Multidisciplinary Treatment in Cleft Lip and Palate Patients

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Abstract

Cleft lip and/or palate are the most common craniofacial anomalies, occurring disproportionately across the world. Cleft anomalies affect several organs and functions within the human body, necessitating multidisciplinary treatment across various specialties.

According to the American Cleft Palate and Craniofacial Association recommendations,[8] all individuals with craniofacial anomalies, including CL/P, should be managed by an interdisciplinary team of specialists. These specialists should represent the disciplines of audiology, radiology/medical imaging, genetics/genetic counseling, neurology and neurosurgery, nursing, ophthalmology, plastic and reconstructive surgery, oral and maxillofacial surgery, orthodontics, otolaryngology, pediatric medicine, pediatric dentistry, psychology, social work, and speech-language pathology. The aim of this paper is to discuss the advantages of and some of the problems with the team management. The types and characteristics of teams are described. Finally, information is given on how to find a specialty team in order to refer a child for further assessment and intervention as appropriate.

Keywords : Cleft Patients, Treatment Protocol, Teamwork Management

Introduction

Cleft lip and palate (CLP) is a frequently encountered congenital anomaly occurring due to a failure fusion of maxillofacial processes in the embryonic period. Clefts can be classified as syndromic (combined with other malformations) and non-syndromic (isolated) cleft lip and palate. There are many etiological factors of non-syndromic cleft lip and palate [1]. Many genetic and environmental factors such as malnutrition, exposure to radiation during pregnancy, stress, teratogenic agents, infectious agents such as viruses and genetic transmission are one of these factors [2,3].

In all cleft lip and palate patients; similar complex occlusal, aesthetic, and functional and speech problems increasing with the severity of cleft are observed [4]. Facial profile abnormalities are observed due to incompatibility between the upper and lower jaw in CLP patients [1]. These disorders are often observed as Angle Class 3 anomalies with the formation of maxillary narrowing as a result of a scar resulting from the surgical closure of cleft region; and sometimes with the addition of increased mandibular development [3]. Some malformations are common in these patients in terms of tooth alignment. Sometimes impacted teeth resulting from the lack of sufficient space in the arc due to skeletal narrowness of the upper jaw and sometimes teeth which do not occur congenitally in the region of cleft are seen frequently[1,2,4]. Although the absence of lateral incisors are observed mostly, the absence of central incisors and canines may be seen. This can be unilateral or bilateral. Even if these teeth are seen particularly in the cleft region, they can be malformed and malpositioned. The bone supports of adjacent teeth are diminished [5].

Multidisciplinary treatment should be considered in cleft lip

and palate patients in order to be able to fully ensure speech and hearing, continuation of occlusion and maxillofacial growth in the normal course and the improvement of physical appearance and psychological state. However, different treatment plans should be considered in its different timing for each case [1,6].

There is international consensus about the fundamental elements of CLP treatment: multidisciplinary teamwork, centralisation, high-volume care, team continuity, long-term treatment planning from birth to adulthood, standardized protocols, documentation, evaluation, follow-up studies, research, training and quality assurance [7,8]. (**Fig. 1**).
We present here the protocols of the cleft and craniofacial and provide guidelines for the most essential treatment.

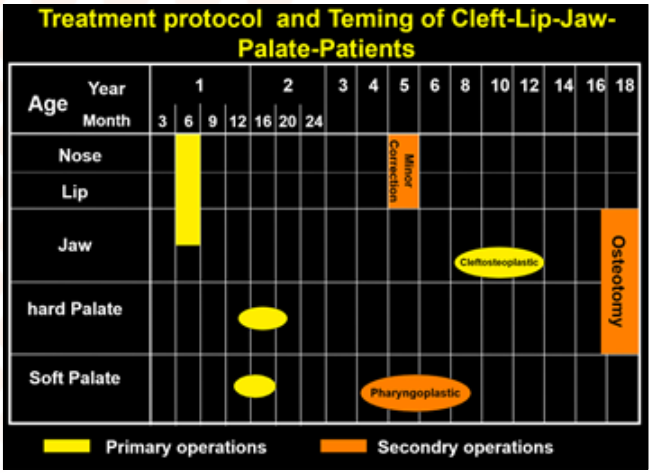

Figure 1: Treatment Protocol and Teming of Cleft Lip and Palate

Epidemiology and Etiopathogenesis

Among the cleft lip and palate population, the most common diagnosis is cleft lip and palate at 46% (Fig. 2), followed by isolated cleft palate at 33% (Fig. 3), then isolated cleft lip at 21% (Fig. 4). The majority of bilateral cleft lips (86%) and unilateral cleft lips (68%) are associated with a cleft palate (Fig. 5) . Unilateral clefts are nine times as common as bilateral clefts, and occur twice as frequently on the left side than on the right. Males are predominant in the cleft lip and palate population [9], whereas isolated cleft palate occurs more commonly in females. In the white population, cleft lip with or without cleft palate occurs in approximately 1 in 1,000 live births. These entities are twice as common in the Asian population, and approximately half as common in African Americans. This racial heterogeneity is not observed for isolated cleft palate, which has an overall incidence of 0.5 per 1,000 live births [10].

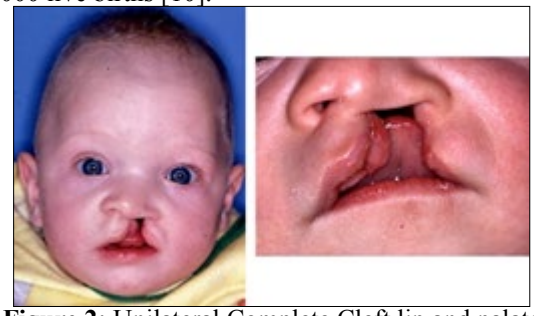

Figure 2: Unilateral Complete Cleft lip and palate

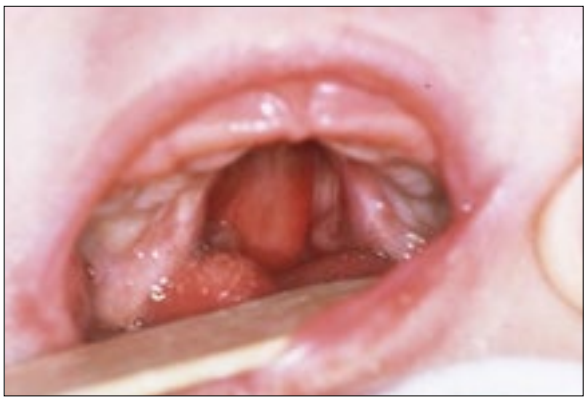

Figure 3: Isolated cleft palate

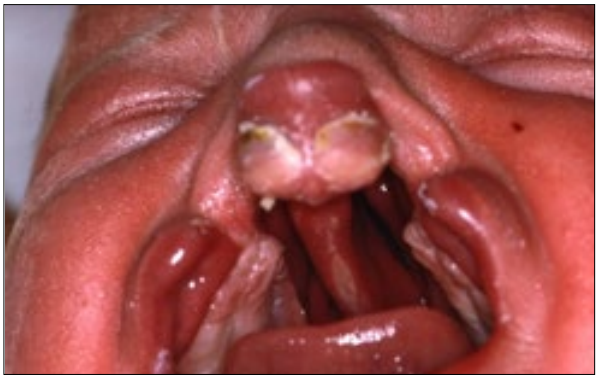

Figure 4: Bilateral Complete Cleft lip and palate before

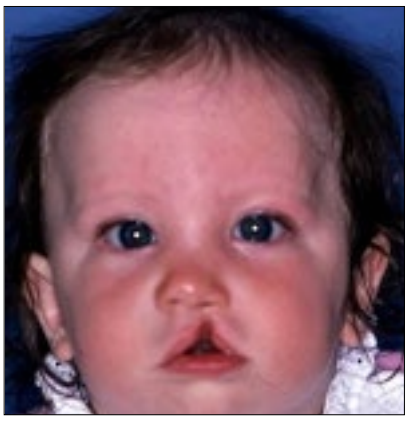

Figure 5: Isolated cleft Lip

Both environmental teratogens and genetic factors are implicated in the genesis of cleft lip and palate. Intrauterine exposure to the anticonvulsant phenytoin is associated with a 10-fold increase in the incidence of cleft lip. Maternal smoking during pregnancy doubles the incidence of cleft lip. Other teratogens, such as alcohol, anticonvulsants, and retinoic acid, are associated with malformation patterns that include cleft lip and palate, but have not been directly related to isolated clefts [3,11].

Genetic abnormalities can result in syndromes that include clefts of the primary or secondary palates among the developmental fields affected. More than 40% of isolated cleft palates are part of malformation syndromes, compared to less than 15% of cleft lip and palate cases. The most common syndrome

associated with cleft lip and palate is van der Woude syndrome with or without lower lip pits or blind sinuses. Microdeletions of chromosome 22q resulting in velocardiofacial, DiGeorge, or conotruncal anomaly syndromes are the most common diagnoses associated with isolated cleft palate. Although there is a recognized genetic component to nonsyndromic cleft lip and/or palate, it appears to be multifactorial. Among other recent studies, a meta-analysis of 13 genome scans by Marazita et al. (2004) revealed multiple cleft lip/palate genes on 16 chromosomal regions. Parents with a child with a nonsyndromic cleft, or a family history of clefting, often ask about their risk of clefts in subsequent pregnancies. The risk depends on whether the proband has a cleft lip alone (CL), cleft lip with cleft palate (CLP), or a cleft palate alone (CP). If the family has one affected child or parent with CLP, the risk of the child of the next pregnancy having CLP is 4%[12]. If two previous children have CLP, the risk increases to 9%, and if one parent and one child were previously affected, the risk to children of subsequent pregnancies is 17%. For families with a history of CP, the risk of CP to children of subsequent pregnancies is 2% if one previously affected child, 1% if two children were previously affected, 6% if one parent has CP, and 15% if one parent and one previous child have CP[12].

Multidisciplinary Cleft Care

Individuals born with cleft lip and or palate require coordinated care from multiple specialties to optimize treatment outcome. The ideal is in a center with a multidisciplinary cleft team, dedicated to treating cleft-related issues from birth to adulthood. Typical members of a cleft team include an audiologist, dentist, geneticist, nurse, nutritionist/dietitian, oral surgeon, orthodontist, otolaryngologist, pediatrician, plastic surgeon, psychologist, social worker, and speech pathologist[1]. (Fig. 6)

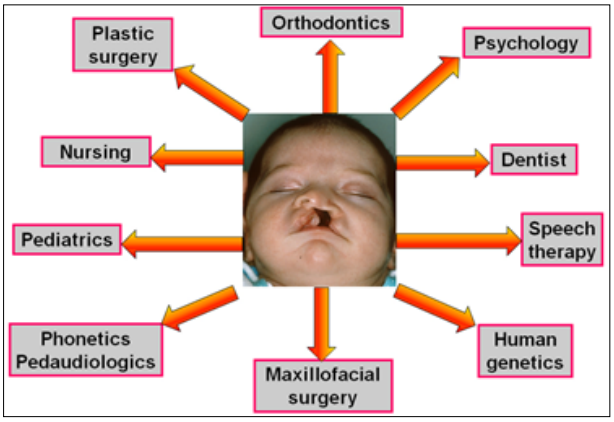

Figure 6: Professional Roles within a Cleft Palate or Craniofacial Anomaly Team

The emphasis is on coordination to minimize the number of surgeries performed while maximizing the benefit to the patient. Although the number of surgical procedures required prior to adulthood has decreased with improved techniques, care of a child with a cleft still requires a complex lengthy surgical treatment plan The goal of cleft care is to eliminate as many steps in the treatment plan as possible by optimizing the outcome and benefit of each essential intervention.[6] Recent advances in presurgical orthopedics, such as nasoalveolar molding and gingivoperiosteoplasty, are examples of optimization of early intervention with the goal of minimizing secondary .surgeries and eliminating previously essential steps such as secondary alveolar bone grafting and rhinoplasty [1,6].

A team of professionals can be multidisciplinary or interdisciplinary, depending on the working relationship of the members and the structure of the team. A multidisciplinary team is a group of professionals from various disciplines who work independently in evaluating and treating patients with complex medical needs [1]. The members of this type of team have well-defined roles and cooperate with each other, but there is little communication and interaction among the team members [13]. The biggest problem with a multidisciplinary team is that the patient receives a series of evaluations and recommendations, but there is no integration of the information or recommendations [1,3,6].

On the other hand, an interdisciplinary team is a group of professionals from various disciplines who work together to coordinate the care of a patient. With this model, there is collaboration, interaction, communication, and cooperation among the different specialists who are involved in the patient's care. There may or may not be a joint evaluation, but there definitely is a joint plan of care. This is developed when all members of the team come together to discuss the findings, impressions, and recommendations [14].

The final plan of care is negotiated and based on the integration of all the recommendations [14]. With this approach, the sequence of procedures and approximate timelines can be outlined for the patient and the family. Therefore, the interdisciplinary team model is felt to be the most effective one for management of patients with craniofacial anomalies [13,14].

A cleft palate or craniofacial team that works together for a period of time may even evolve into transdisciplinary team. This type of team has members that truly understand the other disciplines and how they relate to the total care of the patient. Although team members cannot perform duties across disciplines, they can have an understanding of the various disciplines in order to see the "big picture." This is certainly a benefit for the ultimate care of the patient.

Cleft palate or craniofacial teams often serve as the primary treating team for their patients. In larger centers, the team may also serve as a consulting team. In the role as a consulting team, the team members provide a second opinion as a group regarding the total care of the patient. This is forwarded to the treating professionals for consideration. The treating professionals may be in the local community or far away. Regardless, there must be excellent communication between the team and the practitioners who will be following the patient for treatment and follow-up care [6].

Professional Roles within a Cleft Palate or Craniofacial Anomaly Team

Audiologist: The audiologist is the person who is responsible for testing the child's hearing and middle ear function. Since individuals with craniofacial anomalies are at high risk for structural ear anomalies, middle ear disease, and hearing loss, the audiologist works with the otolaryngologist in monitoring the hearing and middle ear function of these individuals [1].

Pediatric Dentist: The role of the pediatric dentist (sometimes called pedodontist) is to be responsible for the general care of the child's teeth, and the prevention and treatment of tooth decay. The pediatric dentist ensures that the child develops habits of good oral hygiene for the promotion of healthy teeth and gums. Even the primary teeth are important to protect and preserve since they act as placeholders for the permanent teeth. The pediatric dentist may be involved with managing misaligned cleft segments prior to the lip closure. When the child is in the primary or mixed dentition stages, the pediatric dentist is often the one to improve early malocclusion, which often includes moving the maxillary segments through palatal expansion [6].

Geneticist: A geneticist (dysmorphologist) is responsible for assessing patients with a history of cleft, velopharyngeal dysfunction, or craniofacial anomalies for a pattern that indicates a known syndrome. Once a syndrome is identified, the geneticist counsels the family regarding the diagnosis, the recurrence risk for additional offspring of both the family and the patient, and the prognosis [7].

Nurse: The nurse's role on the team is to assess the child's overall physical development. The nurse can determine if the child is growing normally and is in good general health. The nurse is often the professional who assists the family in developing compensatory feeding techniques. Finally, the nurse is usually the professional who counsels the family regarding surgical procedures and answers their specific questions.

Oral Surgeon: The oral surgeon is the specialist who does bone grafts to the alveolar cleft areas when there is deficient bone in the line of the cleft. This professional also performs the orthognathic surgeries, including maxillary expansions and mandibular setbacks, to normalize the occlusion between the maxillary and mandibular arches [15].

Orthodontist: The orthodontist treats dental and skeletal malocclusion and promotes normal jaw relationships. The orthodontist is responsible for aligning misplaced teeth and adjacent tissues to improve the dental and facial aesthetics and to improve the function of the dentition [1,6].

Otolaryngologist: The otolaryngologist, also known as the ear, nose, and throat specialist (ENT), is responsible for monitoring middle ear function and hearing, and treating middle ear disease, which is common in children with a history of cleft or craniofacial anomalies. The otolaryngologist also assesses the structural aspects of the oral cavity, oropharynx, nasal cavity, and upper airway-and treats anomalies, including adenotonsillar hypertrophy, pharyngeal masses, or vocal fold abnormalities [15].

The otolaryngologist may be the surgeon involved in the nasal and oral repairs and reconstruction. The otolaryngologist also manages upper airway obstruction, which is particularly common in infants with Pierre Robin sequence [16].

Pediatrician: The pediatrician is responsible for assessing the patient's overall medical health, growth, and development. The pediatrician determines whether other aspects of medical care should be done prior to surgical intervention [1].

Plastic Surgeon: The plastic surgeon is responsible for the surgical repair of the lip, palate, and facial anomalies, and is also responsible for the surgery for correction of velopharyngeal dysfunction. This surgeon may perform cranial surgery, bone grafts, and orthognathic surgery on the jaws. The plastic surgeon is responsible for not only the repair of the defects, but also for the improvement through surgery of the patient's overall facial aesthetics, feeding function, and speech [16].

Prosthodontist: Prosthodontics is a branch of dentistry that deals with the restoration of natural teeth or the replacement of missing teeth. The prosthodontist can develop prosthetic devices to replace or improve the appearance of surrounding oral and facial structures. The prosthodontist can also manufacture and fit devices to assist with feeding and with velopharyngeal closure [17].

Psychologist: The psychologist assesses the patient's psychosocial needs, and assists the patient and family in dealing with the medical, social, and emotional challenges that occur due to the patient's anomalies. The psychologist often assists the physician in determining the preparedness of the patient for each surgical procedure [18].

Social Worker: The social worker helps families to deal with the many problems associated with the child's anomalies. The social worker may be the one to coordinate appointments and may also assist the families in dealing with insurance and other funding sources. The social worker may help the family to manage their stress and emotional reactions to the many problems and issues associated with the child's treatment [19].

Speech-Language Pathologist (SLP): The speech-language pathologist counsels the parents or guardians regarding what to expect with communication skills and how to stimulate normal development at home. The speech-language pathologist evaluates feeding and swallowing, general development, speech, language, resonance, and velopharyngeal function, and makes recommendations for treatment when problems are identified. The speech-language pathologist provides therapy for communication problems and disorders of feeding or swallowing [17,18].

Team Coordinator: The team coordinator typically represents

the team in any interactions with parents, other health care professionals, and the community. This person is responsible for planning the meetings and scheduling patients for each meeting. The coordinator compiles the recommendations from each professional and puts this together in a comprehensive team report. The coordinator helps to counsel the family regarding the recommendations and ensures that there is follow-up on recommendations that are made by team members [20].

Advantages of and Potential Problems with the Team Approach

The team approach to management offers many advantages to the patient and the patient's family). First of all, the team offers an evaluation of the whole child that is completed through the individual evaluations of many professionals. The team evaluation is comprehensive, yet done with fewer visits and usually at a lower cost than individual evaluations.

The plan of care is devised by professionals who work together and understand each other's disciplines. There is shared decision making among the team members and decisions are based on more information than one professional would have compiled independently [21].

There is usually better follow-up and monitoring of care, since this is the responsibility of the team coordinator.

Teams usually consist of "experts" in the field who can provide state-of-the-art care. Teams promote better services through parent groups, special camps, and the provision of pamphlets and other educational materials. There is usually one main contact person on the team who can assist the family in communicating problems, questions, or concerns [1].

There are also many advantages of the team approach for the professionals. First, the team approach saves time by expediting the collaboration process. It also increases inter-professional communication. This helps to develop good working relationships among the team members and increases the knowledge of each professional. One of the most significant advantages of the team approach is that it makes it possible to keep good serial records [22]. The team can also be an effective vehicle for collaboration in research and publications. Some states have developed networks of teams for the purpose of collaboration in research endeavors and continuing education [6].

Although the advantages of the team approach far outweigh any disadvantage, there are some common inherent problems associated with interdisciplinary teams. One factor that can affect the function of the team is the perceived or ascribed status of various team members relative to other members. This can be based on characteristics such as age, gender, discipline, experience, or accomplishments [23].

If team members are not considered equals in status on the team, then the individuals with the ascribed higher status will tend to exert more influence on the decisions of the group than hose members of lower status.

This can have a negative impact on the quality of the group decision making. For the team to be effective, there must be an atmosphere of equality and mutual respect among all of the team members [23].

Problems can also occur if the individual roles are not clearly defined within the team. If the roles are not clear, there may be interdisciplinary competition or "turf issues" at times [1].
For example, there is often an overlap of skills between the plastic surgeon, the oral surgeon, and the otolaryngologist. As a team, it is helpful to define who does what, when it's done, and under what circumstances. This avoids conflicts over such things as who does the bone graft, who does the orthognathic surgery, or who does the secondary surgery for velopharyngeal dysfunction [6].

A different but equally disruptive problem occurs when there are members on the team who are hypersensitive to feedback. This can be a problem, for example, when a surgical procedure was not as successful as was hoped, and needs to be revised. Team members must be able to speak honestly without concern of "hurting someone's feelings." They must also be able to express differences of opinion without hesitation [1,4,6].

Disagreements in the philosophy of care or in treatment protocols can have a major impact on the team's performance. Communication among members regarding procedures and protocols must take place so that there is consensus regarding the standards of care and continuum of care within the team. If necessary, an algorithm of care can be developed to help team members reach consensus on the management of various diagnoses and patient concerns [7].

All of the potential problems of the interdisciplinary team can and should be overcome for the team to be successful. This requires ongoing communication, honesty, and mutual respect. Ultimately, the focus of the team should be on the care and well-being of the patients, and not on individual agendas and egos of the team members [3,4,5].

Cleft management

Management of children with cleft lip and palate should go through a multidisciplinary team who will provide the optimal treatment (Bill, 2006). The managing team should provide comprehensive diagnosis, planning, and treatment. The cleft team usually includes orthodontist, maxillofacial surgeon, plastic surgeon, prosthodontist, speech therapist, audiologist (ENT specialist), psychologist, and pediatrician [21]. Goals of treatment of the child with a cleft lip and palate should include the repairing the birth defect (lip, palate, and nose), achieving normal speech, language, hearing, functional occlusion, and good dental health. It should also optimize the psychosocial and developmental outcomes [22]. However, protocols for the management of CLP patients vary from center to center. According to the Eurocleft project between 1996 and 2000,

there were 194 different surgical approaches followed for treatment of unilateral cleft alone [23].

Pre-natal diagnosis

Ultrasound examination may detect clefts of the lip and alveolus unlike cleft palate, which is difficult to diagnose through routine screening. Additional examinations and tests can confirm the presence of deformity. These include cephalic presentation of the child, low body mass index of the mother, and examination preferably around the 20th gestational week [24]. Moreover, information about family history should be addressed so that provisions for postnatal measures in adequately equipped hospitals can be made in with improvement in ultrasound technology.

In case of cleft identification, genetic counseling the family including amniocentesis should be performed. For this purpose, a complete pregnancy progress and family history should be addressed. Exposure to any teratogenic factors, the presence of family members with cleft or other birth defects, developmental problems, and genetic syndromes are all important parameter to explore during counseling. In cases where clefts are diagnosed prenatally, the cleft team will be involved in the management so that the family can learn about the nature of the deformity and its care and treatment strategies. Psychological and emotional support of the family is very essential procedure at this time due to the very negative effect once the diagnosis was confirmed [7].

Neonatal period: Birth to 12 months

Immediately after birth, feeding instructions, counseling, diagnosis by a geneticist, and a pediatric consultation are provided. The newborn hearing test is mandatory at birth in California. If the cleft is wide, lip taping is started immediately. This is almost always done in bilateral clefts but also often in wide unilateral clefts [25].

Presurgical orthopedics or nasoalveolar molding (NAM) is also routinely done here at UCSF, in bilateral and wide unilateral clefts. The NAM appliance is fabricated using acrylic from a cast of the infant's maxilla. It is then adjusted weekly or biweekly to correct the nasal and alveolar deformities progressively.[26] NAM has been shown to have positive clinical effect, yet evidence is lacking and there is still much debate on the efficacy and limitations of NAM.[27] Our goal with NAM is to manipulate the segments to allow a tension-free lip repair (Fig. 7, 8).

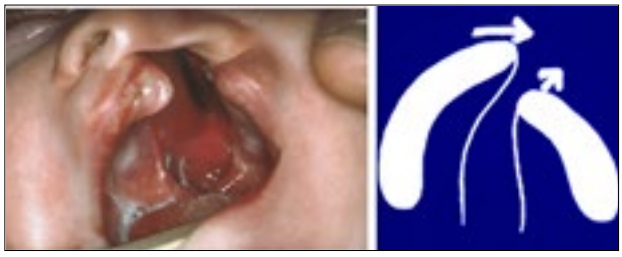

Figure 7: Unilateral Complete Cleft lip and palate

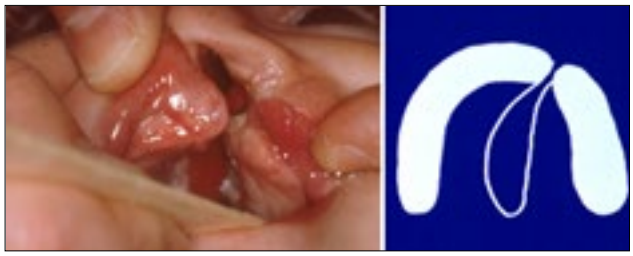

Figure 8: Formation of the jaw segments before the surgical lip closure

The first team evaluation occurs within the 1st week of life. During this visit, the orthodontist and surgeon will explain the need for lip taping and NAM before lip surgery and plan for scheduling lip repair at 10–12 weeks. The surgical technique is modified Millard. Surgical repair of the palate is generally done around 10 months, and pressure equalization tubes are placed at the same time. The surgical technique is Z-plasty or two-flap palatoplasty based on the width of the cleft palate (Fig. 9, 10, 11, 12, 13, 14). A second-team evaluation with emphasis on speech/language assessment is done 3–4 months after palate repair [8,28].

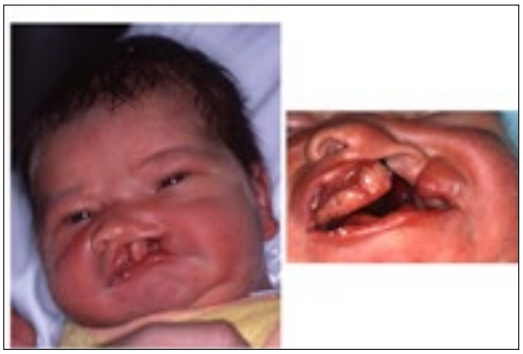

Figure 9 : Unilateral Complete Cleft lip and palate immediately after birth, Pronounced Cleft lip and palate

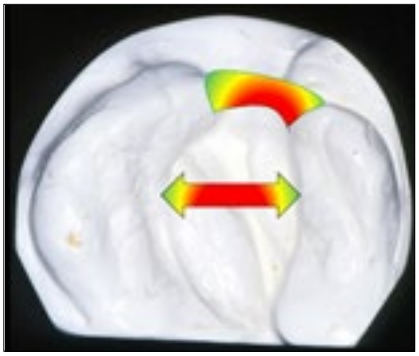

Figure 10 : Pronounced Cleft lip and palate, the two Segments are severely separated

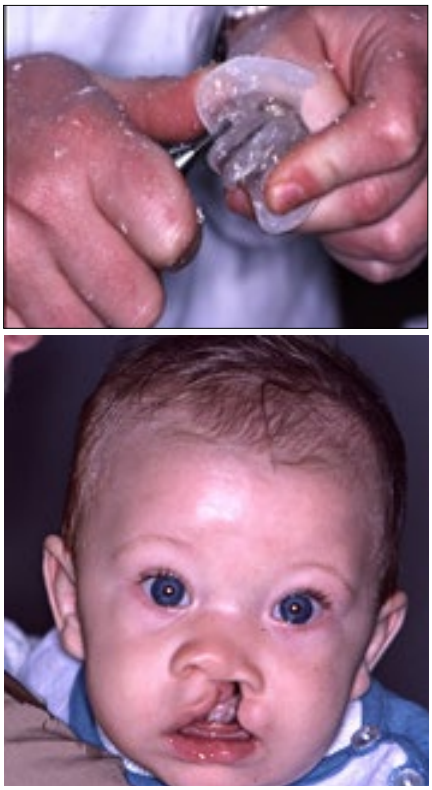

Figure 11, 12: Presurgical orthopedics or nasoalveolar molding

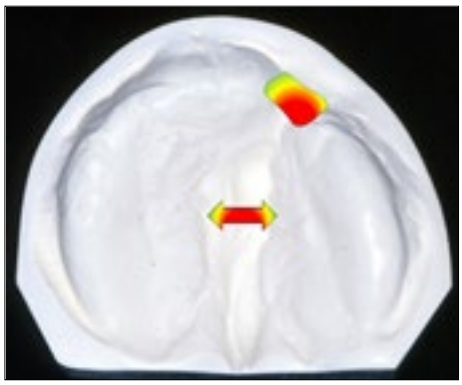

Figure 13: five months after treatment with the functional plate, the growth of the two segments was controlled in the three deminsions. The distance between the jaw segments was reduced to a minimum

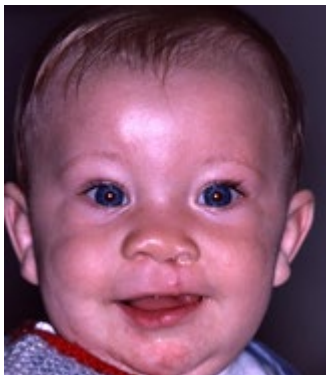

Figure 13: surgical lip closure five months after birth

Primary dentition: 1–7 years

Between the ages of 1 and 7 years, team evaluations are scheduled as needed, typically every 1–2 years.

There may be need for speech therapy, fistula repair, soft palate lengthening for correction of velopharyngeal insufficiency, medical and behavioral intervention, treatment of middle ear disease, or dental treatment.

Currently, our fistula rate is <2%, similar to other well-established centers [6].

At 5–6 years, lip revision and/or columella lengthening in bilateral clefts may be indicated. Radiographs are usually obtained at this time, allowing assessment of jaw growth, dentition, and alveolar cleft defect. During this period, our individuals have a dental home where they are followed by our pediatric dentist. This is especially important because children with CL/P have a higher susceptibility to caries than those without a cleft [29].

Mixed dentition (6–12 years)

The negative effects of surgical repair become clear during this phase including maxillary collapse and arch discrepancies. Moreover, defects in alveolar bone, tooth number, formation, and position can be detected. Surgeons start to consider alveolar bone graft to correct the maxillary defects at this stage. Grafting is best performed with autogenously cancellous bone. Alveolar bone grafting will provide maxillary-alveolar ridge continuity for tooth eruption and alignment. It also provides nasal base support and provides bone through which the permanent canines and laterals can erupt into the dental arch. In bilateral cases, alveolar bone grafting stabilizes the premaxillary segment with bone support [30].

Alveolar bone grafting is performed using a gingival flap of mucoperiosteum, turned back “book” flaps and cancellous bone harvested from the iliac crest. The covering flap of gingival mucoperiosteum is used to cover the graft in the alveolus, nostril floor, and anterior maxilla [30].

The ideal age for bone grafting is 9–11 years to give chance for the lateral incisor or the canine to erupt through the graft and stabilize it. Supernumerary teeth in the surgical site should be extracted 8–12 weeks before surgery. This will allow the surgeon to have intact gingival tissues for proper coverage of the alveolar bone graft. At the time of complete eruption of permanent dentition (approximately 12 or 13 years of age), orthodontic treatment is commenced.

The timing of bone grafting will be decided on the basis of the dental development of individual patients [31]. In patients with well-formed lateral incisors that are in the line of the dental arch, bone grafting can be done quite early, around 7 or 8 years. However, most patients with complete unilateral cleft lip and palate have a missing, ectopic, or deformed lateral incisor, so it is preferable that bone grafting is postponed until they are 10 or 11 years of age .[31] (Fig. 15, 16, 17, 18)

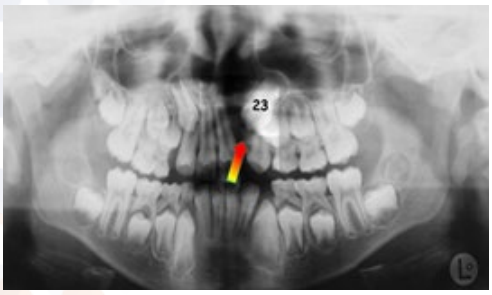

Figure 15

Figure 16

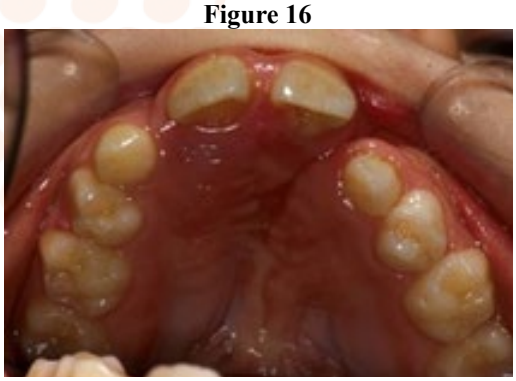

Figure 17

Figure 15, 16, 17: Situation before the osteoplasty in the area of the cleft

This allows the root development of the cleft-side canine to progress more and may help in better canine eruption [32]. An interceptive orthodontic treatment is undertaken in the mixed dentition to reposition the dentition adjacent to the cleft preparing the cleft side for the secondary alveolar bone graft, but such procedure must be postponed until the development of the incisor roots to avoid any resorptive effect on teeth. If maxillary segments and dentition on either side of the cleft are well aligned, it is not necessary to do presurgical orthodontics [33]. Thus, orthodontic treatment is not generally commenced until age 9 or 10 years when, if necessary, the maxillary segments are expanded to correct the transverse relationship using palatal expansion appliances,these include upper removable appliance, quad helix , rapid maxillary expansion, bonded "fan" appliance , and others [34]. (Fig. 18, 19, 20, 21)

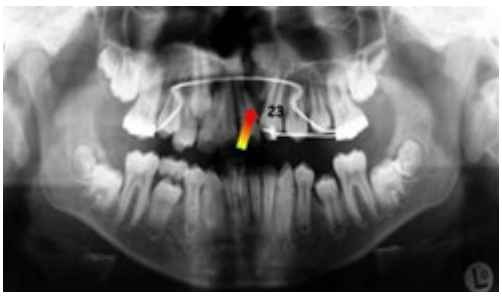

Figure 18

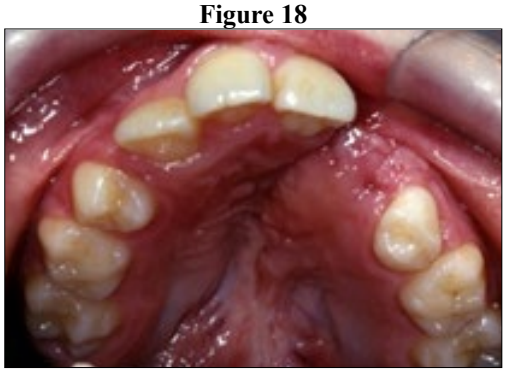

Figure 19

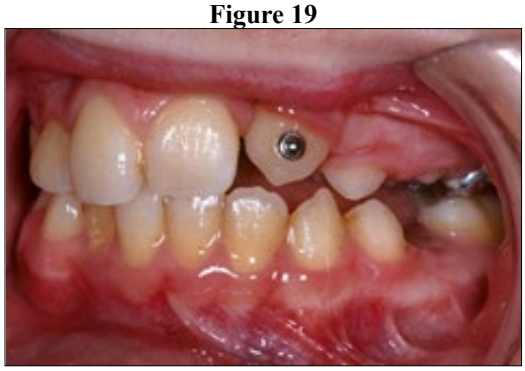

Figure 20

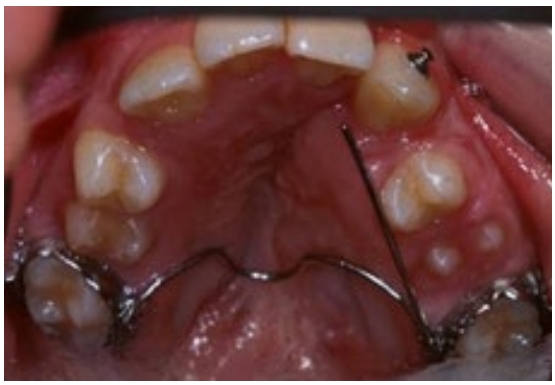

Figure 21

Figures 18, 19, 20 and 21: Situation before the osteoplasty in the area of the cleft. After the osteoplasty, tooth 23 could erupt. tooth 22 is missing

Permanent dentition

Definitive orthodontic treatment must be commenced at this time. The goals of treatment are similar to those for noncleft patients, but certain conditions must be taken into consideration during the treatment planning [35]. These include maintenance of the integrity of the dentition and supporting structures

especially for teeth adjacent to the cleft side, correction of impacted and transposed teeth, and management of congenitally missing teeth4 [36].

If the cleft side lateral incisor is missing, management will be based on either replacing themissing tooth with prosthesis or closing the space. In those patients with missing lateral incisor in whom the maxillary canine has migrated mesially and is erupting into the grafted alveolar ridge, replacement of the missing lateral incisor by the canine and movement of all posterior teeth forward will be the treatment of choice [37]. In cases where the alveolar bone graft is not ideal, bone morphology can be improved by moving the canine forward into graft side [38].

Extractions may be required to create space for arch alignment with the second premolars being first choice in the maxilla. This is related to formation of scar tissue during the course of primary palatal repair, which pulls the premolars palatally. However, relapse is common after orthodontic correction. Invariably, fixed appliances are required to achieve a satisfactory degree of precision in tooth alignment with sound values of tip and torque movements [39,40]. (Fig. 22, 23, 24, 25, 26)

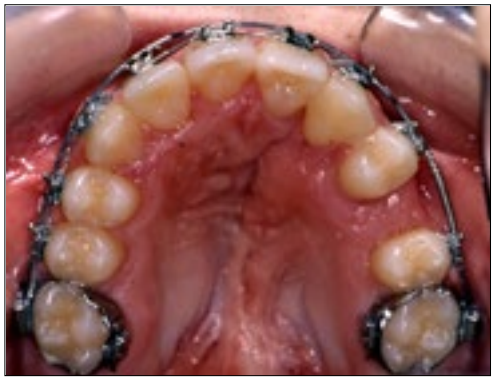

Figure. 22

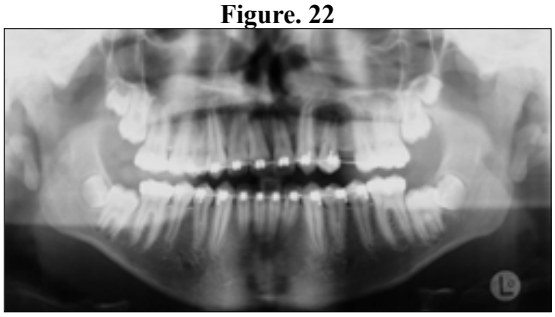

Figure. 23

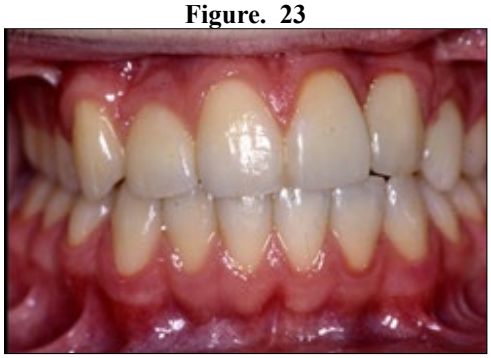

Figure. 24

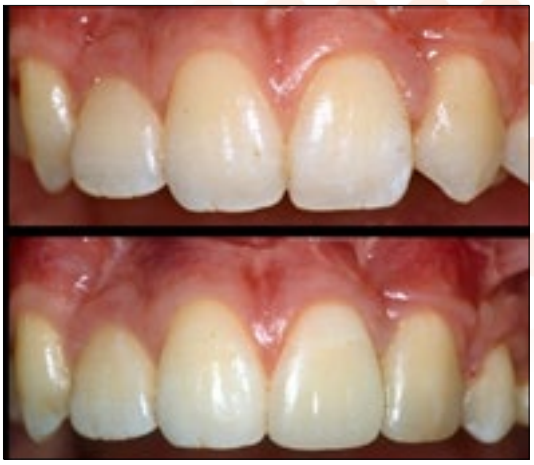

Figure. 25

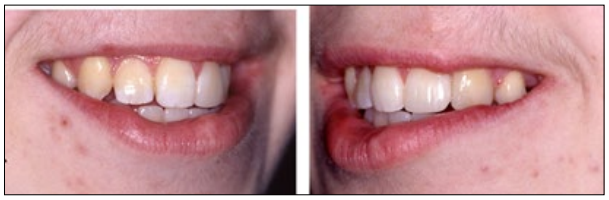

Figure. 26

Figures. 22, 23, 24, 25, 26: maxillary canine has migrated mesially and is erupting into the grafted alveolar ridge, replacement of the missing lateral incisor by the canine. The canine was reshaped into a lateral incisor.

Once the permanent dentition has been established, planning for orthognathic surgery must take place in a tempt to correct mid-face retrusion. Factors such as maxillary retrognathia, the magnitude and effect of any future growth, and patient wishes should be taken into consideration [41].

Surgical correction is indicated only when growth is complete. Surgical revision of the nose (rhinoplasty) will be the last surgical step. This is because movement of the underlying bone will affect the contour of the nose [41].

Hypodontia, microdontia, and conical crowns are common findings in cleft lip and palate. In broad terms, treatment strategies reflect the pattern of tooth absence, the amount of residual spacing, existing malocclusions, and patient's attitude [38-41]. The congenital missing of teeth may result in minimal spacing; still, it may not be an esthetic concern to patients and can be accepted. Space closure and modification of the canine to resemble a lateral incisor is a common treatment option where maxillary lateral incisors are missing [38]. (Fig. 27, 28, 29, 30, 31, 32).

However, where several teeth are congenitally absent, the orthodontic redistribution of space to allow restoration with prostheses is frequently the treatment of choice. The esthetic and functional outcomes of such an approach should be confirmed with a trial diagnostic set [37].

Replacement of missing teeth with prosthesis includes removable partial dentures, conventional and adhesive bridges, and implant supported prostheses [42]. Clearly, both the timing and manner of their application must reflect the needs and limitations imposed by a young, growing individual [38-42].

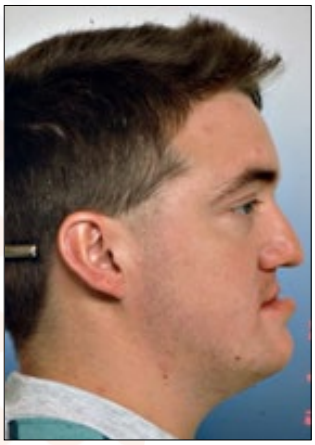

Figure 27

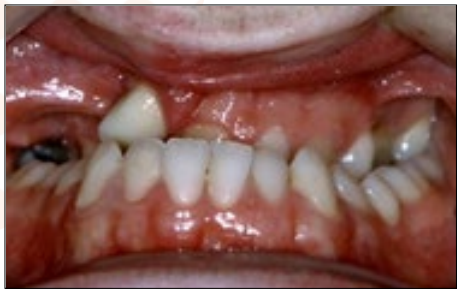

Figure 28

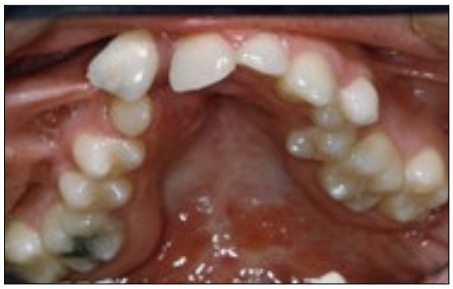

Figure 29

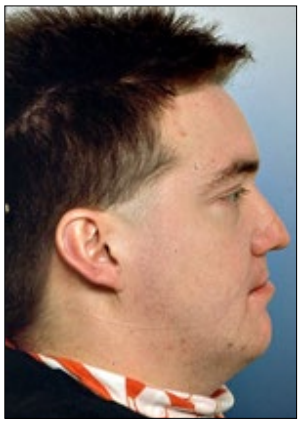

Figure 30

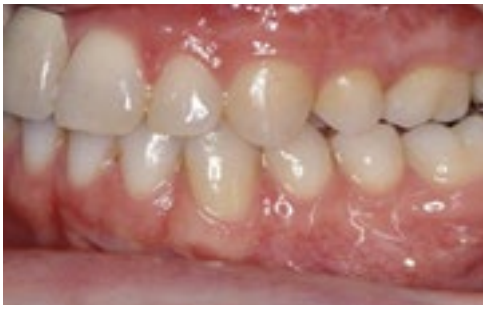

Figure 31

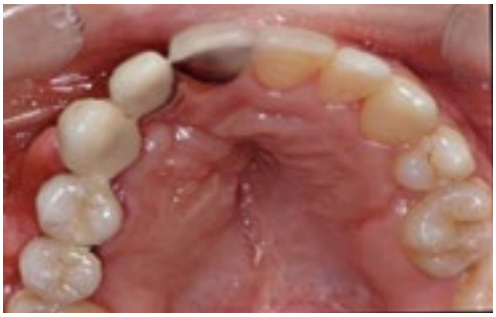

Figure 32

Figures: 27, 28, 29, 30, 31 and 32: Surgical correction of skeletal dysgnathy due to the growth disorder was carried out after growth was complete.

Conclusion

Cleft lip and palate (CLP) a relatively common craniofacial anomaly affects physical, psychological and social aspects of cleft child and his or her parents. And as such necessitates a multidisciplinary team for managing the complexities associated with the the deformity. The treating professionals may be in the local community or far away. Regardless, there must be excellent communication between the team and the practitioners who will be following the patient for treatment and follow-up care.

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