

RECONSTRUCTION OF CLEFT LIP AND PALATE AND STANDARDIZATION OF THEIR CLINICAL RECORD FROM INFANCY THROUGH ADOLESCENCE

Orthodontology

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ABSTRACT

INTRODUCTION: Orthodontics and dentofacial orthopaedics play an important role in reconstruction of child with cleft lip and palate (CLP). In layman term, cleft palate can be defined breach in continuity of the palate.

DISCUSSION: Generally, midfacial irregularity and maxillary retrusion are the commonly seen problem after the surgical correction of CLP patients, which occurs mainly because of intrinsic factors, functional or adaptive factors influencing the position and growth of normal and abnormal part and iatrogenic factors due to effect of treatment procedures. The principle of NAM is “negative sculpturing” and “passive molding” of the alveolus and the soft tissues. Orthodontic techniques are used to mold the maxillary, alveolar, and nasal tissues of an infant with CLP.

Despite all the hard work that goes into every case, one aspect seems to be missing among many dentists across the globe is proper documentation of their cases. A proper documentation has many advantages. From start of the treatment planning in diagnosis to follow-up and for patient satisfaction point of view, standardization of clinical record play vital role in management of cleft lip and palate patients.

CONCLUSION: The orthodontist play an important role in reconstruction of cleft lip and palate patient from birth to adulthood and provides both esthetic and functional treatment. knowing proper documentation not only improves diagnosis and treatment planning for orthodontist but also improve their future clinical practice

KEYWORDS

Cleft lip and palate, Treatment Timing, Documentation.

INTRODUCTION

Orthodontics and dentofacial orthopaedics play an important role in reconstruction of child with cleft lip and palate (CLP). In layman term, cleft palate can be defined breach in continuity of the palate. The role of orthodontist in treatment of cleft lip and palate (CLP) is beneficial, soon after birth of baby for naso-alveolar moulding and during mixed dentition for bone graft success, regular orthodontics in permanent dentition before and after orthognathic surgery along with functional and esthetics rehabilitation of cleft child.

Various literatures suggest that CLP was reported back in 1000 AD. Parea in year 1561, was first try to put obturator to cover the furrow produced by CLP, to help in feeding and phonation. In 1764, Le Monnier, surgically tried to manage cleft lip and palate, but lots of surgical attempts were failed to close the cleft cavity, due to a strong tension present at the mid palatal suture area, so in 1826, Dieffenbach recommend that separation of soft tissues of palate from the underlying bone. Fergusson in 1844 and Von langenback in 1862, popularised the need to elevate the periosteum from palatal mucosa, so creating the mucoperiosteal flap.⁽¹⁾

Primary members of cleft care team include orthodontist, oral surgeon, plastics surgeon, speech therapist and paediatrician, while the secondary members include genetics, ENT specialist and psychologist.

Development of CLP is occurring mainly due to the irregularities in early embryonic development which cause furrowing in palatal area, crowding, maxillary hypoplasia and various others morphological anomalies in both deciduous and permanent teeth. Because of all these, the reconstruction of cleft become complex to treat.

Development of cleft lip and palate

Generally, midfacial irregularity and maxillary retrusion are the commonly seen problem after the surgical correction of CLP patients, which occurs mainly because of intrinsic factors, functional or adaptive factors influencing the position and growth of normal and abnormal part and iatrogenic factors due to effect of treatment procedures.

Occurrence of palatal mucoperiosteal flap signals at the growth centres of hard palate, cause the maxillary growth abnormalities. Scar formation and denuded palatal bone formation near to alveolar margin and pterygopalatine tuberosity sutures have been implication to cause retardation in maxillary growth⁽²⁾

Phases of orthodontic treatment in patient of CLP

American Cleft Palate-Craniofacial Association (ACPA) proposed the following phases of orthodontics in each patients (Fig. 1)

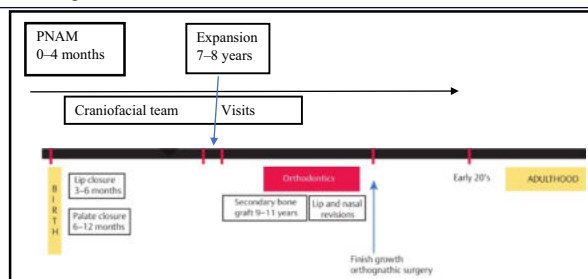


Fig. 1 Phases of orthodontic treatment of cleft lip and palate patients. PNAM, presurgical nasoalveolar molding.

Presurgical maxillary orthopaedics (0–4 months).

Interceptive orthopaedics (7–8 years, about 20% of cleft patients) that involves transverse expansion and protraction (face mask).

Alignment of maxillary incisors and arch preparation before secondary Alveolar Bone Grafting.

Conventional orthodontics in the permanent dentition is always necessary dental adjustments dependent on prosthodontic or orthognathic surgery are performed between 17 and 19 years

PRESURGICAL NASOALVEOLAR MOLDING (PNAM)

The principle of NAM is “negative sculpturing” and “passive molding” of the alveolus and the soft tissues (Fig.2). Orthodontic techniques are used to mold the maxillary, alveolar, and nasal tissues of an infant with CLP.



Fig. 2 A.) Extraoral Photograph, B.) Intraoral photograph

The main objective of presurgical NAM is to decrease the severity of the cleft deformity. Reduction in the width of the alveolar cleft segments until passive contact of the gingival tissues is achieved. The

lip segments should come in contact at rest, symmetrical lower lateral alar cartilages, and adequate nasal mucosal lining, which permits postsurgical retention of the projected nasal tip. In the infant with BCLP, the objective of presurgical NAM includes the nonsurgical elongation of the columella, centring of the premaxilla along the midsagittal plane, and retraction of the premaxilla as a slow process to achieve continuity with the posterior alveolar cleft segments. In BCLP, the reduction in the width of the nasal tip, improved nasal tip projection, and a decrease in the nasal alar base width.

PROTOCOL FOR NAM APPLIANCE:

An impression with a heavy bodied polyvinyl silicone was taken with the infants held in the upside down position in the mother's lap allowing for the infant's neck to be extended. Proper pre-cautions were taken during the impression procedure such as feed restriction, pulse oximeter monitoring, and complete removal of the impression material after it had set.

The acrylic NAM plate was made using a self-cure acrylic resin after blocking out the cleft defect with the modelling wax. A retention button was then fabricated and placed anteriorly at an angle of 40° to the plate in such a way that the vertical position of the retention arm was at the junction of upper and lower lips. The rough edges were all trimmed and smoothed, it was then inserted into the infant's mouth and secured bilaterally on the cheeks with the help of orthodontic bands from the retention button to the cheeks via surgical tape.

ORTHODONTICS PRIOR TO BONE GRAFTING

It mainly involves incisor alignment and expansion (arch preparation) prior to bone grafting. Incisor alignment at the age of 7 to 8 years is done for two reasons; one to fulfil the esthetic requirement of the patient in a growing child, and secondly, correction of anterior crossbite at this age is performed to maximize the forward development of maxillary dentoalveolar process.

During incisor alignment all correction of crossbite and any rotation present in maxillary incisor corrected. After the lip surgery, the arch wire is kept well adapted to the teeth surface and the loop wires are not used as repaired lip and low buccal sulcus can be easily irritated. Anterior crossbite or the negative overjet is corrected by opening the bite with buildup on the lower deciduous molars. After this, another 3 to 6 months are added to correct rotated or inverted incisor by the use of elastic chain.⁽⁴⁾

MAXILLARY EXPANSION IN CLEFT PALATE PATIENTS OR ARCH PREPARATION FOR ALVEOLAR BONE GRAFTING

In CLP patient, maxilla deficient in transverse dimension usually anterior arch is more collapsed than molar segments. Differential expansion obtained early in childhood using Quard helix (Fig. 3A) or Warch. Rapid maxillary expansion (RME) may also be carried out, but in older patients RME is the choice of treatment. NiTi expander (Fig.3B) is another available method of slow expansion.

The advantage of performing expansion before bone grafting are: (1) Ease with which skeletal movement and segment rotation can occur. (2) Benefit with fixed jack-screw type expanders, slow expansion of the appliance can also accomplish segmental expansion. (3) Uncovering covert oronasal fistulas, which could then be repaired simultaneously with bone graft placement. In addition to this, there are some disadvantages also such as segmental movement at the expense of increasing the cleft width and creating a cleft width that exceeds the soft tissue coverage capabilities could negatively impact bone graft results.



Fig 3A. Quard Helix expander



Fig 3B. Niti Palatal expander

FACE MASK THERAPY/FUNCTIONAL JAW ORTHOPAEDICS: CASE REPORT 1

Face mask is an effective tool for treating skeletal Class III

malocclusion with a retrusive maxilla mainly in horizontal growth pattern (Fig.4A,B,C). This therapy involves, downward and forward movement of the maxilla, an increase in overjet, and a backward rotation of the mandible with increased anterior facial height. Mixed dentition is the ideal time for the initiation of face mask therapy with the mean duration to wear is of 14 hours per day.

Surgical Orthodontics

Based on both initial occlusal index and facial aesthetics, following two options are available for the treatment of class III skeletal pattern.

- Compensatory orthodontic treatment: this treatment is available for the patient with initial occlusal index GOSLON 3 with acceptable facial aesthetics as because orthodontic treatment alone would not improve the facial appearance. In such case, mandibular extraction is required.
- Decompensation orthodontic treatment: this type of orthognathic surgery is indicated for the patient with occlusal index GOSLON 4 and 5 or patient with GOSLON 3 coupled with poor facial aesthetics. In about 25 to 30 % of patient, orthognathic surgery is required as for the treatment.

CASE: 1

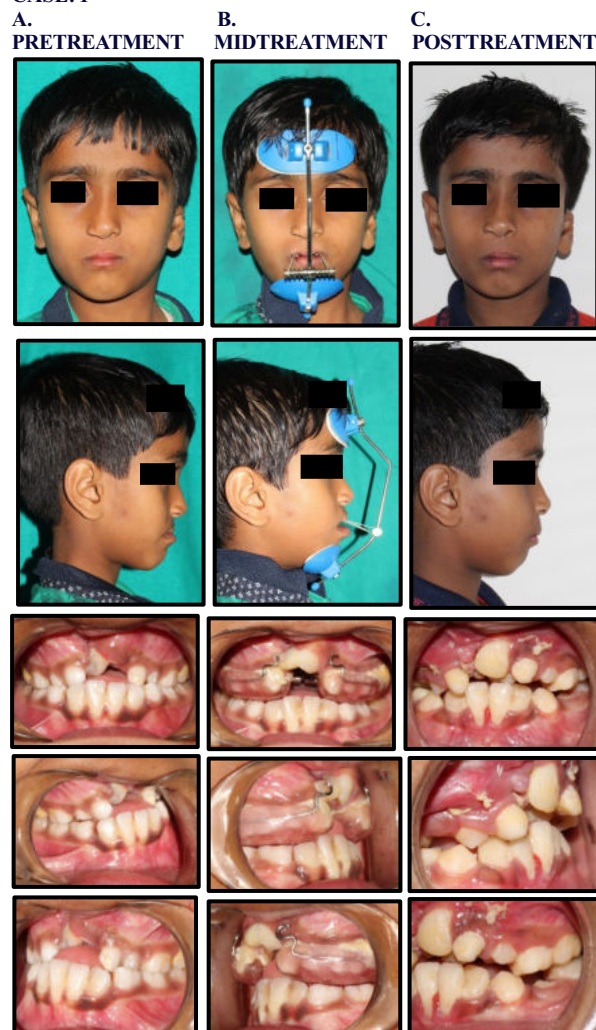


FIG 4. A.) Pre-treatment B.) During treatment and C.) Post treatment Photograph of a patient treated with facemask therapy

In addition to this, maxillary incisors require proclination decompensation movements during preoperative orthodontic treatment, because patient with clefts and Class III facial pattern present retroclined inclination of maxillary incisors due to the restrictive effect of the operated upper lip. Mandibular incisors may be proclined in the presence of a wide symphysis and good quality of gingiva, in patients with mild dental crowding. Orthognathic surgery is performed after the completion of facial growth and usually involves Le Fort I osteotomy for maxillary advancement or a segmental osteotomy to close a big cleft defect.

TIMING AND STANDARDIZATION OF ORTHODONTIC RECORDS

Despite all the hard work that goes into every case, one aspect seems to be missing among many dentists across the globe is proper

documentation of their cases. The World Health Organization (WHO) suggest a set of guidelines for record collection, for cleft patients, to be collected for specific treatment at a particular time and age is tabulated as follow⁽³⁾ (Table 1.1-1.6)

Table: 1.1 Complete cleft lip and palate (UCLP and BCLP)

TIMING	MODELS	LATERAL SKULL RADIOGRAPH	PHOTOGRAPH	SPEECH/TYMPANOMETRY	AUDIOMETRY	PATIENT/ PARENT SATISFACTION
Primary surgery	√		√			
3 years				√*	√*	
5/6 years	√		√	√	√	
10 years	√	√	√	√	√	
18+ years	√	√	√	√		√
Abbreviations: Bilateral cleft lip and palate (BCLP); Unilateral Cleft lip and palate (UCLP)						
* if hard palate is closed						

Table: 1.2 Cleft palate only

TIMING	MODELS	LATERAL SKULL RADIOGRAPH	PHOTOGRAPH	SPEECH/TYMPANOMETRY	AUDIOMETRY	PATIENT/PARENT SATISFACTION
Primary surgery	√		√			
3 years				√	√	
5/6 years	√			√	√	
15/16 years	√	√	√	√	√	√

Table: 1.3 Cleft lip only

TIMING	MODELS	PHOTOGRAPH	PATIENT/ PARENT SATISFACTION
Primary surgery	*√	√	
3 years			
5/6 years	*√	√	
10 years			
18+ years		√	√
*only in case with cleft of the alveolus as well as cleft lip			

Table: 1.4 Alveolar bone grafting

TIMING	INTRAORAL X-RAY	PHOTOGRAPH
Just before bone graft	√	√
6 months after bone graft	√	
After canine fully erupted	√	√

Table: 1.5 Pharyngoplasty

TIMING	SPEECH SAMPLE
Just before operation	√
1 year after operation	√

Table: 1.6 Orthognathic surgery

TIMING	LATERAL CEPHALOGRAM	MODELS
Just before operation	√	√
1 year after operation	√	√

CONCLUSION

Orthodontic management of CLP patients involve specific treatment at ideal age to establish a balance between the growth and development occurring simultaneously according to age. In team care management of cleft patients, Orthodontist is involved at different stages of treatment such as just after birth for presurgical molding, then before and after bone grafting and knowing proper documentation not only improves diagnosis and treatment planning, also improve their future clinical practice.

Hence, we can conclude that the orthodontist play an important role in reconstruction of cleft lip and palate patient from birth to adulthood and can enhance the treatment outcome by mean of providing both esthetic and functional treatment to the cleft patents.

REFERENCES

1. Millard DR Jr. Cleft Craft: The evolution of its surgery. Boston, Little Brown; 1980
2. Shaw WC, Semb G. Current approaches to the orthodontic management of cleft lip and palate. JR Soc Med 1990;83(1):30-33
3. WHO. Global strategies to reduce the health care burden of craniofacial anomalies: report of WHO meetings on international collaborative research on craniofacial anomalies. Cleft Palate Craniofac J 2004; 41(3):238-243
4. Vargervik K. Orthodontic treatment of cleft patients: characteristics of growth and development/treatment principles. In: Bardach J, Morris HL, eds. Multidisciplinary Management of Cleft Lip and Palate. Philadelphia: WB Saunders; 1990;642-64