history, previous surgery, ENT exploration, surgical technique, complications and results.

The mean follow-up period was 73 months (11–136 months).

All patients underwent a photographic study, both preoperative and postoperative, including the frontal, basal, lateral and oblique projections. The aim of this study was to obtain an objective assessment of deformities that helped us to develop a surgical plan, as well as to document the degree of postoperative correction of the deformities existing in each case.3

Surgical Technique

We always started the intervention performing septrhony, using the Cottle technique, to treat deformities of the septum and remove a quadrangular cartilage graft whenever possible.

For the treatment of the nasal back and tip, we performed an open approach in all cases, after making a transcolumnellar incision in inverted “V” and a classical marginal incision. We exposed the upper and lower lateral
cartilages, following the dissection in an avascular plane to the lower edge of the bones. To complete the dissection, we created a subperiosteal tunnel on the backbone, which reached the nasal spine of the front.  

We moulded the graft chosen and adapted it to the required dimensions, shaping it with a number 15 scalpel. This graft had the shape of a boat, measuring approximately 3 mm in width by 3 cm in length, and could be made from septal cartilage (Fig. 1), ear cartilage (shell) (Fig. 2) or synthetic materials (Gore-Tex® in our case), depending on the availability for autologous grafts in each patient. Cartilage plates were also used to achieve the necessary thickness, sutured with monofilament at their edges. The graft was placed in the subperiosteal tunnel, with its head end near the nasion to achieve good immobilisation.

The correction of the nasal tip was usually performed through structure repositioning techniques using sutures (5/0 nylon, monofilament or 4/0 polyglycolic acid), with resection techniques being used very rarely.

Lastly, we performed the osteotomies. We routinely performed percutaneous lateral and transverse osteotomies. In certain cases, oblique osteotomies were also performed.
Results

During the study period, we performed 188 septorhinoplasties in our service, of which 42 were augmentation interventions. A total of 66% of patients undergoing ASR were male (28/42), while 33% were female (14/42). The mean age of patients was 28 years, ranging between 16 and 50 years.

The most frequent cause was the presence of nasal trauma, present in 91% of cases (38/42). In 85.7% (36/42) of patients we performed augmentation septorhinoplasty as primary surgery and in 14% (6/42), as secondary surgery.

We used various types of graft to increase the dorsum of the nose, depending on the needs of each patient. An onlay graft of quadrangular cartilage was used in 66% of cases (28/42), a single sheet of cartilage in 22 patients (85.7%) and a double graft of quadrangular cartilage in 6 patients (21%).

To avoid displacement of the grafts, we sutured them to the triangular cartilages in 18/28 cases (we also sutured the sheets together in patients with 2 layers of cartilage) (Fig. 3) and we used fibrin glue in 4 of 28 patients.

In 6 cases, we wrapped the graft in Espongostan® sheets to regularise their surface and minimise the potential irregularities that sometimes occurred in the dorsum, especially in fine skins.

In 14 patients, it was necessary to use grafts of synthetic material: in all cases, we used Gore-Tex®. This was the sole graft material in 12 (28.5%) patients and it was used together with septal cartilage in two (4.7%) patients.

To increase nasal tip projection and support it, we used a columellar strut.

We used various techniques on the alar cartilages to define the point. In 18 patients, we used dome sutures, with these being in butterfly shape in 6 patients (Fig. 4). In 10 patients, we performed resection of the proximal edge of the alar cartilages associated to medial suture thereof.

Complications could be classified into 2 groups according to the nature of the graft used. In 4 patients in whom we used synthetic material (Gore-Tex®), there was a foreign body reaction (Fig. 5) that occurred with local infection of the soft tissues of the nasal dorsum. Initially, we followed a conservative treatment with local cures and antibiotics. This action solved the problem conservatively in one case, while it was necessary to remove the Gore-Tex® graft in the remaining 3 patients. They underwent a second surgical procedure to correct the defect of the nasal dorsum, using conchal cartilage grafts obtained from the patients themselves in all 3 cases (Fig. 6).

Patients with autologous cartilage grafts presented significant resorption as a complication in 4 cases. The complication was mild and did not require reintervention in 3 cases, as the final result was satisfactory. However, the
fourth patient developed a significant degree of resorption after 5 years, which caused a significant deformity in the nasal dorsum and necessitated review surgery. We decided to use a Gore-Tex® graft for this second operation, with no short- or long-term complications (Figs. 7 and 8).

In total, 4 patients required review surgery, which represents a reintervention rate of 9.5% (4 of 42).

Discussion

Septorhinoplasty is a surgical technique that requires a deep understanding of the anatomy of the nasal pyramid and its possible variants. However, we must take into account the long-term effects that may arise from the techniques used on the elements of the nasal pyramid. For these reasons, a long follow-up of patients is of great importance for the detection of potential complications.5

When evaluating the results of a septorhinoplasty, it is important to note that its goal is not to achieve a given surgical outcome, but the aesthetic and functional satisfaction of the patient.5 Consequently, the operation may meet the expectations of patient but not of the surgeon, and vice versa.

The reconstruction of the nasal dorsum requires knowledge of different surgical techniques and resources, as well as the use of different types of implants, depending on the needs of each patient. In general, it is possible to classify the grafts used in ASR into 3 groups according to their nature: autologous (mainly cartilage or bone), homologous and alloplastic or synthetic.1 The ideal graft would be one combining biocompatibility, low rate of complications and long-term stable results, although this only exists as a concept for now.1,6,7

Autologous cartilage grafting is the one that best fits the above criteria, due to its excellent biotolerance, low rate of infection and extrusion and its ease of production. At present, it is still considered as the material of choice in augmentation nasal surgery.1,7,8 In our experience, it is the first choice in cases of ASR, with low rates of extrusion, infection and displacement, as well as of irregularities in the dorsum. We have had no donor site complications (haematoma or septal abscess) and, unlike other areas, there are no visible scars.

We should note that in 4 patients in our series who received crushed septal cartilage onlay grafts, we observed a significant degree of resorption (Fig. 9).2 For this reason, we currently do not use crushed cartilage, despite support grafts reducing this trend.
In cases where it was not possible to obtain septal cartilage (trauma, infection or prior surgery), we usually chose ear cartilage as a second option.\textsuperscript{8,9} This has similar characteristics to septal cartilage in terms of rate of infection, extrusion and resorption, and is easily obtained with minimal donor site complications and its curved shape makes it ideal in areas where this contour is required.\textsuperscript{1,9} Possible late complications include irregularities on the dorsum and graft deviation or resorption, hence the importance of long-term monitoring in patients with auricular cartilage grafts.\textsuperscript{1,2,10} Patients with major deformities that require a significant increase of the nasal dorsum (greater than 4 mm) present poorer results with auricular grafts. In these cases, we tended to select other types of grafts (costal cartilage or alloplastic materials).\textsuperscript{8,11,12} Costal cartilage provides significant volume and represents an excellent structural support, although it has greater rigidity, a higher tendency to become curved and larger resorption rates than the previous types of grafts. In addition, the possibility of donor site complications (pneumothorax, chest wall deformity or severe postoperative pain) limits its use to severe cases of saddle nose deformity.\textsuperscript{2,12} Due to the risk of complications in the donor area and the possibility of curvature and unpredictable postoperative resorption, we do not use costal cartilage, preferring other options for increasing the nasal dorsum.

In a study published in 2006, Araco et al.\textsuperscript{13} compared different autologous cartilage grafts (atrial, septal, costal and mixed) and assessed the degree of postoperative satisfaction in patients from the 4 groups, finding greater satisfaction in the groups of septal cartilage and auricular cartilage. The literature contains numerous studies supporting the long-term results of autologous cartilage grafts, both due to their low complication rate and to the high degree of patient satisfaction.\textsuperscript{1,7,10,13} In our everyday practice, we do not use bone grafts (cranial, iliac crest) or homologous materials (irradiated costal cartilage), so we will not mention them in this article.
In all our patients who received quadrangular cartilage onlay grafts, we used fixing measures to prevent displacement of the fragments. The most commonly used method was suture of the graft to the triangular cartilages. If the graft consisted of 2 sheets, these were stitched together.

Since the final years of the 20th century, many synthetic materials have been introduced in nasal reconstructive surgery. The advantages provided by these materials are their ease of use and unlimited availability, good immediate results, lack of need for a second surgical site (which decreases morbidity) and low cost.1,11,14 On the other hand, their disadvantages include high rates of mobilisation, infection and extrusion and the need to remove the material, as well as uncertain long-term outcomes.1

The most commonly used alloplastic materials in nasal surgery can be classified into 2 groups: solids (silicone) or porous (polyethylene-Medpor® and polytetrafluoroethylene-Gore-Tex®).2

Silicone is a non-porous polymer material, whose solid form provides great structural support. Being a non-porous material, it reduces the chance of bacterial growth, but this also makes stabilising it more difficult.1 Its main disadvantages are its mobility and tendency towards extrusion, especially when using long implants in areas of tension or in patients with fine skins.15 Zeng et al.11 suggest that, to minimise the incidence of complications, the silicone implant should be placed in a deep plane (subperiosteal), rather than a subcutaneous or subfascial one. In addition, Romo et al.16 suggest that the risk of extrusion with silicone implants is 50% when placed in the columella, compared to 10% when used on the dorsum.

Lin and Lawson9 collected different works presenting a complication rate between 9.7% and 18%. Complications can occur in the first 2 weeks and are mostly secondary to infection by Staphylococcus aureus, or after 4 weeks, with the most frequent being alterations of superjacent skin.2 Among the porous materials, we highlight polyethylene (Medpor®) and polytetrafluoroethylene (Gore-Tex®), with the latter being the only one used by us.

Medpor® is a porous, high-density polyethylene. The size of its pores varies from 100 to 250 μm, which allows growth of fibrovascular tissue, thus contributing fixation and stability to the graft and making it more resistant to infection.1,2 Romo et al.16 refer its use in more than 300 rhinoplasties, with an infection rate of 3%-4%. However, they indicate a higher likelihood of poor results in patients with fine skin and columellar grafts.

In our experience, the most interesting alloplastic material is Gore-Tex®. This is a porous polymer with a pore size of 10–30 μm.1 These micropores enable limited growth of tissue, which helps to stabilise the graft without hindering its removal if needed. In addition, its hydrophobic characteristics reduce adherence of bacteria to the graft.1 Gore-Tex® can be cut and shaped to fit different shapes and sizes. Due to its characteristics, it is more useful for volumetric compensation than for support functions,1 being a poor choice as a columellar strut or as a graft for the external valve.17 Various studies show 2.5% of complications, mainly infection with implant removal,18 which can appear up to 3 years after the intervention.2

In our series we used Gore-Tex® as a graft on the nasal dorsum in 14 patients. It was used in isolation in 12 of them and associated with cartilage in 2 patients. In 4 cases, we found an infectious process, which required implant removal in 3 patients.

Conclusions

Augmentation septrhinoplasty is a complex technique requiring precise knowledge of the nasal anatomy, comprehensive technical management by the surgeon, adequate preoperative planning and the use of different reconstructive options tailored to each particular case.

At present, autologous cartilage, and septal cartilage in particular, is the first option in ASR. If septal cartilage is not available, we always turn to grafts of conchal cartilage of one or both sides depending on the need for material.

Despite the availability of synthetic material, Gore-Tex® in our case, we gave up its use years ago as material of choice for use in augmentation techniques to correct the nasal dorsum due to the complications which resulted in 4 patients included in this study.

Conflict of Interests

The authors have no conflicts of interest to declare.

References