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Original Research Article

Cleft Lip and Palate: Protocol for Orthodontics Treatment

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Abstract

Cleft lip and palate represent one of the great challenges of craniofacial surgery, with initial descriptions of the condition and surgical repair dating back to ancient times. Despite many diagnostic and technical aspects remaining unqualified, much progress has been achieved in understanding and treating this deformity. From more complex genetic studies clarifying its etiology to less mutilating surgical techniques, these advances have helped improve prevention and appropriate care. A protocol for the treatment of cleft patients should followed by the healthcare providers, and coordination amongst them is a major contributor to success in cleft treatment.

Keywords: Cleft patients, Treatment protocol and Teamwork management.

INTRODUCTION

Cleft lip with or while not congenital abnormality [CL(P)] is that the commonest innate malformation within the head and neck. The birth of a baby with a cleft may be a tough and showing emotion charged time for the child's family.[1] Evaluation and treatment of the child with cleft lip and/or cleft palate requires a long-term comprehensive and multidisciplinary approach in terms of medical, surgical, dental, and psychological intervention best accomplished in conduction with a cleft palate team.[2]

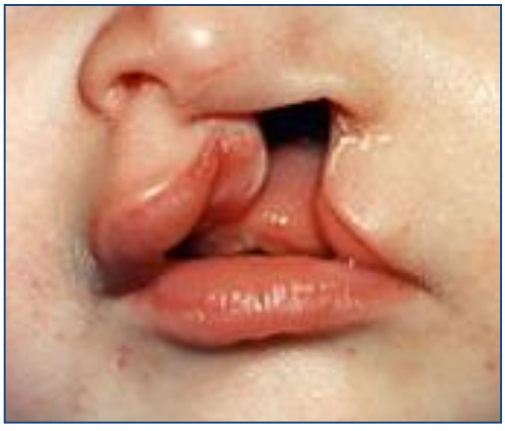

Fig-1: Orofacial Clefts

History

The first recorded operative treatment of a cleft patient has been attributed to the period of the Chin (Tsin) Dynasty (c390 AD). The repair was of a harelip solely, and no mention of congenital abnormality repair was created. Palatal clefts were confused with the more common fistulas resulting from tertiary syphilis and were not addressed surgically because of this association. [3]The greater technical challenges of cleft palate repair no doubt presented a barrier to surgical treatment as well. Although the primary familiar congenital abnormality repair was performed within the early nineteenth

century, the introduction of anesthesia permitted a quantum leap in treatment as it did for many diseases.[4]John Stephenson (1797–1842), a physician who was born with incomplete cleft palate, wrote the earliest recorded description of palatoplasty. As a medical student in Edinburgh, he traveled to Paris to observe the renowned surgeon, Philibert Roux (1780–1854). While he was there, Roux noted his abnormal speech pattern; he performed the primary repair of his velum when Stephenson was 22 years old. In his thesis, Stephenson wrote in remarkable detail of his speech quality: I always pronounced /th/ like /s/. As I grew up, the adjacent components cared-for shut the defect, and by speaking slowly I articulated higher. [5] Thanks to the nasal quality of the language, I won't to speak French a lot of clearly than English. Nature is kind and trying to correct her mistakes, did her best to improve my unpleasant voice by contracting as powerfully as potential the muscles of the cavum …I feel that the nasal sound was due to faulty vibration of the air in its passage from lungs to nares, as a results of the fissure prevented the taste bud from functioning.[5] Following the description of his speech, **[Fig.1]** Stephenson wrote in detail of the procedure, including the positioning (seated upright in front of Dr Roux), anesthetic (none), difficulties (breathing and bleeding), and postoperative course (respiratory difficulty, nothing to eat or drink for 29 h, and discomfort of suture removal). He conjointly delineated the standard of the operative speech: It should be confessed that a number of the nasal quality remains gift. Old habit and therefore the preceding contraction were an excessive amount of on behalf of me. The repaired instrument is not yet fulfilling its proper duties to giving the help it should to my vocal faculty. Who will deny the all-importance of habit? The same problem often occurs today when cleft palate repair is delayed until later in life.[6] After the acceptance of his doctoral thesis, Stephenson returned to his home in Canada and eventually became a principal founder of McGill Medical College, where he served as Professor of Anatomy, Physiology, and Surgery.[6]Roux later published his account of the procedure in 1825, describing the simple suture closure of the surgically freshened edges, which he termed "staphyloraphie".

Johann Friedrich Dieffenbach (1792–1847) studied under von Graefe at the University of Berlin.[10] Dieffenbach expanded the technique of soft palate repair to include closure of the hard palate. Dieffenbach's palatoplasty method involved bringing together the cleft bony segments by a series of twisting silver or lead sutures passed through punch holes in the bony palate.[11] He eventually designed and advocated lateral mucosal relaxing incisions to aid successful soft tissue closure. Later, following von Graefe at Charité Hospital in Berlin in 1840, he not only improved

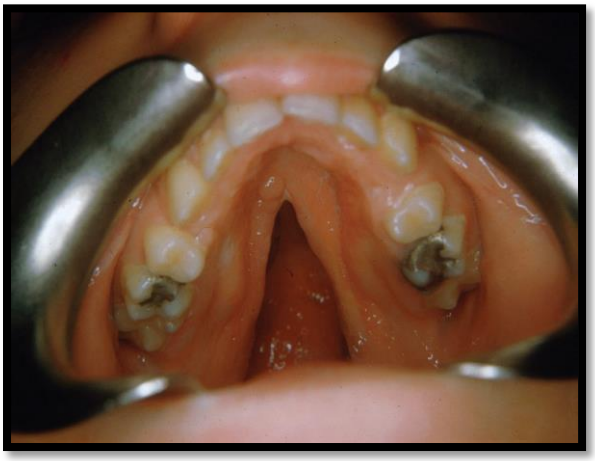

Figure-2: Complete cleft of the secondary palate.

the technique of palatoplasty but also advanced techniques of local flap closure and transplantation. Dieffenbach's possibly most important contribution to plastic surgery was the introduction of ether anesthesia to plastic surgical procedures.9 Dieffenbach had been introduced to anesthetic technique during a demonstration at Massachusetts General Hospital in 1846 and began applying it to routine surgical procedures before his death in 1847.[6] He was so revered in Germany that he received an official state burial. After the death of Dieffenbach, Bernhard von Langenbeck (1810–1887) succeeded to the position at the University of Berlin. Incorporating his extensive work with bone and periosteum of the extremities during the Franco-Prussian war, he was the first to describe the mucoperiosteal plane of dissection and to use its advantage in mobility to cleft palate closure.[12] His technique, with various modifications, is still widely used today. The combination of Dieffenbach's introduction of general anesthesia and von Langenbeck's use of mucoperiosteal flaps ushered in the modern era of cleft palate surgery. The ensuing century has brought greater understanding of the anatomy of the cleft palate, as well as improved surgical approaches.[2] Dorrance's introduction of a pushback [**Fig.2]** technique, Veau's dissection of the levator muscles, and the more recent techniques introduced by Bardach and Furlow are particularly significant. As many of the operations are still in use, we review them in the appropriate technical areas of the chapter rather than in this historical overview.[1]

Gene	Syndrome	Isolated	"Genetic weight"
MSX1	CLP/hypodontia	2% (CLP/CP)	5-9%
IRF6	Wan der Woude Syndrome	1-2% (CLP/CP)	12%
TBX22	XL-CP/anchyloglossia	2-4% (CP)	unknown
FGFR1	Kallmann syndrome	1% (CLP/CP)	unknown
p63	EEC/AEC/	Rare (CLP)	unknown
TGFB3	- - - - - - - -	Rare (CLP)	unknown

Figure-3: The ENT treatament of Cleft Lip and Palate

Incidence and Genetics

Cleft lip and cleft palate area unit common innate malformations, second solely to talipes (talipes equinovarus) in frequency of incidence. Cleft lip with or while not congenital abnormality seems to be genetically distinct from isolated congenital abnormality while not harelip. [2]The former occurs in about 1 of 1,000 newborns (considering all racial groups), the latter in about 1 of 2,000. The incidence of CL(P) varies by ethnic group, with the highest frequency occurring in Native Americans, about 3.6 of 1,000 births [1], followed by Asians with 2.1 of 1,000 births, whites with 1 of 1,000, and blacks with 0.41 of 1,000 births .[2] Conversely, the incidence of CP is constant among ethnic groups (0.5 of 1,000) .[13]Gender differences (male:female ratio) are noted to be about 2:1 for CL(P) and 1:2 for CP. Overall, the prevalence of cleft types in the population is as follows: complete clefts of the lip, alveolus, and palate, concerning 45%; congenital anomaly, alveolus, or both, concerning 25%; and CP, about 30%.[14] **[Fig.3]**

Both CL(P) and CP can be further subcategorized as syndromic or nonsyndromic. Syndromic clefts are those that are part of, or associated with, a recognized pattern of human malformation or syndrome.[1] The cause of syndromic clefts may be single gene transmission (mendelian inheritance: autosomal dominant, autosomal recessive, or X-linked), chromosomal aberrations (trisomy, deletion, addition, or translocation).[2] Other causes can result in clefting, with a recognizable syndrome, such as teratogens (ethanol, thalidomide, phenytoin), and environmental factors (amniotic band syndrome, maternal diabetes mellitus, maternal dietary folate **[Fig.4]**deficiency , ethanol, or tobacco smoke exposures).[15] Estimates of the percentage of syndromic causes in the cleft population have ranged from as high as 60% to as low as 15%. More than 200 recognized syndromes square measure familiar to incorporate a facial cleft as a manifestation.[1,2,16,17] A thorough head and neck examination and search for any other structural anomalies, such as synostosis, telecanthus, maxillary or malar hypoplasia, abnormal pinnae or abnormalcy, nervus facialis palsy or dysfunction, abnormal inframaxillary form, and excursion or disorder, should occur to spot the presence of a syndrome. [1,8] Identification of a syndrome, particularly one with a familiar inheritance mode, has vital prognostic implications and is vital to the family in terms of counsel.[15, 18] **[Fig.4]**

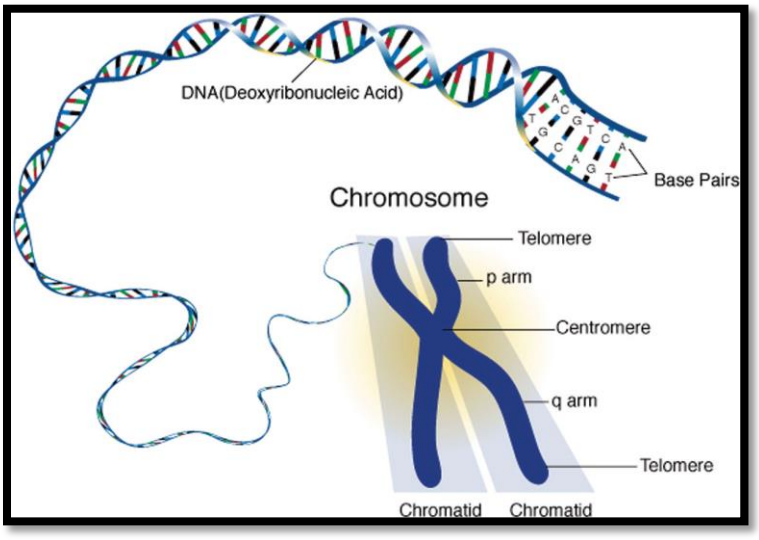

Figure-4: Chromosome structure.

Embryologic Considerations and Classification

Normal embryologic development of the lip and palate can be considered to occur in two related phases: the primary section (beginning at four to five weeks gestation), involving the event of the higher lip, nose, and first palate or premaxilla (the portion of the bony surface anterior to the incisive opening containing the four higher incisors), and the second phase (beginning at 8 to 9 weeks' gestation), involving the development of the secondary palate (the hard and soft palate posterior to the incisive foramen).[14,16,17,18]

The first phase involves proliferation of the mesoderm and ectoderm in the frontonasal process. The frontonasal method has 3 elements: (a) an anterior labial component, which forms the philtrum; (b) an anterior palatal component forming the alveolar part of the premaxilla (with the central and lateral upper incisors); and (c) a posterior palatal component forming the portion of the hard palate anterior to the incisive foramen. Laterally, proliferation of mesoderm with overlying ectoderm occurs in the maxillary processes that eventually form the lateral lip segments and nasal alae.[1,2,13,14,16,18]

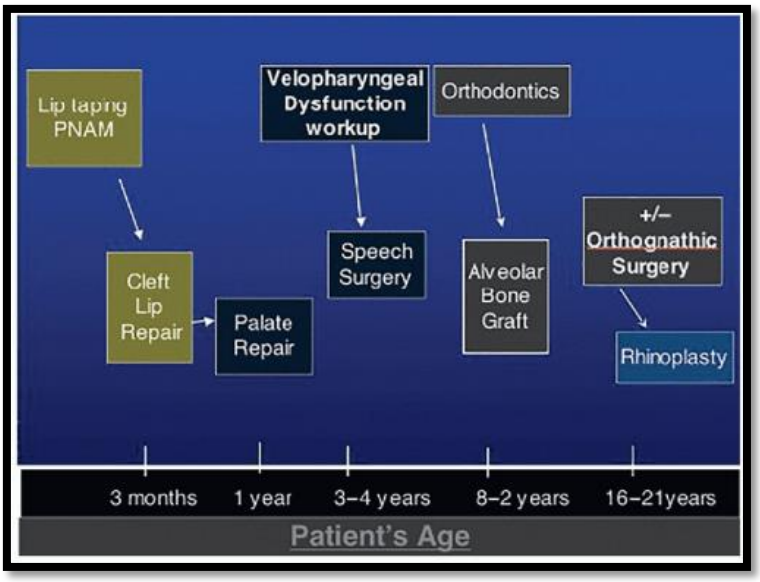

Figure –5: The age treatment of Cleft Lip and Palate

Embryonic formation of the frontonasal process begins with differentiation of the olfactory placode epithelium .[2] Morphogenetic movement of the placode and differential growth forms the characteristic curl of the placode into the nasal alae.[1] The most recent theory of palatal formation involves contact, with subsequent resorption of the contacting surface epithelial cells and adhesion of the contacting prominence. It is believed that this occurs in both primary and secondary palate formation (i.e., contact, loss of surface epithelial cells, and mesodermal contact, with fusion and penetration across the junction).[18] Differences within the physiological condition time of development and fusion of the first surface (about 30 days) and secondary palate (about 50 days) are reflected in the separate genetic inheritance patterns.[1, 2, 18]

Clefts of the lip are either unilateral right or left, or bilateral (group I).[13-16] They can be complete (with extension into the nasal floor) or incomplete (extending from a slight muscle diastasis at the vermilion to a small bridge of tissue at the nasal sill). [13] A cleft involving only the lip can occur as an isolated entity, but a cleft of the alveolus is always associated with a cleft of the lip.[14,17,18]

Group III includes children with a cleft lip and palate. Clefts of the palate can be divided into primary (involvement anterior to the incisive foramen, group IV) or secondary (involvement posterior to the incisive foramen, group II).[17,18] Palatal clefts also can be unilateral (the palatal process of one side is fused with the septum, resulting in communication of the oral and nasal cavities on one side only) or bilateral (no connection between either palatal process and the septum).[18] A complete cleft palate refers to a cleft of both the primary and secondary palates and is nearly always associated with a cleft lip. [18,19] The term incomplete cleft palate is synonymous with a cleft of the secondary palate or can be used to describe a palatal cleft with an area of intact mucosa.[20] The classic submucous cleft palate (bifid uvula, midline diastasis of the levator muscles, and posterior hard palate notching caused by loss of the posterior nasal spine) is accurately a microform expression of a cleft of the secondary palate.[21,22,23]

General Team Management Approach

Because the problems that confront affected children and their parents are complex, variable, and long-term, the facial surgeon should be allied with a cleft palate or craniofacial team that meets regularly.[1,2][**Fig.5]**This allows valuable consultation with colleagues in pediatrics, plastic surgery, dentistry, orthodontics, speech pathology, and audiology on a regular basis. Other experts (e.g., neurosurgery, ophthalmology, and prosthodontics clinicians) can be consulted, as needed, as well as oral surgeons, geneticists, nurses, and social workers.[24] The team approach functions best in an Following the birth of a child with a cleft, the fogeys typically react with disappointment and anger, followed by depression, then guilt. Initial counseling is important and should be scheduled as soon as possible with a healthcare professional skilled in counseling parents of children with craniofacial anomalies. [26] Care and feeding in the first months of life should be demonstrated, and a general outline for the child's long-term care should be offered.[27,28] **[Fig.6**]

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

Anatomic Deformity of Cleft Lip and Palate

The anatomic deformity associated with CL(P) involves the soft tissues of the lip and nose, the cartilaginous and bony supporting structures of the nose and palate, and the underlying bony maxilla.[29,30] **[Fig.7**]

Figure -7: Nasoalveolar molding (NAM) appliance. Hard plate facilitates nipple compression.

Unilateral Cleft Lip

Although the degree of deformity depends on the severity of the cleft, the orbicularis oris muscle, blood supply, and innervation generally follows the external form or silhouette of the cleft lip.[1,2] For the incomplete cleft lip, the muscle fibers of the orbicularis oris are often intact but decreased and hypoplastic across the width of the cleft. In the complete

cleft lip, the muscle fibers are directed superiorly following the cleft margins and terminate at the pillar base medially and to a lower place the nasal ala laterally.[13,15]Often increased muscle bulk exists in the lateral segment, whereas muscle is deficient in the medial segment. The vermilion tends to be thinner on the medial side, which is an important fact to note during the definitive lip repair.[15,31]

The nasal deformity associated with the unilateral cleft lip involves the nasal ala, alar base, columella, medial and lateral crura of the lower lateral cartilage, dome, and septum, as well as the underlying maxilla. Because the lateral maxillary segment is often displaced inferiorly, the alar base and lateral crus are displaced laterally and inferiorly. As a result, the dome is flattened and rotated downward on the cleft side; the columella is short, causing a horizontal orientation to the nostril on the cleft side.[30,31]

Bilateral Cleft Lip

In the bilateral complete cleft lip and palate, the anatomy of the two lateral lip segments is similar to the unilateral cleft lip.[32] The nasal deformity in the bilateral cleft lip often involves a very short columella length, as well as widely flared alae with rotated and displaced lower lateral cartilages.[33] The premaxilla is often protruded with respect to the lateral maxillary segments, which are often hypoplastic and displaced posteriorly. [34]The prolabium (the central portion of the lip) is positioned anterior to the premaxilla and frequently is attached to the anterior gingiva of the premaxilla.[35] The orbicularis oris muscle fibers insert into the lateral cleft margins at the nasal base and alae region, but are rarely found in the prolabium (except in incomplete clefts).[33-35]

Cleft Palate

The deficiencies associated with cleft palate depend on the location of the defect in the palate. In the normal palate, the tensor veli palatini and levator palatini muscles within the soft palate insert into an aponeurosis at the midline raphe.[14,36] In the cleft palate, the muscle fibers follow the medial margin of the cleft and insert into the medial cleft edges and the posterior edge of the lateral bony hard palate. Clefts involving the alveolus will disrupt traditional dental development, eruption, and retention.[37,38]

Facial Growth

The subject of normal human facial growth is extremely complex and incompletely understood; and superimposing a cleft defect complicates an already complex process. Many children with clefts will develop collapse of the alveolar arches, midface retrusion, and resultant malocclusion as they approach their teenage years.[2,39] The underlying cleft deformity itself, as well as the surgical procedures performed to correct the defect, are concerned as attainable conducive causes of those developments.[40] Currently, controversy exists regarding the relationship between surgical procedures and maxillary growth in terms of the sequencing of surgical procedures, the timing of the cleft repair, whether or not the cleft lip repair itself has an effect on maxillofacial growth, and the various surgical techniques of lip and palate repair[1,39]. Of interest, it is common in nonsyndromic older children whose cleft is unrepaired to have relatively normal midfacial projection and occlusion (personal observation).[1,2,39,40]

Orthodontics in cleft lip and palate management

The state of the art for the management of patients with oral facial clefts requires the use of a multidisciplinary approach as various structures, traditionally treated by several specialists, are involved. In the oral cavity, the cleft affects not only the soft and hard palate, but also the alveolus and dentition.[30,41] The structural rehabilitation of these patients requires the surgical correction of the soft- and hard-tissue defects as well asthe secondary effects of the cleft on maxillary development, dental support, and dental–occlusal alignment.[1,2,13,15] **[Fig.8]** The role of the orthodontist in cleft management is essential as the orthodontist assists the surgeon during all stages of reconstructive care: in the early stages, with presurgical nasal and maxillary orthopedics; during the transitional dentition stage, with alignment of the maxillary segments and dentition in preparation for secondary alveolar bone grafting; and during the permanent dentition and late adolescent years, by obtaining satisfactory dental and occlusal relationships and also to prepare the dentition for prosthetic rehabilitation and orthognathic surgery, if required. In addition, it's been the role of the dentist to observe craniofacial growth and dental development, as well as the treatment effects on these patients through the use of roentgencephalometry.[18] With this approach, the management of the cleft patient has evolved dramatically in recent years In recent years.[29,30,42]The reason for improved outcomes is based on refinements in primary and finishing surgical techniques, as well as timing and incorporation of other procedures such as presurgical orthopedics, orthodontics, and new prosthetic approaches utilizing resin-bonded prosthesis and/or osseointegrated implants. It is our experience that patients treated within the context of the multidisciplinary approach can obtain excellent outcomes related to speech, ideal occlusion, satisfactory lip aesthetics, and skeletal balance. [43] However, it is the secondary cleft nasal deformity that still gives the patient the “cleft stigmata.” [30,42] New dentistry and surgery modalities became procurable which can further improve outcomes in patients with orofacial clefts. In infancy, this includes the use of presurgical nasoalveolar molding techniques. In the mixed dentition, novel orthodontic–orthopedic approaches to correct maxillary hypoplasia are utilized; and, in the permanent dentition, the use of new appliances and dental materials to facilitate orthodontic treatment

and the application of bone anchorage screws (BAS) to facilitate orthodontic tooth movement are employed.[43] In addition, the use of distraction osteogenesis to improve the position of the jaw in those cases with severe jaw dysplasia has become a well-accepted procedures.[44] Finally the availability of new diagnostic techniques such as digital skull and dental models, three-dimensional (3D) photogrammetry, lower radiation CT (CT) scans, cone beam CT (CBCT), and therefore the development of 3D digital protocols to plan orthognathic surgery are now at the forefront of current orthodonti

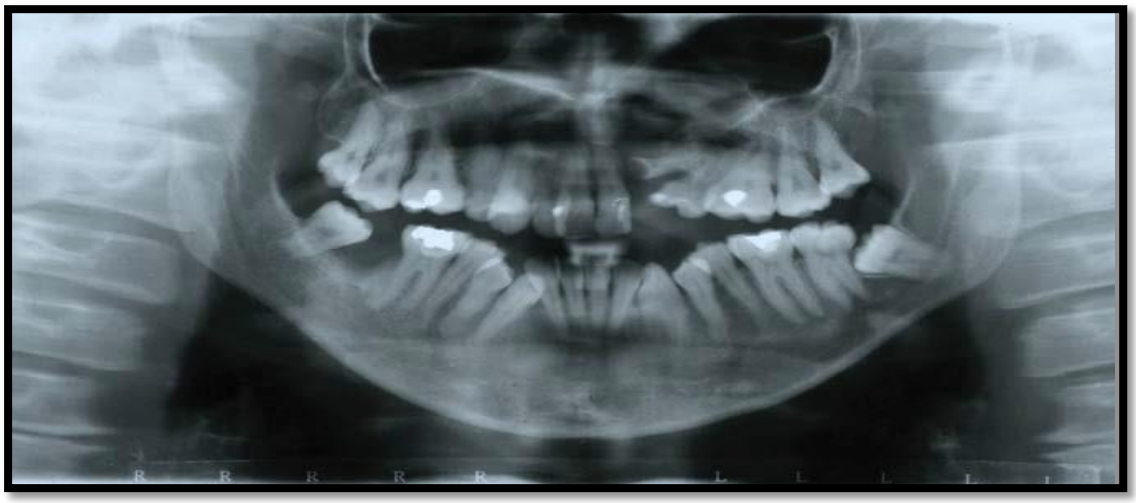

Figure-8: Pre-treatment (a) panoramic

and surgical approaches. The efforts towards improvement of dentistry and surgery ways developed for noncleft patients will profit he difficult issues conferred by cleft patients and square measure a welcome addition to this treatment protocols.[28,30,45] **[Fig.8]**

Orthodontic treatment can be continued 8–12 weeks after bone graft surgery. As soon as appropriate maxillary arch and dental relations are achieved, the orthodontic appliances are removed and the patient is placed in retention until there is full permanent dentition. [1,2]Teeth that were severely rotated prior to treatment need to be retained. [13]Absent teeth can be temporarily replaced with a removable prosthetic appliance to improve aesthetics and limit the effects on speech production. [46] Patients treated with the protocol outlined above complete the preparatory phase of orthodontic treatment in the preteen or early teen years. Patients are followed every 6 months to determine their craniofacial growth and dental development, particularly eruption of the jaw lateral tooth and canine on the cleft side. [15] Occasionally, the jaw canine is wedged and needs surgical exposure and dental medicine incorporation into the arch because the kid is within the full permanent dentition.[47] wedged or severely malpositioned cleft-side jaw lateral incisors area unit typically extracted [47,48]
.

Patients with CLP usually require an extensive and prolonged orthodontic treatment parallel to the surgical treatment. Orthodontic treatment could also be required: (a) in infancy, before initial surgical repair of the lip, (b) during the mixed dentition period, (c) during the permanent dentition period and (d) in the late teens after completion of facial growth, in conjunction with orthognathic surgery.[1,2,13,15] **[Fig.9]**

The introduction of passive realignment of the hard palate shelves has been introduced by McNeil and later by Burston[26,27]. This orthopedic approach makes CLP repair easier and may improve the aesthetic outcome of primary CL nasal repair by repositioning the alar base.[28] However, unless the appliances used are continued throughout the period of facial growth, their long-term influence on facial growth and dentition remains still a matter of discussion.[29,30]

Orthodontic intervention in the primary dentition has been recommended over the past 60 years, although less in recent years.[30]Suggested treatment at that time ranged from full bandingto routine arch expansion[1`,2,29,30] **[Fig.10]**

Numerous authors have delineated the useful effects on dental and skeletal growth development of cleft patients through the elimination of functional and structural problems at this developmental stage. [1,2,16]The most common procedures for this purpose include: (a) maxillary expansion to correct the reduced transverse dimension, (b) incisor alignment and proclination to remove crowding, rotations, and anterior crossbites, as well as (c) maxillary protraction to reduce maxillary retrusion.[28-30] **[Fig.11]**

Many authors report an increasing frequency of permanent dentition treatment, which is possible using the common orthodontics approaches as for non-cleft patients. [25]Since the routine use of bone grafting, space closure in the cleft site has become a desirable and achievable goal to eliminate the need for artificial replacement teeth .[1,2] In these cases within which house closure isn't potential, the employment of adhesive bridgeworksor of implants within the grafted gum ridge has become a treatment of alternative. A further chance is that the transplantation of a lower tooth to the higher arch. [13-16] **[Fig.12]**

The development of effective orthognathic surgical techniques in the 1970s and 1980s has provided orthodontics with the means to complete treatment of almost all cleft patients.[1,2] The use of three-dimensional cephalometry, computed tomography, and scanned dental models, video imaging, and computer-generated images have all contributed to the improvement of orthognathic surgery planning. [25-30]Although initially developed for non-cleft orthognathic surgery, the use of these applications in cleft patients has been increased rapidly.[1,2,27,29,30]

Finally, if it is determined that there is anteroposterior skeletal disharmony, the reconstructive team has to decide if it is convenient to do the bone grafting in the transitional dentition or if it should be done in combination with future orthognathic surgical procedures.[1,2] Patients in whom there is marked tissue deficiency, including maxillary hypoplasia and congenitally missing teeth, are likely candidates for postponement of the traditional approach for secondary alveolar bone grafting and will be treated later on in the permanent dentition in combination with orthognathic surgery.[13-16] If it is deemed important to preserve the dentition adjacent to the alveolar cleft, orthodontics are therefore indicated, even in the presence of a skeletal disharmony[49]. The purpose of the orthodontic treatment is then to prepare the dentition for the alveolar bone graft and also to coordinate the maxillary arch to the mandibular arch for future orthognathic surgery that will be performed in the teen years. This approach minimizes the required orthodontic treatment prior to orthognathic surgery in the adolescent years.[47,50] **[Fig.13]**

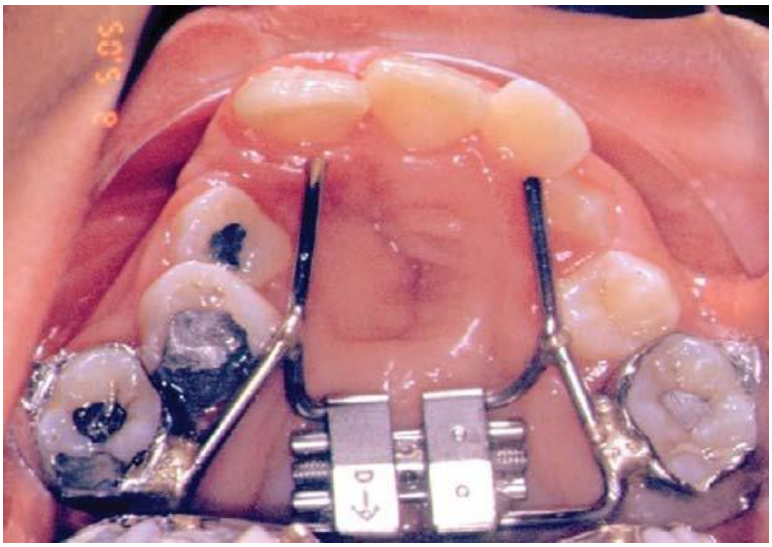

Figure-9: Rapid maxillar expander in place.

Orthodontic management following the developmental approach outlined previously allows the clinician to take advantage of developmental and growth changes and permits the patient and family to recognize the need for distinct phases of orthodontic treatment which also allow for sufficient rest space between stages[47]. This approach assures patient and family acceptance, compliance, and cooperation with the treatment protocol.[1,2]

Since the orthodontist participates in the care of a cleft child from infancy into adulthood, it is imperative to recognize that abnormal facial growth will present an added challenge to the reconstructive team.[48] It is understood that cleft patients do have different facial growth patterns than those seen in noncleft individuals.[2]

However, cleft patients have significant growth potential. If this potential is not negatively affected by the reconstructive procedures required by the patient, it is likely that a favorable outcome will be obtained. [1]Orthodontic treatment will be simplified if minimal growth disturbances affect the patient. [2]Simplification and shortening of orthodontic treatment, which is usually the longest therapeutic intervention for many cleft patients, are desired as this will decrease the burden of care (e.g., patient, family, provider, public health system, society). [25,26] Cleft teams

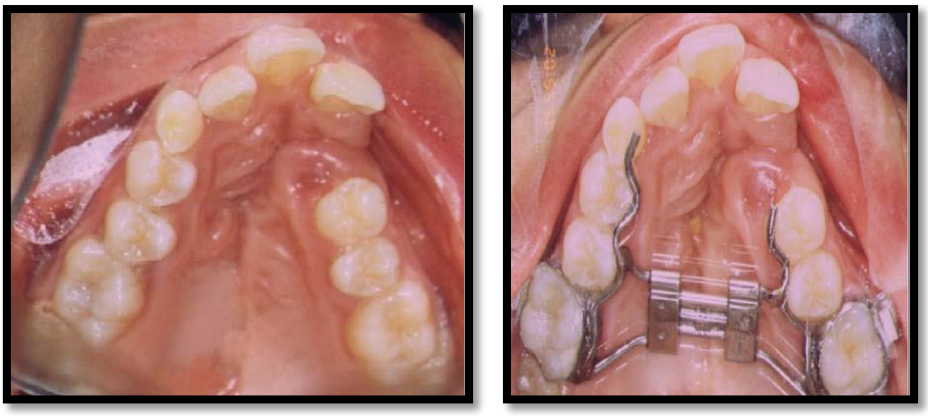

Figure-10: (a) Occlusal pre-treatment and (b) with the hyrax appliance in place

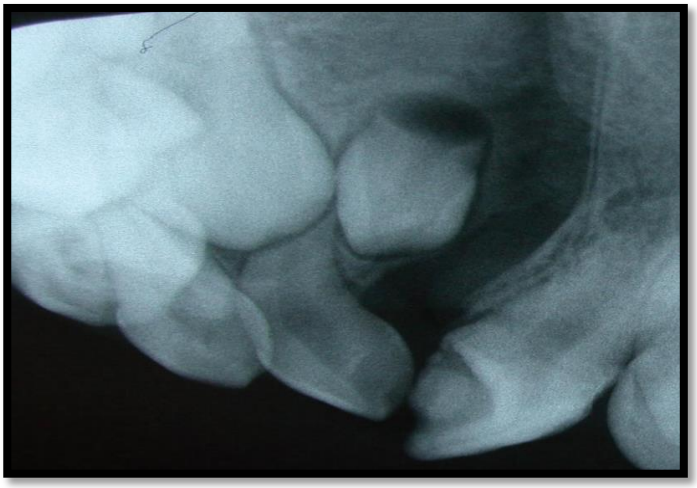

Figure -11: A. Periapical x-rays before

should strive to obtain optimal outcomes by critically assessing their protocols and incorporating proven strategies to manage their patients.[14] It is accepted that surgery will likely create significant scarring in the infant maxilla, resulting in growth attenuation. [26]Careful attention should be given to those protocols that minimize scarring in the anterior maxilla (i.e., delaying alveolar bone grafting and minimizing palatal scarring by avoiding damage to the maxillary body). This, in turn, will result in less need for extended and complex orthodontic procedures.[27,47]

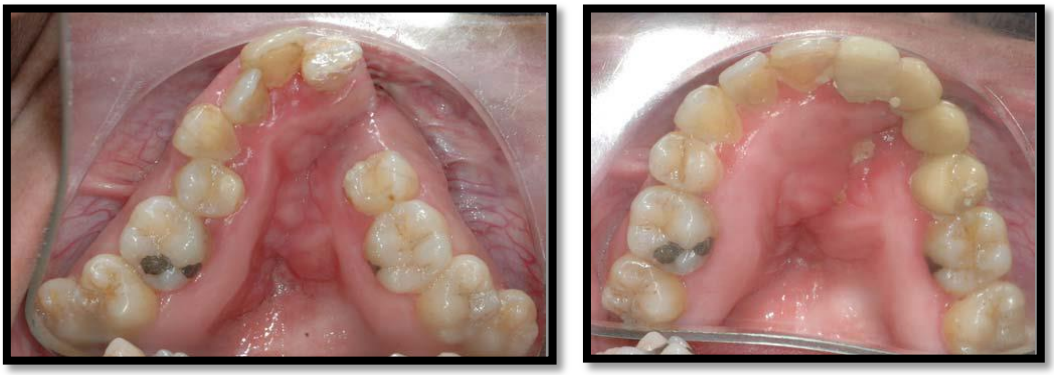

Figure-12; Comparison (a) pre- and (b) post-treatment upper arch

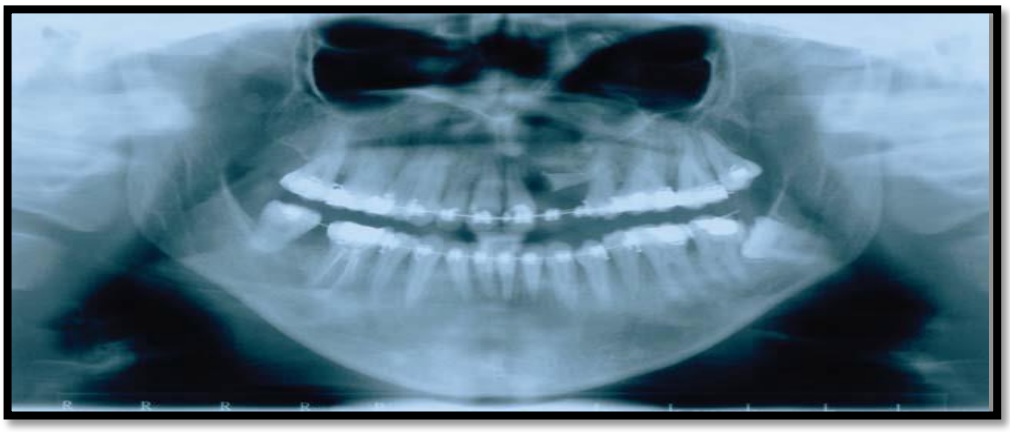

Figure -13: Final radiographs with brackets in place.

The vital contribution of the dentist to the great surgical dental medicine management of the cleft patient is illustrated. The role of the dentist is to support the doctor with all aspects of craniofacial growth, dental development, occlusion, and treatment planning, so ideal outcomes can be obtained.[25] With the addition of nasal alveolar molding as well as maxillary distraction osteogenesis, the traditional protocols for cleft management have been expanded**[Fig.13]**. In addition, the incorporation of new technological advancements in orthodontics, such as highly flexible orthodontic arch wires, self-ligating orthodontic appliances, BAS, and accessibility to new 3D imaging technology, facilitates the required treatment interventions.[47-50] It is hoped that these innovations will provide clinicians with new strategies for the difficult management of the cleft patient, and will provide the patient with outstanding outcomes. [,25,47]The treatment plan of the patient should be developed around the anatomical, functional, and developmental needs of the patient. Close cooperation between the surgeon and orthodontist is imperative for a successful outcome.[1,2,13,15,25.47]

SUMMARY

Cleft lip and palate are the most common congenital malformations involving the head and neck, and a cleft palate team approach best provides long-term multidisciplinary management.;

- Cleft lip and palate occurs in 1 of 1,000 births; cleft palate alone occurs in 1 of 2,000 births. Clefts occur in children with recognizable syndromes or as an isolated deformity (nonsyndromic)
- Complex genetic and environmental interactions are present in most nonsyndromic clefts.
- Lip and surface embryonal development happens in 2 phases: the primary starting at 4 to 5 weeks (lip, nose, premaxilla) and the second beginning at 8 to 9 weeks (secondary palate).
- The relative prevalence of cleft varieties embrace complete congenital anomaly, alveolus, and palate, 45%; cleft lip with or without cleft alveolus, 25%; and clefts of the secondary palate only, 30%.
- Critical psychosocial and nutritional issues should be addressed in the neonatal period or even prenatally.
- The infant is discharged home from the newborn nursery only after a satisfactory feeding method has been established and the parents are capable and comfortable caring for the infant.
- Lip taping or lip adhesion, an early preliminary option for cleft lip, can be performed at 2 to 4 weeks of age. Definitive lip repair is then performed at 4 to 6 months of age. Lip adhesion, which can influence scar formation, is used in carefully selected cases.
- The rule of tens is employed to work out appropriate age for lip repair: the baby is a minimum of ten weeks previous, weighs concerning ten pounds, and contains a haemoprotein of 10 g.
- Cleft palate repair is usually performed at 8 to 12 months of age as long as the child is gaining weight and growing in a normal fashion.
- Patients with cleft lip and palate require a team approach for their treatment, comprised of several specialists. This multidisciplinary care starts from birth and continues into adulthood, and coordination amongst specialists may be a major contributor to success in cleft treatment.

REFERENCES

1. Abu-Hussein M (2011) Cleft lips and palate; the roles of specialists, Minerva Pediatr 63(3): 227-232.
2. Abu-Hussein Muhamad, Abdulgani Azzaldeen and Nizar Watted (2014) Cleft Lip and Palate; A Comprehensive Review International Journal of Basic and Applied Medical Sciences 4(1): 338-355.
3. Boo-Chai K.(1966) An ancient Chinese text on a cleft lip. Plast Reconstr Surg. ;38:89–91.
4. Rogers BO. History of cleft lip and cleft palate treatment. In: Grabb WC, ed. Cleft lip and palate. Boston: Little, Brown; 1971.
5. Stephenson J. Repair of cleft palate by Philibert Roux in 1819. Plast Reconstr Surg. 1971;47:277–283.

6. Entin MA.(19990 Dr. Roux's first operation of soft palate in 1819: a historical vignette. Cleft Palate Craniofac J.;36:27–29.
7. Roux PJ. (11925)Memoire sur la staphyloraphie, ou il suture a voile du palais. Arch Sci Med.;7:516–538.
8. McDowell F.(1971); The classic reprint: Graefe's first closure of a cleft palate. Plast Reconstr Surg.;47:375–376.
9. May H.(1971); The classic reprint. The palate suture. A newly discovered method to correct congenital speech defects. Dr. Carl Ferdinand von Graefe. Berlin: Plast Reconstr Surg. ;47:488–492.
10. Mau A, Biemer E. (1994)Johann-Friedrich Dieffenbach: the pioneer of plastic surgery. Ann Plast Surg. ;33:112–115.
11. Goldwyn RM. (1968);Johann Friedrich Dieffenbach (1794– 1847). Plast Reconstr Surg.;42:19–28.
12. Goldwyn RM. Bernhard von Langenbeck.(1969); His life and legacy. Plast Reconstr Surg. 44:248–254.
13. Abu-Hussein M (2012) Cleft Lip and Palate – Etiological Factors. Dent. Med. Probl 49(2): 149-156.
14. Abu-Hussein Muhamad, Abdulgani Azzaldeen, Watted Nezar, Kassem Firas (2014) The Multifactorial Factors Influencing Cleft Lip-Literature Review. International Journal of Clinical Medicine Research 1(3): 90-96.
15. Muhamad AH, Azzaldeen A (2012) Genetic of Nonsyndromic Cleft Lip and Palate, 2012. 1:510.doi:10.4172/ scientificreports.510
16. Muhamad Abu-Hussein, Nezar Watted, Viktória Hegedűs, Péter Borbély Abdulgani Azzaldeen (2015) Human Genetic Factors in Non-Syndromic Cleft Lip and Palate: An Update International Journal of Maxillofacial Research 1(3):7-23.
17. Brito LA, Meira JG, Kobayashi GS, Passos-Bueno MR. (2012);Genetics and management of the patient with orofacial cleft. Plast Surg Int.;2012:782821.
18. Muhamad AH.(2021) Genetic Basis of Dental Disorders, Why Teach Genetics?. Glob J Clin Medical Case Rep. ; 1(1): 005-009
19. Fara M. The musculature of cleft lip and palate. In: McCarthy JG, ed. Plastic surgery. Philadelphia: WB Saunders; 1991:2598–2626.
20. Carlson,B.M.(2013)HumanEmbryologyandMolecularBiology,5edn. Philadelphia,PA:Elsevier.
21. Carstens,M. H. (2002) Developmentof the facial midline. J Craniofac Surg 13(1):129–187.
22. Ewings, E. L. and Carstens, M. H. (2009) Neuroembryology and functionalanatomyofcraniofacialclefts.IndianJPlastSurgOctober Suppl.S19–S34.
23. O'Rahilly, R. and Müller, F. (1999) The Embryonic Human Brain: An AtlasofDevelopmentalStages.NewYork,NY:WileyLiss.
24. Campbell,A., Costello,B. J., and Ruiz R. L. (2010) Cleft lip and palate surgery:Anupdateofclinicaloutcomesforprimaryrepair.OralMaxillofacSurgClinNorthAm22(1):43–58.
25. Muhamad Abu-Hussein, Nezar Watted, Omri Emodi, Edlira Zere (2015) Role of Pediatric Dentist - Orthodontic In Cleft Lip and Cleft Palate Patients. Journal of Dental and Medical Sciences 14(11): 61-68. 7
26. M Abu-Hussein, N Watted , E Hussien , A Watted (2017) A Feeding Appliance for A Newborn Baby with Cleft Palate, International Journal Dental and Medical Sciences Research 2017, Volume 1(6): 5-09.
27. Abu-Hussein Muhamad and Nezar Watted (2019) Genetics and Orthodontics, International Journal of Applied Dental Sciences 5(3): 384-390.
28. Abu-Hussein Muhamad and Nezar Watted (2019) Genetics in pediatric dentistry: A review, International Journal of Applied Dental Sciences 5(3): 401-408.
29. Abu-Hussein M (2012) Cleft Lip and Palate – Etiological Factors. Dent. Med. Probl 49(2): 149-156.
30. Abu-Hussein M, Watted N, Yehia M, Proff P, Iraqi F (2015) Clinical Genetic Basis of Tooth Agenesis, Journal of Dental and Medical Sciences 14(12): 68-77. DOI: 10.9790/0853-141236877
31. Bennun, R. D., Perandones, C., Sepliarsky, V. A.,et al. (1999) Non-surgical correction of nasal deformity in unilateral complete cleftlip:a6yearsfollow-up.PlastReconstrSurg 3:616–630
32. Gillies,H.andMillard,D.R.,Jr.(1957)ThePrinciplesandArtofPlastic Surgery,Vol.1.Boston:LittleBrown,p.49.
33. McComb, H. (1975) Primary repair of the bilateral cleft lip nose. Br J PlastSurg 28(4):262–267.
34. McComb, H. K. (2009) Primary repair of thebilateral cleftlip nose:A long-termfollow-up.PlastReconstrSurg 124(5):1610–1615
35. Mulliken, J. B. (2000) Repair of bilateral complete cleft lip and nasal deformity–Stateoftheart.CleftPalateCraniofacJ 37:342–347.
36. Bumsted, R. M. (1981) Two-layer closure of a wide palatal cleft. Cleft PalateJ 18:110–5
37. Schweckendiek, W.(1966) Primary veloplasty.In: Schuchardt,K. (ed.) TreatmentofPatientswithCleftsofLip,AlveolusandPalate.Stuttgart: Thieme.
38. Moore, M. D., Lawrence, W. T., Ptak, J. J., et al. (1988) Complications of primary palatoplasty: A twenty-one-year review. Cleft Palate J 25:156–162.
39. Enlow,D.H.(1982)HandbookofFacialGrowth.Philadelphia,PA:W.B. Saunders
40. Shultes,G.,Gaggl,A.,andKärcher,H.(2000)Acomparisonofgrowth impairment and orthodontic results in adult patients with clefts of palate and unilateral cleft sof lip,palate and alveolus.BritJOralMax Surg 38:26–32

41. Lekkas, C., Latief, B. S., ter Rahe, S. P. N., and Kuijpers-Jagtman, A. M. (2000) The adult unoperated cleft patient: Absence of maxillary teeth outside the cleft area. Cleft Palate Craniofac J 37(1): 17–20.
42. Marcusson, A., Akerlind, I., and Paulin, G. (2001) Quality of life in adults with repaired complete cleft lip and palate. Cleft Palate CraniofacJ 38:379–385.
43. Chuo,B.,Seatly,Y.,Jeremy,A.,etal.(2008)Thecontinuingmultidisciplinaryneedsofadultpatientswithcleftlipand/orpalate.CleftPalate CraniofacJ 45:633–638.
44. Persson, M., Aniansson, G., Becker, M., and Svensson, H. (2002) Self conceptan dintro versioninadolescentswithcleftlipandpalate. ScandJPlastReconstrSurgHandSurg 36:24–27.
45. Susami,T.,Ogihara,Y.,Matsuzaki,M.,etal.(2006)AssessmentofdentalarchrelationshipsinJapanesepatientswithunilateralcleftlipand palate.CleftPalateCraniofacJ 43(1):96–102.
46. Freitas JA, Garib DG, Oliveira M, et al.(2012) Rehabilitative treatment of cleft lip and palate: experience of the Hospital for Rehabilitation of craniofacial anomalies-USP (HRAC-USP)--part 2: pediatric dentistry and orthodontics. J Appl Oral Sci. ;20:268–81.
47. Kobayashi TY, Gomide MR, Carrara CF. (2010);Timing and sequence of primary tooth eruption in children with cleft lip and palate. J Appl Oral Sci. ;18:220–4.
48. Ali Watted, Nezar Watted2and Muhamad Abu-Hussein; Multidisciplinary Treatment in Cleft Lip and Palate Patients, J Dental Oral Health; 2020, Volume 2 | Issue 1,-12
49. Abdulgani Azzaldeen, Nezar Watted, Abdulgani Mai, Péter Borbély, Muhamad Abu- Hussein (2017) Tooth Agenesis; Aetiological Factors. Journal of Dental and Medical Sciences 16(1): 75-85.
50. Abusalih A, Ismail H, Abdulgani A, Chlorokostas G, Abu-Hussein M (2016) Interdisciplinary Management of Congenitally Agenesis Maxillary Lateral Incisors: Orthodontic/Prosthodontic Perspectives, Journal of Dental and Medical Sciences 15(1): 90-99. DOI: 10.9790/085315189099
51. Long RE, Semb G, Shaw WC(2000). Orthodontic treatment of the patient with complete clefts of lip, alveolus, and palate: lessons of the past 60 years. Cleft Palate Craniofac J.;37:533–42.