Review Article

Cleft Lip and Cleft Palate: Role of a Pediatric Dentist in Its Management

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Abstract

Cleft lip and palate is one of the most common congenital anomalies requiring multidisciplinary care. Such anomaly causes many problems such as impaired suckling, defective speech, deafness, malocclusion, gross facial deformity, and severe psychological problems. Cleft of the lip and palate is one such condition that occurs at such a strategic place in the orofacial region and at such a crucial time that it becomes a complex congenital deformity. Pediatric dentist has a vital role to play right from the neonatal period up to phase of permanent dentition. This review describes a vital role played by pediatric dentist, may it be preventive, restorative, or the interventional care. In the present review article, we offer an extensive review of the literature found in the ISI Web of Knowledge, Index Copernicus, SCOPUS, PubMed, and Cochrane Library. The key words searched were "Cleft lip," "Cleft Palate," "Cleft lip and palate,' "Dentist," "Pediatric Dentist" "Pedodontist," "Management," and "dental treatment."

Keywords: Cleft lip and palate, management, pediatric dentist, role

Introduction

Orofacial clefts are among the most common congenital anomalies. Such anomalies can have several consequences such as impaired suckling, defective speech, deafness, malocclusion, gross facial deformity, and severe psychological problems and puts enormous stress on the entire family.[1-3] Cleft of the lip and palate is one such condition that occurs at such a strategic place in the orofacial region and at such a crucial time that it becomes a complex congenital deformity. Management of cleft lip and palate (CLCP) involves a multidisciplinary approach requiring the services of patient care coordinator, obstetrician, pediatrician, plastic surgeon, general surgeon, oral surgeon, neurologist, pedodontist, orthodontist, speech therapist, psychologist, prosthodontist, ENT surgeon, social worker, parents, genetic counselor, audiologist, and nurse.[4]

Etiology

The etiology of CLCP is attributed to heredity and environmental factors. In addition to this, infections during pregnancy and parental age play a vital role in etiology of CLCP.

Out of the several genes discovered recently, three of them, namely, the T-box transcription factor-22 gene, poliovirus receptor-like-1 gene, and interferon regulatory factor-6 (IRF6) gene are responsible for causing X-linked cleft palate (syndromic cleft), cleft lip/palate (CL/P)-ectodermal dysplasia syndrome, Van der Woude syndrome (VWS), and popliteal pterygium syndrome, respectively. These genes are also implied in nonsyndromic CLCP.[5,6] Identification of a mutation in IRF6 is associated with an increase in the risk of having a child with CL/P from 4% to 6%, the risk of transmission of an isolated cleft to 50%, and the risk of transmission of a dominant Mendelian disorder like VWS. Nonsyndromic cleft lip with or without cleft palate is seen with highest prevalence rate in Asian races and lowest in African populations.[5]

Shaw *et al*. presented evidence that women above the age of 35 had a doubled risk of having a child with CLCP, above 39 had a tripled risk.[7] Consanguineous marriages have an increased risk of CLCP in children.

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Investigations

Prenatal diagnosis

Cleft lip can be easily diagnosed by performing ultrasonography in the second trimester. Detection rates in cleft lip in low-risk populations vary between 16% and 75% with two-dimensional ultrasound. The use of three-dimensional ultrasound of the face improves detection rate significantly. It is very difficult to make the diagnosis of cleft palate antenatally unless associated with large cleft lip. Recently, fetal magnetic resonance imaging has been used to detect fetal abnormalities, but its less availability and high cost makes its use limited.[4]

Once CLCP is identified, family should be referred for genetic counseling to discuss other tests including amniocentesis.

Problems Associated with Cleft Lip and Palate Patient

The chief complaints of these patients are mainly deformed face, inability to feed, and nasal regurgitation of fluids. Because of deformity of the face, these patients are often seen as an object of curiosity and pity and are often separated from their normal counterparts in society. It may result in lifelong psychological trauma.

Hearing defects are very frequently observed in these patients due to disorder of the middle ear. Speech problems are observed as well. There is a nasal twang in the voice and difficulty in articulation.

Dental problems include:

- Congenitally missing teeth
- Neonatal teeth
- Ectopic eruption
- Supernumerary teeth
- Anomalies of tooth size and shape
- Micro- and macro-dontia
- Fused teeth
- Enamel hypoplasia
- Deep bite
- Crossbite
- Crowding or spacing of teeth.

Role of a Pediatric Dentist

A pediatric dentist is usually the first dental specialist whom the parents will encounter. Jaju and Tate reported that 92% of the programs included the pediatric dentist in the multidisciplinary cleft palate team with the role extending from preventive, restorative to infant orthopedics.[8] The role of pedodontist starts from neonatal period right up to permanent dentition phase. The pediatric dentist facilitates the integration of oral hygiene and dental preventive regimens into the treatment protocol for these children to establish desirable habits and oral health before the provision of advanced reparative surgery and complex dental treatment.[9,10]

Dental examination of child with cleft

The best position to examine a baby is with its head gently lowered onto the pedodontists' lap and the parent sitting facing the pedodontist, supporting and controlling the child's arms and legs. The use of a small dental mirror (No. 2) is recommended.

Management of Neonate

Neonates with a cleft palate have difficulty in eating, which may lead to failure to thrive.[11] In addition to this, neonatal respiratory obstruction is seen which is attributed to a very small and posteriorly displaced mandible.

This leads to insufficient nutrition to the neonate. The current scenario for the management involves reparative surgery within the 12 months of life. At this age, the body weight varies between 5 and 10 kg and the blood volume between 400 and 700 ml. There was a direct relationship between decreased body weight and complications in surgery.[12] Therefore, there is a need for the early intervention by conservative means to decrease complications by increasing body weight and decreasing risk of complications in surgery.

Feeding management

- Parents should be told to hold and nurse the infant. (It increases the bonding between parent and child and negates any fear and guilt regarding the child that they might be having.) Once feeding is finished, mouth and palate should be cleaned using 2–3 tsp. of sterile water. Area around neck should be carefully washed and dried as the baby often dribbles excessive saliva
- Infants with cleft lip and a normal palate, rarely pose any difficulty to feeding. Such a baby can even be breastfed
- Infants with cleft palate, with or without cleft lip, pose considerable difficulty to feeding. A cleft palate prevents the infant from creating closed seal and makes it impossible for the milk to be pulled out from breast or bottle.[13] It will look as if the infant is sucking, but he/she will be using precious calories in a futile attempt to gain adequate nutrition. Such children require specific bottle and a special feeding technique. Special bottles that can be used are Mead Johnson Bottle and Haberman Feeder.[14,15]

Special techniques for feeding

Child should be kept in an upright position. Gravity will help to prevent milk from coming through baby's nose. It limits choking and gas and moreover decreases the risk of middle ear infections. Child should be made to burp regularly. Infants with cleft palate tend to swallow a lot of air during feedings even when eating in an upright position.[11,14] Eventually the feeding time should be restricted to 30 min for 2–3 ounces (60–85 ml). The use of feeding tube which is started early in life includes soft-tissue perforation. The feeding tubes have been held responsible for most of the recorded perforations as the tissues are soft at first and later on become hard and stiff after several hours of use.[16] The feeding tube

in addition to this also produces rare complications such as urinary bladder perforation, pericardial sac perforation, and *Enterobacteriaceae* colonization.[17-19]

Fabrication of feeding obturator

It creates a rigid platform and thereby prevents the tongue from entering the defect and interfering with spontaneous growth of the palatal shelves. It also reduces nasal regurgitation and incidence of choking. Moreover, it also contributes to the development of the jaws and speech.

After the obturator has been fitted, parents need to take care of this appliance. After each feed, the plate should be removed and cleaned with running water and soaked once a day for 20 min in chlorhexidine solution. An evaluation of the feeding practices showed unsuccessful direct breastfeeding, and the use of acrylic plate was considered helpful by a majority of the study group.[20]

Infant orthopedics

Burstone at Liverpool pioneered this technique in the 1950s. Two movements are carried out:

- Expansion of the collapsed segments
- Pressure against premaxilla to reposition it posteriorly to its correct position.

It is done by placing light elastic strap across the anterior segment that applies a contraction force. In severe cases, pin-retained appliances may be required. In some cases, it also consists of a feeder plate with steel wires bent into hooks incorporated into the acrylic.

After an active treatment for 3–6 weeks, it is used a retainer. These orthopedic appliances are used to reposition the segment in early infancy, before lip closure. They can also act as "feeding plate" for infants.

Nasoalveolar molding

The first presurgical nasoalveolar molding (PNAM) appliance was designed by Grayson *et al.* (1999). Nasoalveolar molding is a nonsurgical method of reshaping the gums, lip, and nostrils before CLCP surgery, reducing the severity of the cleft. The objectives of PNAM are:[21]

- Reduction of cleft size by guiding growth and functional rehabilitation
- Restore physiologic continuity of the dental arch to maintain oral and dental health
- To achieve an optimal alignment of the cleft segments within the first few months of infancy before cheiloplasty
- To allow a surgical repair with minimal tension
- To reduce the protrusive position of the alveolar processes
- To prevent tongue from seating into cleft palatal region, thus facilitating transverse growth of palatal shelves
- To actively mold and reposition the deformed nasal cartilages
- To lengthen the columella
- To straighten the columella and correction of alar cartilage displacement
- To reduce the need for secondary alveolar bone grafting.

Surgery is performed after the molding is complete, approximately 3–6 months after birth.

Primary Dentition Stage

Parents of children with a cleft seem to welcome opportunities for discussion and support regarding their child's dental development. Parents appear to value dental advice even before the first teeth erupt, and this is an ideal time to discuss preventive care.

The important aspects of these early visits are:

- Reassurance
- Information
- Preventive advice
- Acclimatization.

It is important to make the parents understand the value of good dental health from the outset. Establishing the correct dental habits from an early age will help to ensure the health of primary and permanent dentition. Early removal of primary teeth in children with a cleft is particularly contraindicated because of possible space loss, making orthodontic treatment more difficult.

Considerations for planning dental care during primary dentition phase

- Pedodontist needs to look for associated syndrome or sequence, such as Pierre Robin, or additional medical problems. The implications of any medical condition in relation to dental care or dental disease, for example, a congenital cardiac anomaly, should be fully discussed with the relevant specialist[9,10]
- Young patients with a CLCP often have associated middle ear infections and consequent hearing difficulties. These children may have a history of frequent courses of antibiotics for repeated ear infections. They may be under the care of an ENT surgeon and required to be operated under general anesthesia. The need for general anesthesia for surgical procedures might present an opportunity to the pedodontist for necessary dental treatment to be carried out simultaneously[9,10]
- It is required to obtain full details concerning the child's prescribed medication. Administration of sucrose-containing medicines can give rise to dental caries. It is essential to explore the possibility of a sugar-free alternative in these cases.

Behavior management

As usual the pedodontist is expected to come across certain behavioral problems. Such a child with a cleft may be shy, nervous, or have a behavioral problem. This can be attributed to multifactorial but frequent hospital visits, and previous hospitalization may play a part. Such children may also be influenced by their parents' behavior which is sometimes

anxious and overprotective. Pedodontist needs patience to establish good communication, especially in these early years. It will prove to be beneficial throughout the course of treatment. Pedodontist may come across speech, and hearing difficulties are a common occurrence in patients with a cleft palate.

Speech and hearing difficulties in a child with cleft palate may present a possible barrier to satisfactory communication with the child. It is important to get to know the child patient as an individual and allow him/her time for necessary acclimatization and confidence building.

As discussed earlier, it is also equally important to get to know the parents, as gaining their trust and confidence will facilitate the provision of regular dental care.

Preventive management

Diet

Advice to be given to parents:

- Boiled and cooled water and milk as the only suitable dentally safe drinks for use in a feeding bottle. Fruit drinks and squashes, including baby fruit juices, have an erosive potential
- Sugar-containing and acidic drinks should be kept to a minimum and should be given at mealtimes only, with the introduction of a training beaker or cup from the age of 6 months
- Weaning foods and drinks should be free from nonmilk extrinsic sugars as far as possible
- Babies with a cleft are usually able to cope with a dummy although its use is best deferred until after the palate repair is fully healed. The exception to this is the baby with Pierre Robin syndrome, where the use of a dummy can help to encourage the sucking reflex. As for all children, parents are advised that the dummy should not be dipped in any food or drink, and comforters containing sweetened drinks should also be avoided, especially at bedtime.

While verbal dietary advice should always be given to parents, it is useful to give them written instructions.

Toothbrushing

Parents may be nervous to brush in the region of the cleft, especially following primary lip and palate surgery. They often think that bleeding from gingival inflammation is caused by damage from toothbrushing or the breakdown of surgical repair.

Parents should be shown in detail how to brush the teeth and gums properly. It is important to point out the potential problem areas of plaque accumulation around the teeth in the cleft region.[22]

Where the upper lip has been repaired, parents should be shown how to lift it, stretching the lip carefully by sliding an index finger along the labial gingivae, without doing any damage to the scar. This helps to give them a clear view of the cleft region with good access to the crowns of the anterior teeth and the gingival margins for plaque removal. For the toddler, parents are advised to stand or kneel behind the child when brushing, with the chin supported and head resting against the parents' chest. A low-fluoride children's toothpaste containing no more than 600 ppm fluoride is recommended for children under 6 years of age to reduce the likelihood of enamel opacities in the permanent teeth.[23] Children with a high risk of developing caries should use a standard toothpaste (1000 ppm fluoride). Parents should be given the opportunity to practice the toothbrushing technique in the operatory.

Toothbrush

A small baby brush is advised as the first toothbrush. It can be used up until the eruption of the first permanent molars and beyond. An interdental brush is a useful additional aid where there is crowding of teeth or in the case of bilateral cleft where the upper anteriors can be very retroclined. Many parents who are keen to do their best become anxious if they have problems. Parents of children with a CLCP need extra support, encouragement, and praise to persevere. Parental help and supervision continues to be important part.

Use of fluoride

- Fluoride supplements: Decisions regarding fluoride supplements will depend on various factors such as the fluoride content of the local water supply, the likelihood of compliance, the caries experience of the patient and other family members, and other factors related to the family's social circumstances
- Fluoride varnish: A twice-yearly professional application of topical fluoride varnish is recommended.[23] With a cooperative child, the best method of application is to apply the varnish with a brush to dried tooth surfaces.

Restorative care

It is essential that carious teeth are restored as early as possible. Radiographic assessment is necessary for thorough treatment planning with regard to caries activity and progression. It is also beneficial to assess growth and development of a child. Bitewing radiographs should be considered once the child is able to cooperate satisfactorily (or lateral oblique view in the less cooperative patient).

Regular communication with the cleft team

For the parents of babies with a cleft, the stages of cleft surgery are major "landmarks" or "milestones." Pedodontist needs to have an understanding of the surgical procedures and their timing so that dental care can be integrated sensitively within the overall treatment plan.

For example, the dentist needs to inform the orthodontist about any relevant dental management problem, such as a high caries rate or behavioral difficulties. Teeth with a poor long-term prognosis should be discussed to aid future orthodontic treatment planning. Any extraction as a result of caries should be jointly planned, especially if teeth are to be removed under general anesthesia.

Mixed Dentition Stage

Pediatric dentist has an important role in helping to balance the child's developing independence with a continuing need for parental help and supervision. Many patients with CLCP experience problems with teasing at school. Psychological counseling arranged by the cleft team is sometimes required to help the child and support the family. The increased tendency toward a Class III incisal relationship may become more apparent at this stage. The patient and family are encouraged to focus on the continuing importance of the prevention of dental disease and the maintenance of oral health. In some cases, orthodontic treatment is started early. For example, a simple upper removable appliance may be provided to correct an anterior crossbite. Definitive orthodontic treatment is carried out when the permanent dentition is fully erupted.

Behavior management

- The patient is encouraged to start accepting responsibility for his or her own dental health with prevention playing a key role
- Accepting the appearance of the cleft and the teeth in this region is often a big hurdle for some patients and their parents. By working together closely with the parent and child, any anxiety can be more readily identified and overcome.

Preventive management

Dietary counseling

It is best achieved with a 3-day diet diary. Erosive tooth surface loss due to the excessive intake of acidic food or drink is also a potential problem in this age group.

Toothbrushing and oral hygiene maintenance

Oral hygiene before bone grafting must be of a very high standard as gingival inflammation can cause loss of new bone.[24] Access to the teeth in the cleft region is often difficult, and a baby-sized toothbrush is still useful even at this age, especially where the upper lip is tight. This can be supplemented with an interdental brush. Teeth often need to be targeted individually when toothbrushing, as conventional brushing round the arch will exclude abnormally positioned teeth in the cleft region, particularly those placed palatally. A 0.2% chlorhexidine gluconate mouthwash is useful for short periods following surgery or to help stabilize gingival health in severe cases of gingival inflammation, where the patient is anxious about the bleeding gingival tissues and is nervous to brush.

Parental support with toothbrushing is helpful throughout the mixed dentition period, and supervision is advised until at least 7–8 years of age.

Pit and fissure sealants

Fissure sealants are an important consideration for this group of patients. The procedure is advisable for first and second permanent molars and premolars, wherever indicated. Fissure sealing should be carried out as soon as the teeth have erupted sufficiently to allow adequate moisture control of the occlusal surfaces.[24]

Use of fluoride

The application of fluoride varnish is a valuable preventive measure.

Fluoride mouthwash usage could be introduced at this stage if only a topical effect is required.

Restorative care

Pulp treatment procedures and stainless steel crowns for primary molars should be used where appropriate.

Radiographic management

Require many radiographs to monitor growth and development, facilitate planning for orthodontic treatment or surgery, and assess outcome and stability. Radiographs can also be required, as necessary, to investigate the developing dentition and any pathology, trauma, or other dental conditions.[25]

Interceptive care

- A tentative decision on extraction of supernumerary teeth and over retained teeth has to be taken
- Correction of crossbite can be done
- Expansion of collapsed segment to improve surgical access to the graft site is carried out in this stage. Traumatic occlusion is eliminated in preparation of alveolar graft[26]
- Correction of jaw relationship using facemask therapy in mild maxillary deficient cleft patient can be started.

Permanent Dentition Stage

This stage marks the beginning of definitive orthodontic treatment. Once again the main role of the dentist is to help the patient maintain good oral health and prevent dental disease.[25]

Behavior management

During the teenage years, the patient can lack motivation and find it difficult to visualize the result of the orthodontic treatment. Peer group pressures are strong, and school commitments become more demanding. Missed dental appointments may occur. The pedodontist is in a position to encourage and support the patient in carrying out the appropriate preventive measures and making him aware of the importance of attending both orthodontic and regular dental checkup appointments.[27]

Preventive management

- Dietary counseling continues to be of paramount importance
- The patient needs to be made aware of the potential problem of decalcification around the orthodontic brackets and other dental caries problems if the frequency and amount of sugar intake is not controlled
- Acidic foods and beverages need to be regulated to avoid the possibility of erosion
- A 3-day diet diary may again be indicated.

Written instructions, in addition to verbal advice, are helpful for the patient to refer to at home.

- A toothbrush with a small head is recommended, and the interdental brush and twin spiral brush are valuable interdental aids. When fixed appliances are not being worn, the use of dental floss may be appropriate
- Professionally applied topical fluoride, in the form of fluoride varnish, continues to be useful. Patient-applied topical fluoride in the form of a mouth rinse (daily or weekly) is worthwhile especially during orthodontic treatment.

Restorative care

- Restorations required as a result of caries should be carried out before the start of orthodontic treatment and regularly reviewed and maintained throughout this period
- Adhesive restorative techniques for the remodeling of tooth form, composite or porcelain veneers, and resin-bonded bridges are used to achieve esthetic improvements after the completion of orthodontic treatment
- Conventional crowns and bridges or the provision of a partial denture (possibly combined with an upper retainer) are sometimes necessary.

Definitive orthodontic treatment

It is done in this stage.

Conclusion

- Pediatric dentist performs a dual role in both improving the personal impact as well as improving the surgical outcome
- Patients with CLCP are a priority group. Pedodontist has a key role to play in providing continuing, high-quality, preventive-based dental care
- Thorough treatment planning, patient support, and skillful behavior management are important aspects of this multifaceted care
- Good communication on a regular basis between the pedodontist and relevant members of the cleft team helps to achieve the best oral health outcome for the patient.

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Conflicts of interest

There are no conflicts of interest.

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