ISSN : 1001-1781
Journal of Clinical Otorhinolaryngology, Head, and Neck Surgery

OROFACIAL CLEFT: A MULTIDISCIPLINARY PERSPECTIVE ON MANAGEMENT AND CARE

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ABSTRACT

Orofacial cleft (OFC) is a congenital deformity affecting the oral, facial, and craniofacial structures, caused by genetic and environmental factors. Preventive measures such as modifying parental regimes and discontinuing certain medicines can help reduce the incidence of OFC. Treatment requires a team of specialists, and early counseling of parents is crucial. Similarly, cleft lip and palate are common craniofacial birth defects that require an interprofessional team for comprehensive care. Understanding the complex causes and potential preventive measures for both OFC and cleft lip and palate is essential in reducing their incidence and improving the lives of those affected and their families, while also addressing the stigma surrounding these conditions. Increased awareness and understanding are necessary to support affected individuals and their families.

KEYWORDS: Congenital deformity; Interdisciplinary team; Orofacial cleft

INTRODUCTION

Orofacial cleft is a common congenital deformity affecting thousands of individuals worldwide. This condition results from a complex interplay of environmental and genetic factors that disrupt the tightly regulated developmental processes of the facial structures. The

resulting oral, facial, and craniofacial deformities can have a profound impact on an individual's quality of life, including their confidence, behavior, and societal attributes[1].

While the causes of orofacial cleft are multifaceted, genetic variants, environmental factors, and maternal health are all contributing factors. Development of the facial structures occurs during a critical period between 14 and 60 days post-conception, and disruptions to this process can lead to cleft lip and/or palate. Some of the genetic variants that have been identified as contributing factors include Interferon regulatory factor 6 (IRF6),Mshhomeobox 1(MSX1),Fibroblast growth factor(FGF)signaling pathway genes, Bone Morphogenetic Protein 4 (BMP4), and a locus on 8q. However, many cases of orofacial clefts remain unexplained[2].

Preventive measures, such as modifying parental regimes, improving diet with additional multivitamins and mineral supplements, and discontinuing certain medicines and drugs, can help reduce the incidence of orofacial cleft[3]. Maternal smoking during pregnancy has been shown to strongly interact with genetic factors, increasing the risk of orofacial cleft[4]. Periconceptional folic acid supplementation can decrease the incidence of clefts, while zinc deficiency during fetal development can lead to isolated cleft palate and other malformations[5].

Orofacial cleft imposes a substantial economic and health burden, both at a personal and societal level. The sub-phenotypes of both isolated and non-isolated OFC have provided significant insight into the causal factors. Non-syndromic or isolated OFC involves only developmental or structural abnormalities without any other associated conditions. Treatment of the deformity requires a team of specialists, including surgeons, speech therapists, dental surgeons, and orthodontists. Early counseling of parents and guardians is crucial, and increased awareness of potential risk factors is necessary to provide appropriate preventive measures.

Hence, understanding the complex causes and potential preventive measures for orofacial cleft can help improve the lives of those affected and their families. By raising awareness about this condition and providing insight into its impact on personal, psychosocial, and economic health, we can work towards reducing its incidence and providing better support for those living with orofacial cleft.

Figure 1: Cleft lip.

PREVALENCE AND INCIDENCE

Oral clefts affect approximately 1 in 700 live births worldwide[6]. Cleft lip with or without cleft palate occurs in 1 in 940 US births, while isolated cleft palate occurs in 1 in 1574. Occurrence

varies by population. The risk of recurrence depends on factors like family history and the type of cleft. If one child is affected, the chance of another child being affected is 2-5%. If there is more than one affected family member, the risk increases to 10-12%[7].

EMBRYOLOGY

The face is formed from five facial prominences, but incomplete mixing of tissues during development can lead to cleft lip or palate. Cleft lip happens because of the failed mix between 4th and 6th months of pregnancy, whereas the cleft palate occurs between the 6th and 12th months of pregnancy[8], which is known as the critical period of embryonic development. During this time, teratogens can cause birth defects.

ETIOLOGY

Orofacial clefts have a complex and multifactorial etiology, with both genetic and environmental factors playing a role in their development. While it is still unclear what specific environmental variables cause the illness and what genes predispose people to it, factors such as chromosomal abnormalities, maternal alcohol consumption and smoking, nutrient deficiencies, and exposure to certain medications have been linked to the development of oral clefts. Additionally, research has shown that some genetic variations, such as the MTHFR 677TT or MTHFR 1298CC genotypes, combined with inadequate folate intake, may increase the risk of having a child with cleft lip with or without palates[9.]

Various medications have been associated with oral clefts, including anticonvulsants like phenobarbital, valproate, and dilantin, as well as drugs used to treat cancer, acne, arthritis, and psoriasis. Additionally, maternal use of vasoactive medications and tobacco smoking has also been linked to the development of oral clefts. It is important for healthcare providers to carefully consider the potential risks of medications and environmental factors during pregnancy, and for individuals with a family history of oral clefts to discuss their risk with their healthcare provider.

CLASSIFICATION[10]

Classification by Davis and Ritchie (1922)

This particular grouping was recommended by 'Davis and Ritchie in 1922'. It was one of the very first classifications as mentioned in the literature. This classification system roughly categorized the cleft defects into three broad assemblies categorized on the basis of the position of cleft in approximation to the associated alveolar process.

Table 1; Classification by Davis and Ritchie

Group I- Pre alveolar clefts	Unilateral cleft lip Bilateral cleft lip Median cleft lip
Group II - Post alveolar clefts	Cleft hard palate alone Cleft soft palate alone Cleft soft palate and hard palate Sub mucous cleft
Group III-Alveolar clefts	Unilateral alveolar cleft Bilateral alveolar cleft

	Median alveolar cleft.

CLASSIFICATION BY VEAU (1931)

Veau recommended the following grouping system in the year 1931.

Table 2: Classification by Veau.

Group I (A)	Defects involving the soft palate only
Group II (B)	Defects involving the hard palate as well as soft palate extending not any further than that of the incisive foramen, thereby comprising of the secondary palate alone.
Group Ill (C)	Complete unilateral cleft, extending from that of the soft palate to the alveolus, commonly inclusive of the lip.
Group IV (D)	Complete bilateral clefts, more often resembles Group III but has a bilateral appearance.
When cleft is bilaterally present, pre-maxilla is observed to be suspended from the nasal septum.	

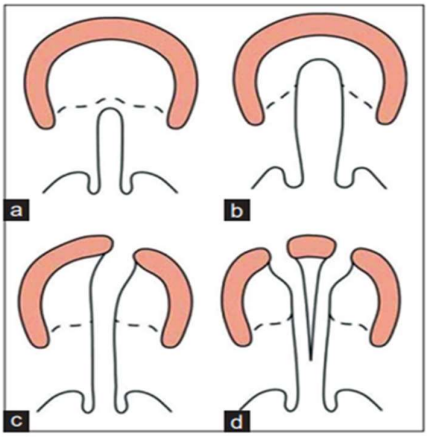

Figure 2: Diagrammatic presentation of Veau's classification.

MILLARD'S MODIFICATION OF THE KERNAHAN'S

STRIPPED "Y" CLASSIFICATION (1976)

Millard further supplemented two triangles over the tip of the "Y" to signify the nasal floor. This amplified the quantity of boxes to 11 as

Block 1 and 5- referring to the Nasal floor

Block 2 and 6- referring to the Lip

Block 3 and 7-referring to the Alveolus

Block 4 and 8-referring to the hard palate anterior to the incisive foramen

Block 9 and 10-referring to the hard palate posterior to the incisive foramen

Block 11- referring to the soft palate

The unaffected regions weren't shaded and the shading of the triangles signified the falsification of the nose

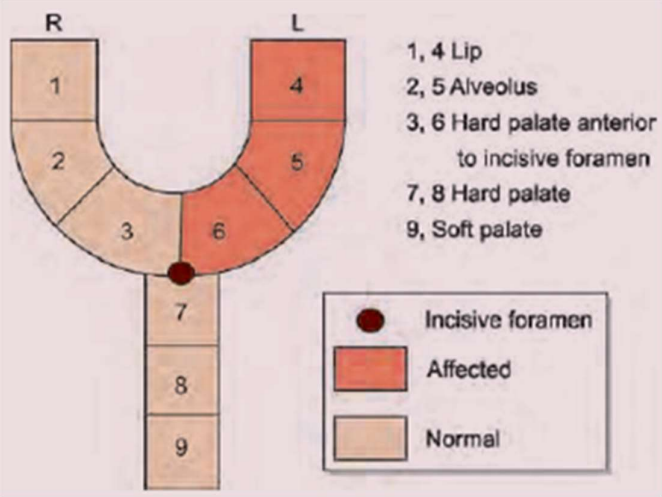

Figure 3: Diagrammatic Presentation of Millard's Modification and Classification

LAHSHAL CLASSIFICATION OF CLEFT LIP AND PALATE (1989)

"Kriens 104 proposed LAHSHAL, an abbreviated documentation system in 1987. Lahshal is a paraphrase of the anatomic areas affected by the cleft.

L- Lip
A-Alveolus
H-Hard palate
S-Soft palate
H-Hard palate
A-Alveolus
L-Lip

This classification is based on the premise that clefts of lip, alveolus and hard palate can be bilateral while clefts involving the soft palate are usually unilateral. The areas involved in the cleft are denoted by the specific alphabet standing for it."

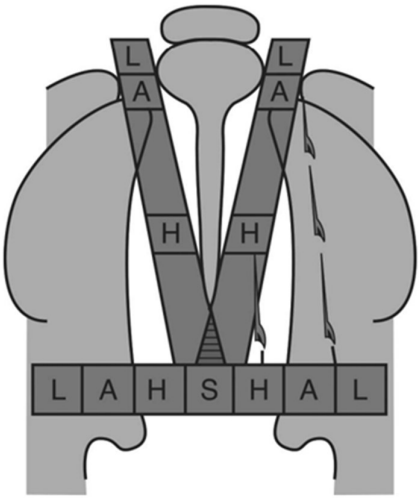

Figure 4: Diagrammatic Presentation of LAHSHAL Classification

RARE FACIAL CLEFTS CLASSIFICATION BASED ON TOPOGRAPHICAL FINDINGS

a. Median clefts of upper lip with or without hypoplasia or aplasia of pre-maxilla

b. Oblique clefts (oro-orbital)
c. Transverse clefts (oro-auricular)
d. Clefts of lower lip, nose, and other very rare clefts.

CLASSIFICATION BY ELNASSRY (2007)

Elnassry proposed following classification in 2007. He divided cleft lip and palate patients in to seven classes.

Class I: Unilateral cleft lip
Class I1: Unilateral cleft lip and alveolus
Class II: Bilateral cleft lip and alveolus
Class IV: Unilateral complete cleft lip and palate
Class V: Bilateral complete cleft lip and palate
Class VI: Cleft hard palate
Class VII: Bifid uvula.

TYPES OF OROFACIAL CLEFTS

Depending upon the site, oro-facial cleft is divided into two parts:

- Cleft in facial region,
- Cleft in oro-dental region.

Table 3: Types of orofacial defects

Cleft in facial Region	• Cleft Lip → • Oblique facial cleft • Lateral facial clefts • Median mandibular clefts	Unilateral cleft lip -- Complete cleft lip/Incomplete cleft lip Bilateral cleft lip -- complete cleft lip/incomplete cleft lip Median cleft lip-- complete cleft lip/ incomplete cleft lip"
Cleft in oro-dental region	• Cleft lip and cleft palate • Isolated cleft palate • Sub mucous cleft palate • Cleft of lip and alveolus • Cleft of the uvulae and soft palate • Cleft of uvulae alone	

ROLE OF PEDIATRIC DENTIST IN CLEFT LIP AND PALATE PATIENTS

Pediatric dentists are crucial members of the cleft palate team, providing dental support for proper development and appearance. They collaborate with other specialists to ensure functional and aesthetically satisfactory results through the use of feeding appliances, pre-surgical orthopedic decisions, and pre and post-surgical dental care[11].

A. **Examination of child with cleft at a dental set-up**

To effectively examine a baby or child, the dentist should position the child's head slightly lowered onto their lap while the parent or guardian stands in front of them to assist and control the child's limbs[12]. Using a small dental mirror can also be helpful during the examination.

B.**Management of associated neonates**

Newborns born with a cleft palate often face difficulties with feeding, leading to poor growth and breathing issues due to the displacement of the palate and mandible. Reparative surgery is the current standard of treatment in the first year of life. However, at this stage, infants typically weigh between 5-10 kg, which can lead to increased surgical complications[13]. To minimize risks, it's important to intervene early with conventional methods to increase body weight and reduce the risk of complications during surgery.

C. **Management of the process of feeding**

Parents or guardians should be educated on how to properly care for and feed the infant with a cleft palate. Before feeding, the mouth and palate should be prepared by using 2-3 teaspoons of sterile water. The neck area should also be carefully wiped and dried since the infant may salivate excessively.

Infants with cleft lip defects and a regular palate typically do not have feeding difficulties. However, infants with cleft palate defects, with or without cleft lip defects, often struggle with feeding. The cleft palate prevents the creation of an adequate seal, making it difficult for the infant to suckle from a breast or bottle[14]. Even if the infant appears to be sucking, they may not be receiving adequate nutrition. To address this issue, precision bottles and advanced feeding techniques, such as the Mead Johnson Bottle[15] and the Haberman Feeder[16], can be used.

D.**Methods created for specialised feeding**

It is important for subjects with cleft palate to be positioned upright during feeding to prevent milk from entering the nose, choking, and reducing the risk of middle ear infections[17]. Frequent burping is also necessary to prevent swallowing large amounts of air. The feeding time should be limited to about 30 minutes, and a special feeding technique and precision bottle should be used[18]. The use of a feeding tube, if necessary, should be done carefully as it can cause soft-tissue perforation and other complications such as urinary bladder perforation, perforation of the pericardial sac, and colonization of enterobacteriaceae.[19,20,21]

E. **Fabrication of feeding Obturator**

The obturator plays a crucial role in the treatment and management of cleft palate defects by providing support for proper tongue movement and aiding in the development of the palatal shelves. It also helps reduce the frequency of nasal regurgitation and choking, promotes jaw growth, and improves speech. After the obturator is placed, it is important for parents and guardians to maintain proper care of the appliance. This involves removing the obturator after each feeding, cleaning it with running water, and soaking it once a day in a solution of chlorhexidine. Studies have shown that ineffective breastfeeding and the use of an acrylic plate are common feeding practices that can be improved with the use of an obturator[22].

F. **Infant specific Orthopaedics**

Orthopedic appliances can be used as feeding plates for newborns with cleft palate defects. These appliances can help to reposition the involved segments before the lip closure in the initial stages of infancy. They can also aid in the proper feeding of the newborn by creating a seal between the mouth and the nipple of the bottle or breast, thus preventing milk from leaking

out of the nose and reducing the risk of choking. These appliances can also help in reducing the need for surgery in some cases[12].

G.**NasoalveolarMoldings**

Most primary pre-surgical naso-alveolar molding appliance was developed in 1999 by Grayson et al. Naso-alveolar molding happens to be a non-surgical technique for restructuring the lip, gums and nostrils right prior to CLCP involved surgery, decreasing the involved brutality of the cleft defect[23].

H.**Behaviour Management**

Pediatric dentists may encounter behavioral issues with children who have cleft palate due to frequent hospital visits and anxious parents. Patience and good communication skills are essential for successful treatment. Speech and hearing problems are common in these children and may hinder communication. It's important to get to know each patient as an individual and to involve parents in their care to ensure efficient oral care delivery.[12]

I. **Preventively oriented management**

i) Diet:Parents should only use boiled and cooled water or milk in nursing bottles, avoiding sugary and acidic drinks. Children should start using a cup or bowl for drinking at around six months old, and weaning should be free from non-milk sugars. For children with cleft defects, a pacifier can be used after palatal repair, except for those with Pierre Robin syndrome. Comforters and sugary drinks should be avoided, especially at bedtime. Written instructions can supplement oral dietary guidance.

ii) Tooth brushing: Parents may be hesitant to brush their child's teeth in the cleft defect area, but they can be taught the proper technique to do so. Plaque buildup in this area should be addressed, and parents can gently lift the repaired lip to improve access. To brush a toddler's teeth, parents should kneel or stand behind the child and support their chin. Low-fluoride toothpaste is recommended for children under six years old to prevent enamel damage. Those at higher risk of cavities should use higher fluoride toothpaste. Parents should be given a chance to practice brushing techniques[24].

iii) Toothbrush: For a first toothbrush, a small baby brush is recommended. In cases of crowded or difficult-to-reach teeth, an interdental brush can be helpful. Parents of children with CLCP need support, reassurance, and encouragement to persist. Parental guidance is crucial.

iv) Use of fluoride

Fluoride supplements:

Choices regarding implementation of fluoride complements ought to be determined by on numerous influences including the content of fluoride of the local supply of water, the probability of amenability, caries involvement of the concerned subject and their associated family members.

Fluoride varnish:

A twice timely in a year organized professional application of essential topical varnish comprising of fluoride is suggested. The greatest presentation strategy involves applying the varnish with the aid of a brush to dry tooth surfaces along with an accommodating subject.[25]

v) Restorative cares for the teeth

Restorative care should be done as soon as possible for caries affected teeth. Radiographic evaluation is necessary for management and growth assessment. Communication with the cleft

team is important to coordinate treatment. Dentists should inform orthodontists about any relevant dental issues, and consider the impact of extractions on future orthodontic treatment.

vi) Pit& fissure sealants

Fissure sealants are recommended for first and second permanent molars and premolars as soon as they erupt to control moisture on occlusal surfaces[26].

J. Radiographic Managements

Numerous radiographs are required to monitor growth and development, to schedule orthodontic therapy or surgery, and to assess the outcome and stability. To assess the developing dentition and any pathophysiology, traumas or other dental conditions, radiographs may also be required[27].

K. **Interceptive Cares**

Tooth extraction and cross bite correction can be avoided by using alternative treatments. Jaw expansion may be done to improve surgical access for grafting. Occlusion trauma can be prevented during alveolar grafting. Patients with minor maxillary deficiency cleft may undergo jaw modification with facemask therapy[28].

L. **Definitive orthodontic treatment**

The ideal time to begin orthodontic treatment is a matter of debate. Anomalies and functional issues are usually addressed in the mixed dentition phase, while definitive treatment may be postponed until the late mixed dentition for maximum growth potential and patient compliance. However, some clinicians may recommend starting treatment earlier for certain types of malocclusion.

PROBLEMS OF CLEFT AFFILIATED INDIVUALS

A cleft defect involving the alveolus could frequently have a consequence on the involved process of development for both the primary as well as permanent teeth along with the jaw.

A. Malocclusion

Cleft deformities can cause jaw inconsistencies and a malocclusion, where teeth don't align properly. The primary cause is the retarded growth of the maxilla, which can be restricted due to scarring from surgery. Unilateral clefts can cause a narrow dental arch, while bilateral clefts can cause constricted posterior sections and protruding anterior sections. Orthodontic treatment, including the use of appliances to widen the dental arch, is often necessary throughout childhood and adolescence. In some cases, surgery may be needed to correct skeletal deformities and occlusal disharmonies.

B. **Nasal Deformities**

People with cleft lip defects often have accompanying nose deformities, such as flared alar cartilage and pulled columella. Surgical alteration of nasal deformities is usually postponed until cleft defects are resolved because correcting the alveolar cleft defect alters the foundation of the nose and may require a final nasal revision surgery[29].

C. **Feeding**

Children with cleft palatal abnormalities have trouble creating negative pressure to suck milk, but special nipples with wider openings can help. Other methods include using eyedroppers or syringes to inject milk into the mouth. Feeding should be done upright, and frequent burping is recommended to prevent swallowing air[30].

D. Ear Problems

People with soft palate cleft deformity are more prone to middle ear infections due to the complex arrangement of muscles in the soft palate. This can lead to chronic serous otitis media and hearing loss. Infants with cleft palate may require myringotomy to drain the middle ear. Audiograms are used to assess hearing ability. Treatment is necessary to prevent permanent damage to the auditory sensory nerves[31].

E. Speech Difficulty

Cleft lip and palate can lead to speech difficulties and dental problems. These issues can negatively impact language development, and adequate air control is necessary for clear speech. Speech pathologists can help with intervention and ongoing therapy, especially in cases of hearing loss. It is important for parents to monitor their child's development and seek regular medical care[32].

F. Associated Anomaly

Children with cleft defects are more likely to have other genetic abnormalities, but there is no specific pattern to which areas are affected. In general, around 30% of cleft-affected children have additional anomalies such as neurological issues, congenital heart disease, or mental retardation. This means that they may require additional care beyond the treatment for their cleft condition.

DIAGNOSIS

Cleft defects can be detected before birth with ultrasound, but there's no consistent screening[33]. Diagnosis after birth is typical. Improved ultrasound technology can now detect craniofacial deformities, providing better counselling and preparation for care and delivery. A quick diagnosis can be made with two planes of the foetus face through ultrasound. It's crucial to conduct a thorough anatomy survey as there are over 350 disorders associated with cleft defects.

MANAGEMENT

Facial clefts (OFCs) are common and treatable birth defects caused by various factors. Dentists play a crucial role in providing preventive and oral healthcare for people with cleft and craniofacial defects, often working with a team of specialists. Timely and coordinated care is essential for optimal health outcomes and improved quality of life, from birth through adulthood[8].

A. Management of Newborn with OFC

After a baby is born with a cleft defect, they should receive a paediatric consultation, genetic testing, feeding instructions, and counselling. A hearing test and cleft evaluation are also conducted while still in the hospital. Lip taping can begin early, and cleft correction should be done by 18 months to prevent speech difficulties. Palate repair timing must balance speech and craniofacial risks. Presurgical orthopaedics may also be recommended to reduce velopharyngeal insufficiency risk.

B. NasoalveolarMolding (NAM)

NAM is an effective way for interdisciplinary teams to improve the nasolabial aesthetics of infants with clefts. The process involves taking impressions of the maxillary arch and creating a palatal plate and modified nasal stent. The appliance is attached to the upper arch with a wire loop and adhesive, and denture paste is used to secure it. Nasal and alveolar moulding is done to advance the apex of the anterolateral cartilage, prolong the short columella, and maintain morphological changes. The appliance is worn continuously until cleft lip surgery, which typically occurs at three or four months of age[34].

C. Management of Toddlers and Preschool Children with OFC

Children with OFC may experience oral health issues due to feeding, swallowing, and aesthetic problems. It's important for parents to establish a dental home for their child, starting as early as the first baby tooth. Finding a dental office that offers comprehensive care for children, including fluoride treatment and nutrition counselling, can help prevent cavities. Limiting sugary foods and drinks is also important. Dentists will provide ongoing care and monitor the child's growth and development.

D. Tooth Development in the Cleft Region

Children with OFC are at risk of dental abnormalities, including decay and missing or smaller teeth. Dental professionals should inform parents about potential tooth loss and restoration options. Bone grafting can provide bony support for teeth to emerge, but timing varies. Patients with bi-lateral cleft lip and palate may have a projecting pre-maxilla that can limit orthodontic therapy benefits. Dental evaluation is required for planning.

E. Management of Adolescents with OFC

Patients with OFC face challenges in receiving the best care for healthy speech, facial symmetry, occlusion, and self-esteem. Earlier interventions can limit maxillary growth and lead to malocclusion and jaw abnormalities. Adolescents may undergo orthodontic treatment and orthognathic surgery for better bite and dental alignment. Dental professionals can prevent tooth cavities and gingival irritation with regular maintenance and oral hygiene instruction. Restorative therapy with composite resins may be necessary, and dental prostheses reintegration may require referral to oral maxillofacial surgeons or consulting dental surgeons. Collaboration for last oral restoration is also common[8].

F. Management of Adults with OFC

Some adults with untreated OFC may still require dental care. This can be due to large clefts that couldn't be entirely fixed with surgery or lack of access to good therapy when they were young. Even after initial cleft defect correction, some may develop oro-nasal fistulas and oral clefts. Corrective jaw surgery is an option for teenagers and young adults, but it's important to wait until their facial growth is complete to avoid facial deformities and malocclusion. In some cases, surgery may be preferred earlier for aesthetic and psychological reasons, but may need to be repeated later.

i. Prosthetic Reconstruction

Prosthetic reconstruction is complicated in adults with untreated cleft palate, and even more so in edentulous patients. Patients with OFC may have various conditions, such as a collapsed

maxillary arch, impaired chewing, and oro-nasal fistulas. Missing teeth are also common. Prosthodontic therapy aims to maintain remaining teeth and tissue and provide a comfortable and functional prosthesis for communication, chewing, and occlusion. Prosthetic techniques include natural tooth implants, dental restorations, and removable prostheses. Soft tissue support is crucial in reconstructive surgery[8.]

ii. Palatal Obturator

Even after surgery, some patients may still have speech difficulties due to an oro-nasal fistula. A palatal obturator can help improve speech by reducing hypernasality. Dental restorations have limitations and complications, so dental implants are being explored as an alternative. However, limited studies have been conducted on dental implant outcomes for OFC patients.

Medical Management

Taking a daily dose of 0.4 mg of folic acid is recommended to prevent neural tube defects. This is double the daily intake of 0.2 mg for women. Studies suggest that higher doses of folic acid during pregnancy can lower the prevalence of oral cleft defects, including cleft lips and cleft palate. Maternal multivitamin use also lowers the likelihood of developing cleft lip and cleft palate.

Psychological Management

The psychological treatment for cleft patients starts at diagnosis. Accurate information and counselling for families is crucial. Orthodontic wire or prosthodontics obturator may be used for correction. Removable prostheses are recommended for oro-nasal fistulas. Parents must be informed at their own pace. Inadequate repair can affect social and familial bonds and cause lifelong psychological effects.

Social Management

Parents should talk to their children about coping with social situations related to cleft lip/palate. Strong support systems prevent negative self-image. Treatment teams, including psychologists, are necessary for efficient care. Craniofacial teams diagnose and treat various craniofacial defects and offer consultations. They are committed to providing aid, attention, and support for a better quality of life..

Surgical Treatment

In order to reduce the irregularity and enable patients to lead normal lives, cleft lips and cleft palate defects care aims to surgically fix the clefts and whatever problems it may bring about. Surgery is used to change the appearance of the face in this treatment, a vocal system that makes speech understandable and teeth that are both functionally ideal and aesthetically pleasing[8].

Timing of Surgical Repair

Timing of surgical repair for cleft lip is controversial among healthcare professionals. Surgeons typically follow the "rule of 10"(i.e., 10 weeks of ages, 10 1b in body contain weights, and at very least 10g of haemoglobin in per decilitre of blood collections) for when a newborn is medically stable for surgery. However, surgery for cleft palate is often delayed until there are

no other medical risks. The timing of surgery can have both benefits and drawbacks for the individual's life.

Benefits:

- Ease of feeding,
- Better phonation skill development,
- Better oral and nose cleanliness,
- Improved auditory tube function,
- Improved mental health for both parents and the baby.

Drawbacks

- Surgery-related scarring impacts maxillary growth restriction; and
- Surgical correction is also difficult in younger children with small structures.

i) Cheilorrhaphy

Cheilorrhaphy is a surgical treatment used to fix cleft lips. It is usually performed as soon as possible after birth. The cleft lip can affect the growth of the maxilla due to the disturbance of the orbicularis oris muscle. Repairing the lip and restoring the muscle sphincter can help with the growth of the alveolar segments.

ii) Palatorrhaphy

Palatorrhaphy is commonly completed in a single procedure, but rarely requires two. The soft palate closure, or staphylorrhaphy, is typically carried out first in two surgeries, followed by the hard palate closure, or uranorrhaphy.

PROSTHETIC SPEECH AID APPLIANCES

Prosthetic maintenance is important for people with cleft palates for two reasons: missing teeth and speech issues. Dentists can provide replacement teeth and speech assist devices made of acrylic that help with hyper-nasal speaking.

A speech-improving appliance can help improve muscle activity before pharyngeal flap surgery or as a secondary procedure for velo-pharyngeal competence. It also helps sustain underdeveloped upper lips and avoids prosthetic dental replacements. Maintaining residual teeth is crucial for effective speech aid device therapy.

FUTURE OF CLEFT LIP AND PALATE RESEARCH IN INDIA

Consanguineous marriages are more common in Southern India compared to other regions due to cultural traditions. There is limited research on the effects of consanguinity on cleft lip and palate and other craniofacial defects[34]. However, efforts are being made to improve the quality of cleft care in India through multicentre research projects, such as the INDIACRAN project[35]. The Indian Council of Medical Research is also working to develop a comprehensive database on genetic disorders, including birth defects, with the aid of a network of genetic centres across

the country. Research is also being conducted to understand the relationship between genotype and phenotype and gene-gene and gene-environment interactions in genetically identifiable groups in India.

CONCLUSIONS

Orofacial clefts and related disorders are a significant challenge in India, but progress is being made through a multidisciplinary approach to diagnosis and treatment. Parental counselling is crucial, and NGOs and WHO collaborations are playing a vital role in addressing unmet needs. There is a need to improve birth defect reporting and ascertainment to determine the prevalence of orofacial deformities and their causes in India.

REFERENCES

1. Lidral AC, Moreno LM, Bullard SA. Genetic Factors and OrofacialClefting. SeminOrthod. 2008 Jun;14(2):103-114. doi: 10.1053/j.sodo.2008.02.002. PMID: 19492008; PMCID: PMC2598422.
2. Leslie EJ, Murray JC. Evaluating rare coding variants as contributing causes to nonsyndromic cleft lip and palate. Clin Genet. 2012:n/a–n/a. [PMC free article] [PubMed] [Google Scholar] [Ref list]
3. Holmes LB, Baldwin EJ, Smith CR, et al.. Increased frequency of isolated cleft palate in infants exposed to lamotrigine during pregnancy. Neurology 2008;70:2152–8. 10.1212/01.wnl.0000304343.45104.d6 [PubMed] [CrossRef] [Google Scholar] [Ref list]
4. Honein MA, Rasmussen SA, Reefhuis J, et al.. Maternal smoking and environmental tobacco smoke exposure and the risk of orofacial clefts. Epidemiology 2007;18:226–33. 10.1097/01.ede.0000254430.61294.c0 [PubMed] [CrossRef] [Google Scholar] [Ref list]
5. Hernández-Díaz S, Werler MM, Walker AM, et al. Folic acid antagonists during pregnancy and the risk of birth defects. N Engl J Med 2000;343:1608–14. 10.1056/NEJM200011303432204 [PubMed] [CrossRef] [Google Scholar] [Ref list]
6. Borçbakan C. An analysis of 1000 cases of cleft lip and palate in Turkey. Cleft Palate J. 1969;6:210–2. [PubMed] [Google Scholar] [Ref list]
7. Saal HM. Classification and Description of Nonsyndromic Clefts. In: Wyszynski DF, editor. Cleft lip and palate. Oxford University Press; 2002. pp. 47–52. [Google Scholar] [Ref list]
8. Berkowitz S, editor. Cleft lip and palate. Berlin, Heidelberg: Springer Berlin Heidelberg; 2006.
9. Darwin C. The variation of animals and plants under domestication. London, England: John Murray, Albermarle Street; 1875. [Google Scholar] [Ref list]
10. Khan M, Ullah H, Naz S, Iqbal T, Ullah T, Tahir M, Ullah O. A revised classification of the cleft lip and palate. Can J Plast Surg. 2013 Spring;21(1):48-50. doi: 10.1177/229255031302100102. PMID: 24431938; PMCID: PMC3891101.
11. Jaju R, Tate AR. The role of pediatric dentistry in multidisciplinary cleft palate teams at advanced pediatric dental residency programs. Pediatr Dent 2009;31:188-92.

12. Kaul R, Jain P, Saha S, Sarkar S. Cleft lip and cleft palate: Role of a pediatric dentist in its management. Int J PedodRehabil [serial online] 2017 [cited 2023 May 6];2:1-6. Available from: https://www.ijpedor.org/text.asp?2017/2/1/1/205471.
13. Fillies T, Homann C, Meyer U, Reich A, Joos U, Werkmeister R. Perioperative complications in infant cleft repair. Head Face Med 2007;3:9.
14. Shprintzen RJ. The implications of the diagnosis of Robin sequence. Cleft Palate Craniofac J 1992;29:205-9.
15. Jones JE, Henderson L, Avery DR. Use of a feeding obturator for infants with severe cleft lip and palate. Spec Care Dentist 1982;2:116-20.
16. Thom AR. Modern management of the cleft lip and palate patient. Dent Update 1990;17:402-8.
17. Goldberg WB, Ferguson FS, Miles RJ. Successful use of a feeding obturator for an infant with a cleft palate. Spec Care Dentist 1988;8:86-9.
18. Boros SJ, Reynolds JW. Duodenal perforation: A complication of neonatal nasojejunal feeding. J Pediatr 1974;85:107-8
19. Hanafy Eel-D, Ashebu SD, Naqeeb NA, Nanda HB. Pericardial sac perforation: A rare complication of neonatal nasogastric tube feeding. PediatrRadiol 2006;36:1096-8.
20. Hurrell E, Kucerova E, Loughlin M, Caubilla-Barron J, Hilton A, Armstrong R, et al. Neonatal enteral feeding tubes as loci for colonisation by members of the Enterobacteriaceae. BMC Infect Dis 2009;9:146.
21. Mattar MS, al-Alfy AA, Dahniya MH, al-Marzouk NF. Urinary bladder perforation: An unusual complication of neonatal nasogastric tube feeding. PediatrRadiol 1997;27:858-9.
22. Trenouth MJ, Campbell AN. Questionnaire evaluation of feeding methods for cleft lip and palate neonates. Int J Paediatr Dent 1996;6:241-4.
23. Grayson BH, Santiago PE, Brecht LE, Cutting CB. Presurgicalnasoalveolarmolding in infants with cleft lip and palate. Cleft Palate Craniofac J 1999;36:486-98.
24. Bokhout B, Hofman FX, van Limbeek J, Kramer GJ, Prahl-Andersen B. Incidence of dental caries in the primary dentition in children with a cleft lip and/or palate. Caries Res 1997;31:8-12.
25. Clark DC. A review on fluoride varnishes: An alternative topical fluoride treatment. Community Dent Oral Epidemiol 1982;10:117-23.
26. Crawford PJ. Sealant restorations (preventive resin restorations). An addition to the NHS armamentarium. Br Dent J 1988;165:250-3.
27. Pitts NB, Kidd EA. The prescription and timing of bitewing radiography in the diagnosis and management of dental caries: Contemporary recommendations. Br Dent J 1992;172:225-7.
28. Bergland O, Semb G, Abyholm FE. Elimination of the residual alveolar cleft by secondary bone grafting and subsequent orthodontic treatment. Cleft Palate J 1986;23:175-205.
29. Eshghi M, Vallino LD, Baylis AL, Preisser JS, Zajac DJ. Velopharyngeal status of stop consonants and vowels produced by young children with and without repaired cleft palate at 12, 14, and 18 months of age: A preliminary analysis. Journal of Speech, Language, and Hearing Research. 2017 Jun 10;60(6):1467-76.

30. Cooper-Brown L, Copeland S, Dailey S, Downey D, Petersen MC, Stimson C, Van Dyke DC. Feeding and swallowing dysfunction in genetic syndromes. Developmental disabilities research reviews. 2008;14(2):147-57.
31. Flynn T, Möller C, Jönsson R, Lohmander A. The high prevalence of otitis media with effusion in children with cleft lip and palate as compared to children without clefts. International journal of pediatric otorhinolaryngology. 2009 Oct 1;73(10):1441-6.
32. Shprintzen RJ, Golding-Kushner KJ. Velo-Cardio-Facial Syndrome: Volume 1. Plural Publishing; 2008 Jul 1.
33. Maarse W, Bergé SJ, Pistorius L, van Barneveld T, Kon M, Breugem C, Mink van der Molen AB. Diagnostic accuracy of transabdominal ultrasound in detecting prenatal cleft lip and palate: a systematic review. Ultrasound Obstet Gynecol. 2010;35:495–502. [PubMed] [Google Scholar] [Ref list]
34. Grayson BH, Maull D. NasoalveolarMolding for Infants Born with Clefts of the Lip, Alveolus, and Palate. SeminPlast Surg. 2005 Nov;19(4):294–301. doi: 10.1055/s-2005-925902. PMCID: PMC2884748.
35. Sastri KA. A history of South India: From prehistoric times to the fall of Vijayanagar. 4th ed. Madras: Oxford University Press; 1976. [Google Scholar]
36. Mossey P, Little J. Addressing the challenges of cleft lip and palate research in India. Indian J Plast Surg. 2009 Oct;42Suppl(Suppl):S9-S18. doi: 10.4103/0970-0358.57182. PMID: 19884687; PMCID: PMC2825065.
37. Aljammali, Zainab Mahmood. "Effect Of Drugs On Teeth And Gums-A Review." TJPRC: International Journal of Pedodontics and Preventive Dentistry (TJPRC: IJPPD) Vol 1: 1-8.
38. Kulchandani, Nirali, et al. "Neo-Natal Malformation: Dandy-Walker Syndrome." International Journal of Early Childhood Special Education 14.3 (2022).
39. Aura-Tormos, Juan Ignacio, et al. "Current trends in orthodontic journals listed in Journal Citation Reports. A bibliometric study." American Journal of Orthodontics and Dentofacial Orthopedics 156.5 (2019): 663-674.
40. Aura-Tormos, Juan Ignacio, et al. "Current trends in orthodontic journals listed in Journal Citation Reports. A bibliometric study." American Journal of Orthodontics and Dentofacial Orthopedics 156.5 (2019): 663-674.
41. Dharuman, M. U. T. H. U. M. A. T. H. I., S. Gopalakrishnan, and R. B. Velmurugan. "Development of biomedical publications on orthodontics research in PubMed from 1991 to 2013: a bibliometric analysis." TJPRC Int J Orthod Res 1 (2015): 1-6.
42. Lone, PARVEEN AKHTER, T. A. S. L. E. E. M. Kouser, and A. S. I. F. Iqbal. "Unusual bear maul injuries." J Dent Res Development 5.01 (2015): 11-22.