



ORIGINAL ARTICLE

Analysis and Treatment of Cleft Lip Nasal and Palate Deformity[☆]

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KEYWORDS

Rhinoplasty;
Cleft lip;
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Abstract

Introduction and objectives: Cleft lip and palate are usually associated with craniofacial defects and nose deformities that alter the facial aesthetic configuration. After initial surgical treatment, further surgery (both nasal and maxillary) is often required to reduce the physical impact in these patients. These techniques should be delayed until the development of the facial skeleton is complete. The purpose of this study was to assess the system used in the preoperative analysis of such patients, the surgical technique and our results after proper follow-up time.

Materials and methods: This was a retrospective study describing the medical history of patients with background of unilateral cleft lip treatment in childhood who underwent surgery in our service to correct their nasal deformity between June 2010 and June 2011.

Results: We evaluated 5 cases on which we performed a functional, aesthetic, anthropometric and psychological analysis. The treatment was carried out at an average age of 18.3 years, with an individualised surgical technique using open septorhinoplasty. The mean follow-up time was 24.5 months.

Conclusions: Preoperative analysis for this condition should include an aesthetic and functional nasal study and an anthropometric and psychological study. Open septorhinoplasty carried out at the age of 16–18 years is an appropriate procedure to correct the cleft lip nasal and palate deformity. Our surgical technique offers good long term functional, aesthetic, anthropometric and psychological outcomes.

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PALABRAS CLAVE

Rinoplastia;
Fisura labial;
Fisura palatina

Análisis y tratamiento de la dismorfia nasal secundaria a fisura labiopalatina

Resumen

Introducción y objetivos: La fisura labiopalatina suele asociarse a malformaciones craneofaciales y dismorfias nasales que alteran la configuración estética facial. Tras el tratamiento quirúrgico inicial suelen ser necesarias intervenciones quirúrgicas, tanto nasal como maxilar, para reducir el impacto físico que presentan estos pacientes, técnicas que deberán retrasarse

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hasta que el desarrollo del esqueleto facial se haya completado. El objetivo de este estudio es exponer la sistemática utilizada en el análisis preoperatorio de estos pacientes, la técnica quirúrgica utilizada y nuestros resultados después de un tiempo de seguimiento adecuado.

Material y métodos: Estudio retrospectivo descriptivo mediante la revisión de pacientes con antecedentes de tratamiento de fisura labiopalatina unilateral en la infancia intervenidos en nuestro servicio para corregir su dismorfia nasal entre junio del 2010 y junio del 2011.

Resultados: Se evaluaron 5 casos, en los que se realizó un análisis funcional, estético, antropométrico y psicológico. El tratamiento se llevó a cabo a una edad media de 18,3 años, por medio de un proyecto quirúrgico individualizado a través de una septorhinoplastia abierta. El tiempo medio de seguimiento fue de 24,5 meses.

Conclusiones: El análisis preoperatorio para de este tipo de patología nasal debe incluir un estudio estético, funcional, antropométrico y psicológico. La septorhinoplastia abierta llevada a cabo a la edad de 16-18 años es un procedimiento adecuado para corregir la dismorfia nasal secundaria a fisura labiopalatina. Nuestra técnica quirúrgica ofrece buenos resultados funcionales, estéticos, antropométricos y psicológicos a largo plazo.

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Introduction

Cleft lip and palate are the most frequent congenital craniofacial defects.¹ The international prevalence of cleft lip (CL), with or without cleft palate (CP), is of 7.94/10 000 live births, and in Spain it is 3.79/10 000 live births.² The aetiology of cleft lip and palate (CLP) is thought to be multifactorial (genetic, teratogenic and/or environmental factors),³ although there are no studies which have determined the exact causes that produce it.

The clinical spectrum of this disorder ranges from the lesser degree which constitutes CL to the maximum extent represented by a bilateral CLP, and which correlates with the severity of nasal alterations.³

CLP is usually accompanied by a characteristic nasal dysmorphism and hemifacial growth disorders.⁴ The causes of this nasal dysmorphism can be primary or secondary; the primary are intrinsic to those of CLP, whilst the secondary are associated with varying degrees of partial recurrence of the original deformity, scarring and/or sequelae from previous surgical procedures.^{5,6}

Patients with nasal dysmorphism secondary to CLP present aesthetic involvement and functional impairment leading to a psychological conflict which in some cases causes isolation and/or social exclusion.⁴⁻¹¹ This, in turn, can cause a need for early intervention due to the functional and aesthetic alterations suffered by these patients.

Many techniques for the correction of this nasal dysmorphism have been described, but the only correct procedure is likely to be the use of cartilage grafts; preferably through an open rhinoplasty, which should not be performed until the development of the facial skeleton is complete (16-18 years).^{5,12,13}

The aim of this study is to describe the systematic approach employed for the preoperative analysis of these patients, the surgical technique used and our results after an adequate follow-up period.

Materials and Methods

We conducted a descriptive study by reviewing patients who had undergone treatment for unilateral CLP during

childhood at the paediatric surgery unit of our centre and who had been intervened at our department to correct their nasal dysmorphism during the period between June 2010 and June 2011.

We conducted a preoperative analysis, which in all cases consisted of a functional, aesthetic, anthropometric and psychological study.

Functional analysis was performed through anterior rhinoscopy complemented by nasofibroscope and an assessment by patients using a visual analogue scale (VAS), all of which was verified by active anterior rhinomanometry and acoustic rhinometry. The nasal aesthetic study was performed through physical examination and photographic evaluation with frontal, basal, lateral and oblique projections. Anthropometric evaluation was carried out with a lateral cranial radiograph to measure the SNA angle and with a lateral photograph to measure the true vertical (TV) angle (Table 1). The psychological study was conducted with the short form-36 tool and the scale of satisfaction with physical appearance.

After the preoperative analysis we established an individualised surgical plan for each case. The results for each patient were evaluated in subsequent review appointments.

The clinical data collected were: age, gender, symptoms, medical and surgical history, ENT examination, surgical technique, complications, results and follow-up period.

Surgical Technique

Under general anaesthesia, we applied topical, local and regional anaesthesia. If the patient presented hypoplasia

Table 1 Anthropometric Analysis.

SNA angle	Formed between a line from the <i>sella turcica</i> to the nasion and another line from the nasion to the subspinal point (or point A)
Tv angle	Formed between the true vertical line passing through the nasion and another line from the nasion to the subnasal point



Figure 1 Dissection of the columellar flap in open rhinoplasty and autogenous septal cartilage prior to remodelling.

and maxillary retrusion these were treated with an autogenous cancellous bone graft from the iliac crest, with a size according to the defect being treated, which was placed through a marginal incision in the upper gingival. After exposing the anomalous area, the graft was deposited in the region of the premaxilla and anterior nasal spine, with no need for modelling and fixing. Next, we performed septoplasty with subperichondral and subperiosteal resection of the deviated nasal septum, which was subsequently used for future grafts. We then used an open approach through a transcolumellar, inverted "V" incision and a marginal incision at the level of the skin of each nasal vestibule. We dissected the columellar flap and created a supraperichondral dissection of the superior and inferior lateral cartilages and a subperiosteal dissection of the nasal bones. We performed a reduction of the osteocartilaginous dorsum. Both inferior lateral cartilages were released. The septal cartilage extracted previously was remodelled and the columellar strut was prepared and fixed at the level of both medial crura. We proceeded to perform a transdomal single suture of both lower lateral cartilages using a 5-0 absorbable suture in a mattress stitch between the medial and lateral crura of both inferior lateral cartilages, and then progressively tightened the knot until we obtained the desired effect. When necessary, we also placed a shield tip graft to define the nasal tip. In cases where we identified hypoplasia of the lateral crura of the inferior lateral cartilage we decided to place an alar batten graft. When we observed excess skin in the nasal vestibule, this was resected and the resulting skin edges were sutured. We sutured skin incisions and performed lateral osteotomies. At the end of the procedure, we placed an anterior, bilateral nasal packing, which was removed after 48 h, and applied

topical mupirocin at the level of the nasal vestibules and columella.

Results

We reviewed a total of 5 patients. All of them were males and at the time of surgery they had a mean age of 18.3 years, with a range between 17.5 and 18.7 years.

The reason for consultation in all cases was nasal respiratory failure and a desire to improve nasal aesthetic appearance.

All cases presented anterior septal deviations towards the intact fossa and in 1 case a dislocated septal cartilage towards the intact fossa.

Preoperative active anterior rhinomanometry at baseline showed a mean total flow of $655 \text{ cm}^3/\text{s}$ (SD: 25.3) with a resistance of 150 Pa. Preoperative acoustic rhinometry presented a mean value for the minimum cross section area in the deviated side of 0.33 cm^2 (SD: 0.09) at baseline. The mean value of the VAS was 4.

We identified 1 case of maxillary retrusion and hypoplasia with SNA and TV angles of 77.2° and 4.3° , respectively.

The psychological study identified social anxiety, social isolation and depression problems.

We performed a septoplasty in all patients and the extracted septal cartilage was used for nasal tip grafts. Subsequently, we conducted a rhinoplasty by open approach in all cases. All patients were operated on by the same surgeon (Fig. 1).

A reduction of the osteocartilaginous dorsum was carried out in all procedures as required, along with placement of a columellar strut and a single transdomal suture of the inferior lateral cartilages (Fig. 2). We placed an alar graft



Figure 2 Positioning and fixing of the columellar strut. On the right, single transdomal suture.



Figure 3 Preoperative and postoperative images of a patient with hypoplasia of the left inferior lateral cartilage.



Figure 4 Preoperative photographic study and postoperative results of the use of a shield tip graft.



Figure 5 Preoperative and postoperative images of a patient suffering hypoplasia of the superior maxillary treated with autogenous bone graft from the iliac crest.

in 1 case which presented hypoplasia of the inferior lateral cartilage (Fig. 3). We placed a shield tip graft in another case with poor definition of the nasal tip (Fig. 4). The case suffering maxillary retrusion and hypoplasia was corrected with an autogenous, iliac crest bone graft (Fig. 5). The case where redundant skin was identified as an element of nasal dysmorphism was treated by resection (Fig. 6).

We observed no perioperative or postoperative complications during the hospital stay, which was 2 days in all cases.

The mean follow-up period was 24.5 months, with a range between 18 and 27 months. All evaluations registered subjective and objective improvement of the functional, aesthetic and psychological aspects. The postoperative active anterior rhinomanometry at baseline registered a mean total flow value of $723 \text{ cm}^3/\text{s}$ (SD: 18.2), with a resistance of 150 Pa. Postoperative acoustic rhinometry

obtained a mean value for the minimum cross section area on the deviated side of 0.53 cm^2 (SD: 0.06) at baseline. The mean value of the postoperative VAS was 2.

Discussion

Nasal pathology treatment offered to patients with CL, with or without CP, is one of the greatest challenges for otolaryngologists due to the complexity of the problem, especially considering that the techniques available are often accompanied by unpredictable results.

Regarding the septopyramidal deviation that accompanies this type of anomaly, the external nasal description was carried out by Ortiz-Monasterio in 1987 (Table 2) and septal deviation by Sandham and Nagasao in 1993 and 2008,



Figure 6 Results of the resection of redundant skin.

Table 2 External Nasal Analysis.*Columellar deviation*

- Short on cleft side
- Base towards the non-cleft side

*Depression and deviation of the nasal tip**Reduction of the projection of the nasal tip**Reduction of nasal rotation*

- Short medial crura on the cleft side
- Long lateral crura on the cleft side

*Wide and flat nasal wing on the cleft side**Flattened and "v"-shaped nostril on the cleft side*

respectively (Table 3). The latter is correlated with the severity of the CL and is more pronounced in the posterior and superior portions of the septum.^{7,14} The causes of nasal dysmorphia may be primary or secondary. Primary causes are intrinsic to those of CLP, whilst secondary causes are associated to varying degrees of partial recurrence of the original deformity, scarring and/or sequelae from previous surgical procedures.⁵

On the other hand, in some cases the causes of the accompanying hemifacial growth inhibition have not yet been established. Some authors advocate causes inherent to CLP whilst others defend iatrogenic causes.^{4,5}

In order to carry out our preoperative analysis of these patients, we included the following studies: aesthetic, functional, anthropometric and psychological. The aesthetic and functional aspects were based on the methods recommended in the literature.^{5,6} The anthropometric analysis can be carried out based on various different cephalometric angles and points. We based our analysis on the measurements suggested by Meazzini in 2011 to determine the degree of maxillary protrusion, through the SNA and TV angles.⁸⁻¹⁰

Regarding their appearance, these patients often presented psychological problems such as high levels of social anxiety, social isolation, depression and anxiety.¹¹ Therefore, it was important to conduct an opportune treatment with an adequate psychological study of patients prior to surgery and subsequently thereto, so as to observe possible psychological conditions and determine the extent of improvement or lack thereof. The present study identified psychological problems related to physical appearance and which significantly improved in all cases with the surgical procedure offered.

Table 3 Internal Nasal Analysis.

Deviation of the antero-caudal portion of the septum towards the non-cleft side

Inclination of the septum towards the cleft side

Hypertrophied anterior nasal spine and deviated towards the non-cleft fossa

With or without hypertrophy of the inferior turbinate on the non-cleft side

The correct moment to carry out a correction of nasal dysmorphia secondary to CL, with or without CP, has been a subject of debate. Some authors believe that septopyramidal surgery can be performed conservatively in childhood to correct these defects, especially if there is evidence of a significant functional impact. Others believe that the correction of nasal dysmorphia should be part of the initial treatment for CL, thus improving the long-term aesthetic results without affecting facial growth.¹² Nevertheless, there are others who do not support these ideas, as they believe that it may inhibit or alter facial development and, therefore, prefer to operate once the development of the facial skeleton and nasal growth are complete, at about 16–18 years of age.^{13,15} Thus, our patients were treated at a mean age of 18.3 years, so as to ensure that they had completed their facial and nasal development.

Sometimes, little attention is paid to the functional impairment of these dimorphisms and the functional results that can be obtained with the interventions performed.¹³ Classical submucosal resection should be delayed from the usual practice of rhinology, as it is considered to be an obsolete procedure. In our work, we primarily used this technique to obtain cartilage for subsequent grafts, and also due to possible nasal floor defects, as well as increased fibrosis and scarring in the treated areas. All operated cases presented mild septal deviations, especially at the level of Cottle areas II and III, with mild functional impairment, which were corrected by subperiosteal and/or subperiosteal resection. We obtained improvement of nasal respiratory failure in all cases, both subjectively and objectively. However, cases with Cottle area I septal deviations could not be corrected by submucosal and/or subperiosteal resection. This could only be achieved through the classical Cottle technique, which is more difficult to carry out in these patients.

Treatment of these nasal disorders should be individualised according to the characteristics of each patient, severity of CLP, surgical treatment undergone previously, the degree of nasal dysmorphia, the presence of hemifacial hypoplasia, etc. Thus, minor septopyramidal deviations can be treated through closed septorhinoplasty, although in most cases the recommended technique is open septorhinoplasty.^{13,16-20} Although there is no surgical procedure of choice for this type of pathology, the most adequate technique to correct this type of nasal dysmorphia probably involves the use of cartilage grafts, preferably through open rhinoplasty.⁵ In our study we used an open approach in all cases, as it offered adequate exposure of the affected components, with excellent control and management of the deformity, especially at the level of the nasal tip (Fig. 1).

The nasal tip was the most commonly compromised region. At present, there are various different options to correct alterations of structures in the nasal tip,^{6,21} but it is important to bear in mind that, in order to monitor results and preserve a natural anatomy, it is preferable to employ non-destructive techniques. Thus, we favoured a single transdomal suture of the inferior lateral cartilages, which sought to obtain greater symmetry and recreate a new point of definition of the tip or at least enhance it.

There are certain cases in which different types of grafts must be used to correct nasal deformities or irregularities and to improve projection, rotation and tip definition qualities. These generally employ autogenous cartilage (from the same patient) obtained from the shell of the ear, nasal septum, costal region and even synthetic materials in some cases,^{6,21–23} although the latter are not recommended in these patients. Some authors prefer ear cartilage. We used septal cartilage in all cases because, as in the study by Rodriguez-Bruno, we considered it the first choice for nasal grafts and necessary to remodel in order to obtain a natural correction of defects.²² Columellar struts allowed us to increase nasal tip projection, shield grafts defined the nasal tip and alar grafts helped to rebuild and support the lateral crura of the hypoplastic inferior lateral cartilage and improve nasal projection (Figs. 2–4).

The management of hemifacial growth impairment is very important in these patients and these anomalies should always be considered and treated at the beginning of surgery, given that hypoplasia and maxillary retrusion contribute greatly to reduce the support of the medial crura and to decrease nasal rotation and depress the nasal tip.²³ Various different techniques, such as Lefort I osteotomy and placement of grafts, can be used to address this problem.^{3,23} In our case, we decided to place an autogenous cancellous bone graft from the iliac crest, adjusted to the size of the defective region (4 cm³). This type of graft offers greater strength and support than cartilage, with superior results compared to allografts, which are not recommended in these patients. Moreover, the iliac crest provides a large amount of graft material with predictable behaviour and high levels of success.²² Although there have been reports that this type of graft can be resorbed in some cases, we found good and long-lasting results after 18 months follow-up (Fig. 5).

Although we found few references in the literature regarding the management of the nasal dorsum in these patients, there are reports concerning its increase and/or reduction.^{3,13,24} However, all of our patients required a reduction of the nasal dorsum to a greater or lesser extent due to the presence of ridges, which we believe was related to the severity of nasal tip deflection and hypoplasia, always present in one of the sides.

Resection of the excess skin which is part of nasal dysmorphia in some cases of CLP has been part of the surgical technique described by some authors,²⁴ helping to achieve an adequate aesthetic harmony of the nose (Fig. 6).

Conclusions

The preoperative analysis of these nasal pathologies should include aesthetic, functional, anthropometric and psychological studies. Open septorhinoplasty, carried out at the age of 16–18 years, is an appropriate procedure for correcting nasal dysmorphia secondary to CLP. Our surgical technique provided good functional, aesthetic, anthropometric and psychological results in the long-term.

Conflict of Interests

The authors have no conflict of interests to declare.

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