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Prosthetic Management of Orofacial Clefts in Newborns: A Series of Case Reports

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Abstract

Orofacial clefts are one of the most common congenital defects. They can be isolated or associated with syndromes. Their etiology is multifactorial, involving both genetic and environmental factors. The therapeutic management of these children extends from birth to adolescence and involves several professionals, including the surgeon, pediatric dentist, orthodontist, and speech therapist. The realization of palatal obturators in newborns, constituting the only part of the overall treatment, allow normal feeding and prepare the infant for the surgical phase. The objective of this article was to show prosthodontic management of two cases of orofacial clefts by fabricating palatal obturators.

Keywords: Orofacial Clefts, Palatal Obturators, Impression, Prosthetic Management, Palate

1. Introduction

Orofacial clefts are the most common congenital facial malformations in the world. It affects, on average, 1 in 700 newborns, with ethnic and geographical variations [1,2]. It results from a failure of fusion between the facial buds during the fourth week of intrauterine life. It is characterized by a lack or insufficiency of fusion of the upper lip, and/or the alveolar ridge of the maxilla, and/or the bony palate, and/or the soft palate [3]. The etiology appears to be multifactorial, involving both genetic and environmental factors. It can be isolated or associated with syndromes [4,5].

Orofacial clefts exhibit many serious consequences. It can affect feeding, speech, hearing due to tooth agenesis and supernumerary and /or malpositioned teeth as well as the appearance; nose and mouth asymmetry; leading the affected children with low self-esteem and poor social and behavior skills, thus a substandard quality of life [6-8]. Many studies have reported that children with orofacial cleft have an increased caries experience in comparison with non-affected children. Mainly because of limited access of cleft areas making oral hygiene difficult, extended periods of bottle feeding with a greater amount of sugar compared to breast-feeding, reduced salivary flow and mouth breathing [9,10].

Many patients with cleft lip and/ or palate show a lack of growth in the mid-face area according to S Kakkar and al, it is the result of disturbance in the muscular activity during mastication, swallowing and speech as well as a maxillary growth deficiency resulting in an erratic pressure of the lips and masticatory muscles on the bony structures leading in many malocclusions such as classIII with anterior and / or posterior crossbites [11]. The therapeutic management of these children is complex and extends from birth to the end of adolescence. It is multidisciplinary, involving several specialties, including pediatric dentistry. In the neonatal phase, the treatment consists of performing prosthetic rehabilitation, which, at this stage of life, serves both to restore oral functions that are often impaired and to improve the condition for a possible surgical procedure [12].

This rehabilitation is carried out using palatal obturator plates, which separate the nasal cavities from the oral cavity, thus enabling breastfeeding. The aim of this article is to present, through two clinical cases, the prosthetic steps involved in creating obturator plates and their expected outcomes.

1.1. Clinical Cases

1.2. First Case

A newborn, presenting with a unilateral cleft lip, alveolar ridge, and palate, was referred to the Pediatric Dentistry Department at the Monastir Dental Clinic for the creation of an obturator plate. The general examination revealed that the patient had no general pathology and no

associated malformities defects. The patient was from a non-consanguineous marriage. The intraoral examination allowed for the assessment of the extent of the cleft, as well as the anatomical elements that were favorable and unfavorable for prosthetic rehabilitation.

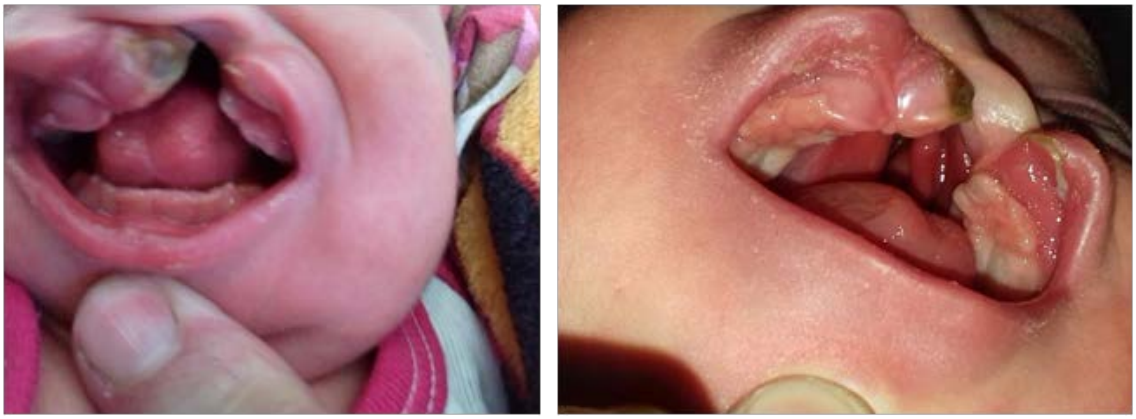

Figure 1: Complete Unilateral Cleft Lip and Palate

An individual impression tray (IIT) in wax was made on a pediatric impression tray (Figure 2).It was then tried in the mouth and adjusted.

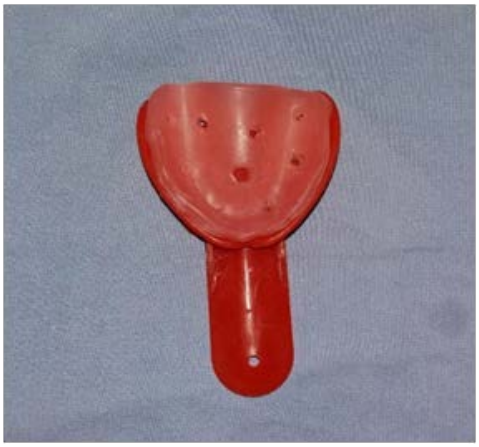

Figure 2: Making of an Individual Impression Tray (IIT) in Wax

In this case, silicone was used for the impression (Figure 3).

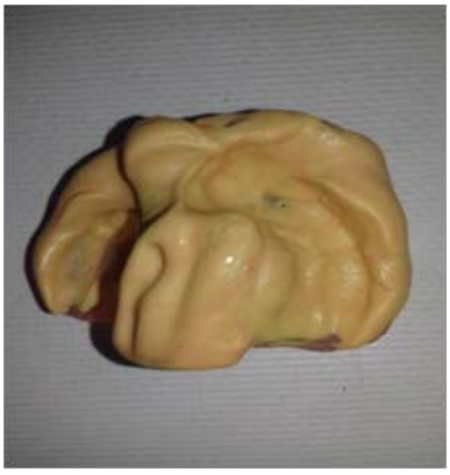

Figure 3: Silicone Impression

The impression was poured, and the plate was made on the plaster model.(Figure 4)

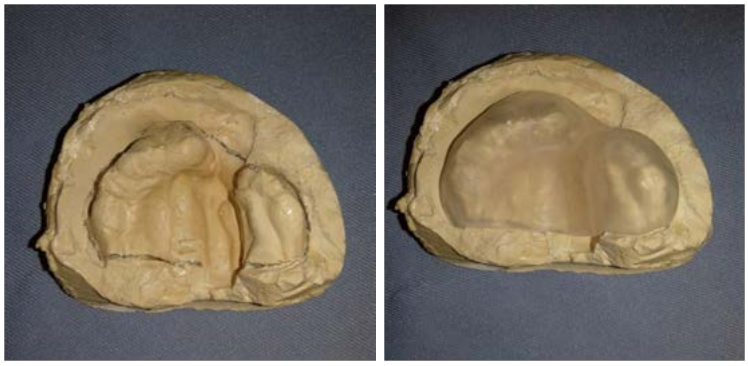

Figure 4: Creation of the Palatal Plate

The plate was examined extra-orallyfor any rough surface then placed in the mouth and adjusted intraorally so that it initiated a sucking reflex . (Figure 5)

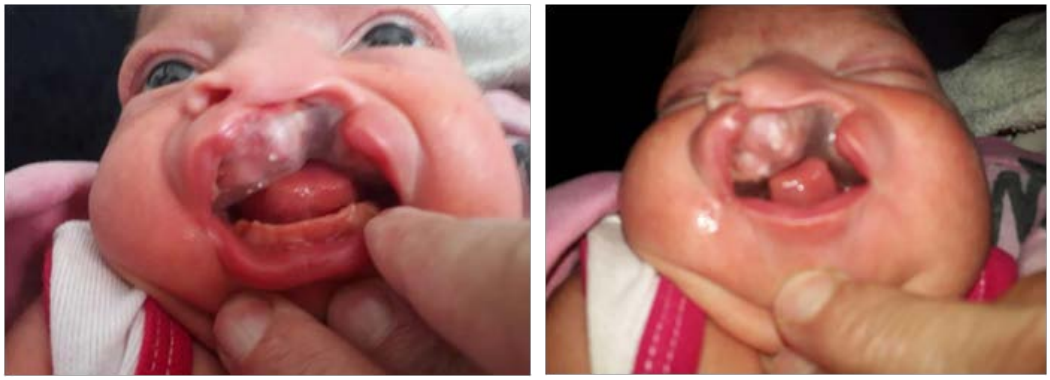

Figure 5: Try-in of the plate in the mouth

The plate was tested with the bottle feeding to ensure proper passage of the milk into the oropharynx no nasal regurgitation of milk was noticed. (Figure 6)

while educating the purpose of the feeding plate, the method of insertion, removal, and maintenance was taught to the parents as well as instructions were given to the mother regarding the storage and use of the obturator. Like it should be kept in a clean and dry place when not in use, regularly inspecting the surface for any signs of wear or tear. After feeding, the infant oral cavity and obturator should be cleaned with a soft cloth soaked in warm water.

Figure 6: Bottle feeding with the plate in the mouth

Regular check-ups were scheduled to monitor the plate and, if necessary, remake it to accommodate the growth of the maxillae.

Second Case

A newborn was referred to the Pediatric Dentistry Department at the Monastir Dental Clinic, presenting with a velopalatal cleft as part of Pierre Robin syndrome. The intraoral examination confirmed this defect and assessed the extent of the cleft. (Figure 7)

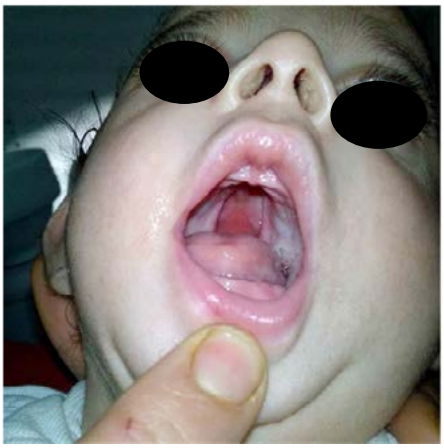

Figure 7: Velopalatine Cleft

A wax individual impression tray (IIT) was made and adjusted in the mouth. The impression was made with alginate (Figure 8). Specifically, a gauze was adapted to the support surface to prevent the material from fusing into the upper respiratory and digestive tracts.

Figure 8: Taking the Impression

The impression was poured, and the plate was made .It was adjusted and tried in the mouth. (Figure 9)

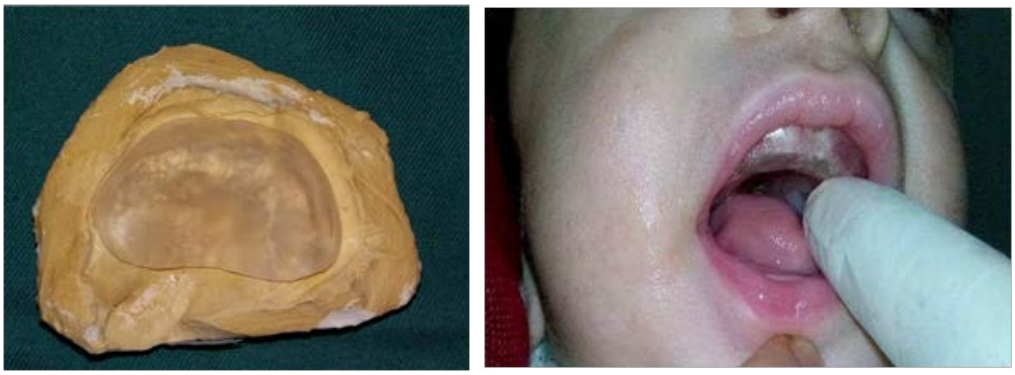

Figure 9: Creation and Try-in of the Plate in the Mouth

Breastfeeding techniques were taught to the parents as well as the instructions for the obturator storage and cleaning, and regular follow-ups were scheduled. For both cases, written consent was obtained from the parents before the initiation of obturator therapy. Both families were educated about the condition their children were suffering from and were further explained about the treatment options and further outcomes that mainly alter the quality of life.

2. Discussion

According to epidemiological studies, cleft lip and palate are more common (46%) than isolated palatal clefts (33%) and isolated cleft lips (21%). Combined cleft lip and palate are more common in males, while isolated palatal clefts are more frequent in females [13-15]. They are often associated with genetic syndromes (more than 340 have been described), such as Pierre Robin syndrome, Van der Woude syndrome, and Di George syndrome [16].

Most authors agree that orofacial clefts have a multifactorial origin, with a complex interaction between genetic factors with variable penetrance and expression thresholds,

modulated by environmental factors. Several defective genes have been studied and linked to facial clefts (TGFa, TGFb, MSX1, RARa, etc.) [17]. Certain environmental factors may be involved, such as deficiencies in vitamin A, riboflavin, folic acid, or an excess of cortisone. Several teratogens have been linked to the appearance of facial clefts: tobacco, alcohol, retinoids, aminopterin, diphenylhydantoin, trimethadione, and thalidomide [18].

The therapeutic management of these children from birth to the end of adolescence is multidisciplinary and includes many specialties: neonatology, surgery, speech therapy, otorhinolaryngology, speech-language pathology, orthodontics, pediatric dentistry, psychology, and genetics. According to many schools of thought, cleft lips are surgically corrected, typically during the neonatal period (the first ten days of life), and palatal clefts are addressed at three months of age [19].

In the case of palatal clefts, obturator plates are indicated while waiting for the surgical phase. Introduced in the early by McNeil later adopted by Burston and modified by Hotz and Gnoinski [19,20,21]. They offer several advantages:

• Allow normal feeding and thus promote weight recovery,

• Reduce nasal regurgitation: by separating the nasal cavities from the oral cavity, it prevents irritation of the nasal mucosa by milk and improves the infant's feeding conditions by facilitating sucking,

• Normalize the position of the tongue and enable swallowing: the interposition of the tongue in the cleft could lead to an unfavorable orientation of the palatal and maxillary palatal plates, almost vertically, exaggerating the width of the bony gap. Thus, the neonatal palatal plate, by providing a support point for the tongue, prevents this verticalization phenomenon and allows for the acquisition of normal tongue motor patterns, restoring correct palatal anatomy.

• Reduce parental frustration due to feeding problems and involve them in the treatment,

• Contribute to guiding the growth of the maxilla to achieve a harmonious alveolar arch,

• Prepare the infant for surgery by restoring a harmonious contour to the alveolar ridges and reducing the deformation of the nasal septum [22-24].

These plates are made of acrylic resin. The crucial step in their creation is the impression taking, due to the risk of asphyxiation. Conventional impression materials such as alginate or silicone have been proven strenuous for neonates because of the complex anatomic structures, small oral cavities, limited cooperation, difficulty in maintaining static position during impression -taking and the constricted airways of children which can result in a reduction in oxygen saturation or inducing a gag reflex requiring an immediate medical intervention [25].

For this reason, it is essential that the impression is preferably taken in the absence of the parents to avoid any psychological trauma and thus prevent disruption of the procedure. It is also necessary that the impression be taken in a hospital setting equipped with an oxygen source, and potentially an oxygen saturation measurement device and surgical suction. The presence of an anesthesiologist is advisable. The recommended position for the infant is upright position, with the head well supported, allowing for the clearance of the airways.

The most commonly used impression materials are elastomers, such as silicone, due to their volumetric stability, pleasant taste, availability in various viscosities, and high precision in recording. It is easily manipulated and allows passage into undercut areas without the risk of tearing. But as any other impression material it has to be manipulated with care as accidents can happen. (figure 10)

Figure 10: Silicone Pieces Extracted from A One-Month-Old Baby 'S Trachea During an Impression Taking

Irreversible hydrocolloids should be avoided to prevent any risk of inhalation of the material or retention of its debris in the nasal and paranasal undercut areas [26].The impression is taken using an adapted and adjusted individual impression tray (IIT).Regular follow-ups should be established to monitor growth and adjust the plate accordingly. New plates may be made depending on wear and maxillary growth until primary surgery.

Orofacial cleft patients' management using conventional impression techniques is considered as a heavy task due to the elevated risk of respiratory complications. Moreover,

the storage, transfer, and retrieval of the plaster models are difficult adding that it is susceptible to dimensional changes. So, the overcome the issues associated with traditional procedures, digital impression has been introduced to be used at various stages of cleft care using an intraoral scanner. It provides benefits, including the improvement the precision, efficiency, and safety of obtaining oral impressions in neonates with cleft palate as well as fabricating the appliances used in pre-surgical orthopedics and streamlining collaboration among specialists. Digital impression technology has emerged as a promising alternative to make the treatment more efficient and less discomforting for both practitioner and patients [25].

3. Conclusion

Neonatal prosthetic management of orofacial cleftstruly impacts the overall therapy of these defects by minimizing the associated complications and promoting normal growth of the facial structure. This early therapy is only one part of the overall treatment, which involves multiple specialists in a well-defined chronological sequence. Incorporating advanced technologies such as digital impressions can further enhance the efficiency of neonatal prosthetic care. Despite their potential, these techniques remain underutilized in many clinical settings. As we continue to improve interdisciplinary care, embracing innovation will be key to optimizing outcomes for these patients.

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