

Presurgical orthopedics in children with cleft palate. Case Report

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Abstract

Cleft lip and palate require presurgical orthopedics to achieve the normal alignment of the cleft maxillary segments prior to Primary Cheiloplasty. **Clinical case.** A male newborn treated at the Hospital Regional de Concepción diagnosed with complete bilateral cleft lip and palate treated with presurgical orthopedics. Evolution was observed after the first year, as well as the advantages of the Grayson technique and the interaction of the participating multidisciplinary team. **Conclusion.** Presurgical orthopedic treatment is effective in the rehabilitation of cleft children, and contributes breastfeeding and child feeding. It also makes possible to move the affected bony and soft tissue elements to a better anatomical position in an early stage resulting a better surgery aesthetic and functional. Primary cheiloplasty is thus facilitated by a tension reduction of soft tissues and of the width of the alveolar cleft palate.

Keywords: newborn, cleft lip, cleft palate, orthopedics

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Introduction

Cleft lip and palate is one of the most frequent congenital malformations that affect the maxillofacial complex. It ranks third among all malformations and has multifactorial etiology. During gestation there is an alteration in the fusion of tissues that form the upper lip and palate (1, 2). Around the world, 1 in 1,200 children born alive present this malformation according to data of the Latin American Collaborative Study of Congenital Malformations. In Chile, the rate almost doubles the world rate: approximately 1.8 in 1,000 children born alive (1, 3).

This malformation, a cleft lip or a cleft palate or both, affects different functions of children, such as feeding, hearing, breathing and phonation (1, 4), and it entails aesthetic, psychological and social adaptation problems (3, 4).

The rehabilitation of affected patients is a complex process that begins early and includes a multidisciplinary focus that aims to achieve complete rehabilitation, to improve the aesthetic appearance of the soft and hard tissues compromised and to facilitate the individual's social integration (5).

Current protocols support the use of presurgical orthopedics from birth to align the segments of the cleft maxilla and the nasal molding in the first months, prior to the surgical reconstruction of the lip and palate. This procedure is based on Matsuo and Hirose's research. They report that in newborns, the nasal cartilage is still in development and subject to relocation due to the plasticity of the cartilage that has high levels of hyaluronic acid that circulates in the body several weeks after birth (4, 6-10). It is also possible to modify these anomalies in newborns because of the maternal estrogens present that make the cartilaginous and bony structures of the fetus elastic and plastic (3).

Presurgical infant orthopedics has been used

since 1950, with McNeil and Burston in England, as adjuvant neonatal therapy to correct cleft lip and cleft palate. However, it is only many years later that it becomes an accepted technique (7, 11). Grayson et al. designed an orthodontic plate where they added a nasal extension for simultaneous nasal and alveolar molding. The combination of these two elements creates the nasoalveolar molding device. The nasal extension is placed when the distance between the cleft alveolar segments is lower than 5 mm (4).

Presurgical orthopedics is indicated for infants with a large cleft lip and palate defect and a severe skeletal malformation of the maxilla. Its main aim is to achieve a normal anatomy at an early stage by decreasing the size of the opening and re-establishing the correct anatomic ratio of the cleft maxillary segments (2, 12). It also helps guide the growth of the segments where the maxilla is divided (13), improve lingual function, facilitate newborn feeding, mold the nasal cartilages and reshape the columella (14).

Ideally the infant should be younger than 72 hours for this procedure. The presurgical treatment is completed at the age of 5 months approximately, before the closing of the primary palate (1, 15), after which, the device is removed and the first surgery is performed (16).

Clinical case

Male newborn diagnosed with complete bilateral cleft lip and palate (Fig. 1). He received care at the Hospital Guillermo Grant Benavente by a multidisciplinary team of health specialists that included, in the first phase: a pediatric surgeon, an obstetrician, a kinesiologist, a speech therapist, a pediatric dentist and a psychologist.

In the general physical exam, low weight and normal skin coloration is observed. In the ex-

traoral and intraoral exam, a bilateral cleft lip is observed, as well as a good jaw ratio, premaxilla displacement greater than 4 mm from the lateral segments, with greater displacement to the left, and bilateral complete cleft palate. Presurgical orthopedics rehabilitation was started at an early stage with the insertion of a removable obturator plate and a nasal splint which were in place until the infant was 4 months old (Figs. 2 and 3).



Fig. 1: Bilateral cleft lip and palate



Fig. 2: Removable obturator plate and nasal splint



Fig. 3: Patient with obturator plate and nasal splint



Fig. 4: Checkup before lip closing primary surgery. The benefits of presurgical orthopedics can be observed.

The treatment of the newborn was coordinated by a multidisciplinary team to achieve complete rehabilitation and to improve the infant's living conditions: feeding, phonation and aesthetics. Presurgical orthopedics began at birth and was in place until the infant was 4 months old, when Mülliken's bilateral cheiloplasty was performed (Fig. 4). Good results were obtained and there was no lip retraction. According to the care protocol, a kinesiologic treatment was applied to heal the wound using mesotherapy and ultrasound, among other techniques. Both the appearance and the texture of the skin improved, with greater mobility and more action capacity and functionality of perioral muscles (Figs. 5 and 6). In the dental checkup after the cheiloplasty, the infant's mother was given information about the need for good oral hygiene habits with dressings, as well as a healthy diet. The following stage would be when primary teeth erupted and preventive clinical measures would need to be taken. A speech therapist was part of the process as there was a delay in

the use of expressive language. A palatoplasty was performed when the infant turned one year old. The patient evolved well and there was good movement of the soft palate. Nowadays the patient attends periodical checkups with the medical team.



Fig. 5: Post-op checkup; results of Mülleriken's cheiloplasty



Fig. 6: Post-op checkup.

Discussion

Different techniques and management guides have been described for the early rehabilitation of the cleft alveolar ridge. They include presurgical orthopedics, which is important for creating and preserving normal functions (17).

In this case, the treatment began by following the clinical guide on cleft lip and palate of the Chilean Ministry of Health: an impression of the cleft maxilla was taken with quick-set silicone. Then, the working model was used to build an acrylic obturator plate which was used during the first week of life. The plate should remain in contact with the palate and the alveolar processes, and it must be fixed using elastic tapes externally attached to the cheeks and to an extension of the plate through the cleft lip. The plate was modified weekly to bring alveolar segments closer gradually. This is achieved by adding soft acrylic in the areas where bone displacement is desired and by selectively removing acrylic in the areas where bone is expected. This is done to reshape alveolar segments to achieve alignment and the occlusion of the alveolar gap (9).

A study conducted by Spengler et al. (10) showed that presurgical therapy has major advantages for the treatment of bilateral cleft lip and palate. Some of them were observed when treating our patient. A few examples: improvement of nasal asymmetry and projection of the deficient nasal tip associated bilateral cleft lip and palate. It allows for an appropriate alignment of alveoli, lip and nose, which results in better surgical outcomes (18). The size of the cleft palate is significantly reduced before the surgery (18, 19), which allows the surgeon to successfully perform a gingivoperiostoplasty, and facilitates the closure of the nasolabial gap by reducing the tension in soft tissues (2, 12, 18). Once the alveolar segments are better positioned and bone bridges through the defect become more solid, permanent teeth have a greater probability of erupting in a good position with the necessary periodontal support. It also results in fewer and less complicated surgeries to restore and maintain acceptable nasolabial aesthetics such as the growth of the

nose (16-19), resulting in substantial savings for the family. Another advantage was shown by Lee et al. (7), who reported that midfacial growth on the sagittal and vertical planes is unaffected. Besides, it results in good long-term nasal aesthetics, it corrects the wrong position of the nasal cartilages and the alar base on the affected side, it extends the columella, and it restores the normal contour of the maxillary arch (5). It also makes it possible to separate the oral and nasal cavities thus minimizing the entry of food into the nasal cavity, reducing adverse effects on the nasal mucosa and facilitating feeding (2, 9, 11, 14). It minimizes or reduces the future need for a nasoalveolar bone graft (15, 17, 18). It improves breathing and the development of orofacial functions: deglutition, phonation and feeding (16). It corrects the disposition of long-term facial structures (9, 18) and it also has psychological and social benefits for parents and patients (20).

In a prospective study conducted by Spengler (9) in Houston with patients with bilateral cleft lip and palate, measurements were taken in cast models to compare before and after treatment results. They showed significant reductions in protrusion and deviation of the premaxilla, and in the width of the defect, which was observed in subsequent checkups. During the treatment, patients must attend periodical checkups with the pediatric dentist, as was the case of this patient, to prevent and monitor decay, as well as otolaryngologic evaluations at least once a year (21).

Conclusion

Presurgical orthopedics treatment is efficient in the rehabilitation of cleft children as it allows for early redirection of the affected bony elements and soft tissues to a favorable anatomic position. This yields better surgical

results, both aesthetic and functional, as primary surgery of the lip is facilitated by the reduction of the tension in soft tissues and the reduction of the cleft palate and alveoli. Nasoalveolar molding has proven efficient to achieve greater symmetry of the lip and of the nasal cartilages, as well as to improve the projection of the tip of the nose.

Presurgical orthopedics plates are part of the care protocol of the cleft child, as it is not only an important element when closing the defect and relocating soft tissues, but also a contributing factor to facilitate feeding.

Besides, it reduces the need for surgical reconstruction of the columella. The use of the nasoalveolar molding brings the maxillary segments closer so that, if the gingivoperiostoplasty is performed when the lip is closed, there is a significant reduction in the need for a subsequent alveolar bone graft.

Treating a cleft patient is a complex procedure which requires a multidisciplinary approach and parents' full cooperation to achieve a successful result.

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