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Cleft Lip and Palate- An Orthodontic Perspective

Manash Jyoti Borah, Deeksha Bhanotia, Ananthu S Kumar, Geethu Maria Jose, Tarannum Alam Shaikh, Pooja Kanwar

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ABSTRACT: Cleft lip and palate are most common dentofacial anomalies to affect the orofacial region. It occurs alone or in combination of other dentofacial anomalies, particularly congenital heart diseases. These patients require treatment at right time and at right age to achieve functional and aesthetic well being. A multi approach team work is required to manage this condition. This article aims to review the knowledge required for primary care of cleft lip and palate.

Key words: cleft lip; cleft palate; dental care; orthodontics

I. INTRODUCTION:

Cleft lip and palate is a common congenital malformation in the head and neck region. Depending on the extent of malformation, patients may have complex problems dealing with facial appearance, feeding, airway, hearing and speech. A multidisciplinary team approach is required for management of this anomaly like: pediatrics, plastic and reconstructive surgery, orthodontics and dentofacial orthopedics, oral and maxillofacial surgery,otolaryngology, genetics, social work nursing, speech therapy etc. the treatment of cleft lip and palate starts at birth till childhood when craniofacial skeletal growth is finished. Orthodontist plays a vital role in rehabilitation of patients to achieve optimal outcome in different age groups.

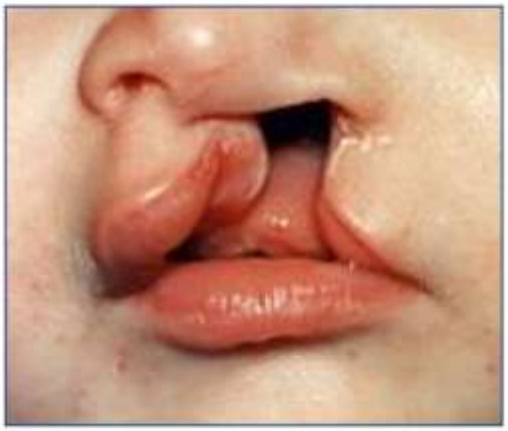

Fig-1: Orofacial Clefts

Incidence and Genetics: Cleft lip and cleft palate are common dentofacial anomalies. Cleft lip with or without cleft palate appears to be genetically distinct from isolated cleft palate without cleft lip [1]. The former occurs in about 1 of 1000 new borns and latter in about 1 of 2000 [2].

Both Cleft Lip and Palate, Cleft Palate can be further sub categorized as syndromic or non syndromic .the cause of syndromic clefts may be single gene transmission (mandelian inheritance autosomal dominant, autosomal recessive or X-Linked), chromosomal aberrations (triosomy deletion, addition or translocation). Other factors may be ---teratogens (ethanol, thalidomide, phenytoin) and environmental factors (amniotic band syndrome, maternal diabetes mellitus, maternal dietary folate). [3]. More than 200 recognized syndromes are known to include a facial cleft as a manifestation [4, 5,]

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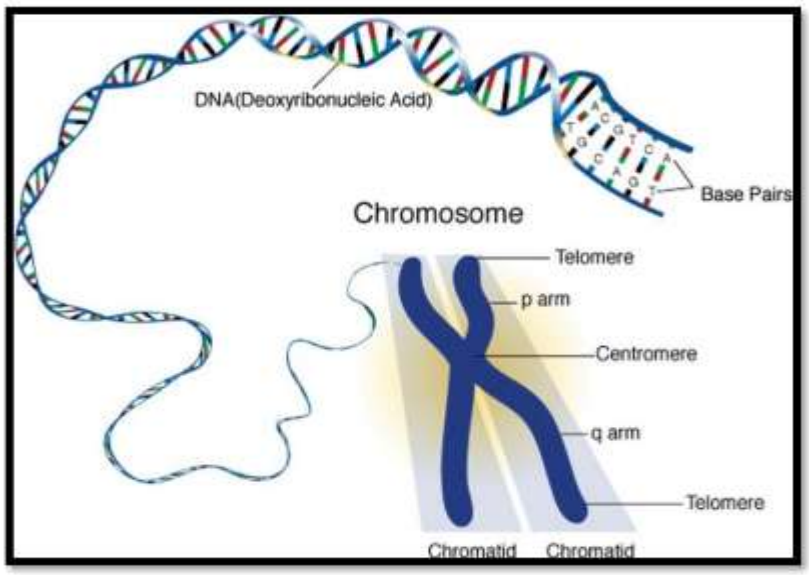

Figure 2: Chromosome

Embryology:

Normal embryologic development of the lip and palate can be considered to occur in two related phases: the first phase (beginning at 4 to 5 weeks' gestation), involving the development of the upper lip, nose, and primary palate or premaxilla (the portion of the bony palate anterior to the incisive foramen containing the four upper 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).[6,7,8.9]

The first phase involves proliferation of the mesoderm and ectoderm in the frontonasal process. The frontonasal process has three components: (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.[10,11]

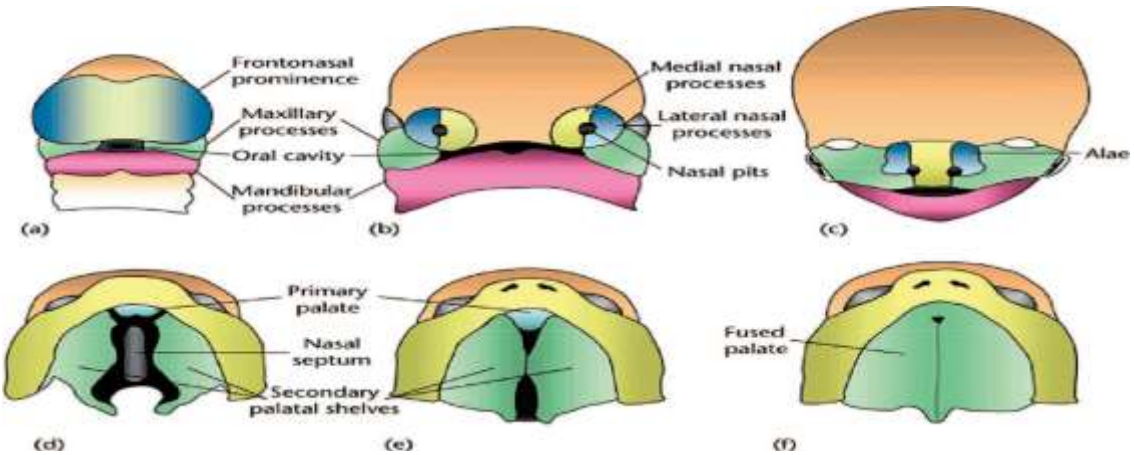

Figure 3: Embryological development of Face

II. MANAGEMENT:

The most common orthodontic problems refer to malocclusions, which often needs orthognathic surgery in the future. The most frequent ones are crossbites and partial open bites, especially at the surgery side. Among the angle classification, the most frequent are Class I malocclusions, but in difference when compared to

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the population of healthy individuals, more frequent are Class III malocclusions with dominance of pseudomesioclussion connected to maxillary hypoplasia, whereas, in healthy individuals, Class II malocclusions are three to eight times more frequent. There are also theses that hypoplasia is related to the whole midface complex [12]. It is also popular to use GOSLON-Yardick scale for defining dentoalveolar malocclusions among patients with clefts. It is a five-category scale that helps divide malocclusions and plan patient's treatment needs.

The GOSLON index is presented in Table 1. GOSLON 3 and higher are observed in ca. 60–70% of patients [13]. Table 1. GOSLON Index—the division, description and treatment needs [12].

GOSLON Scale Meaning Treatment Needs

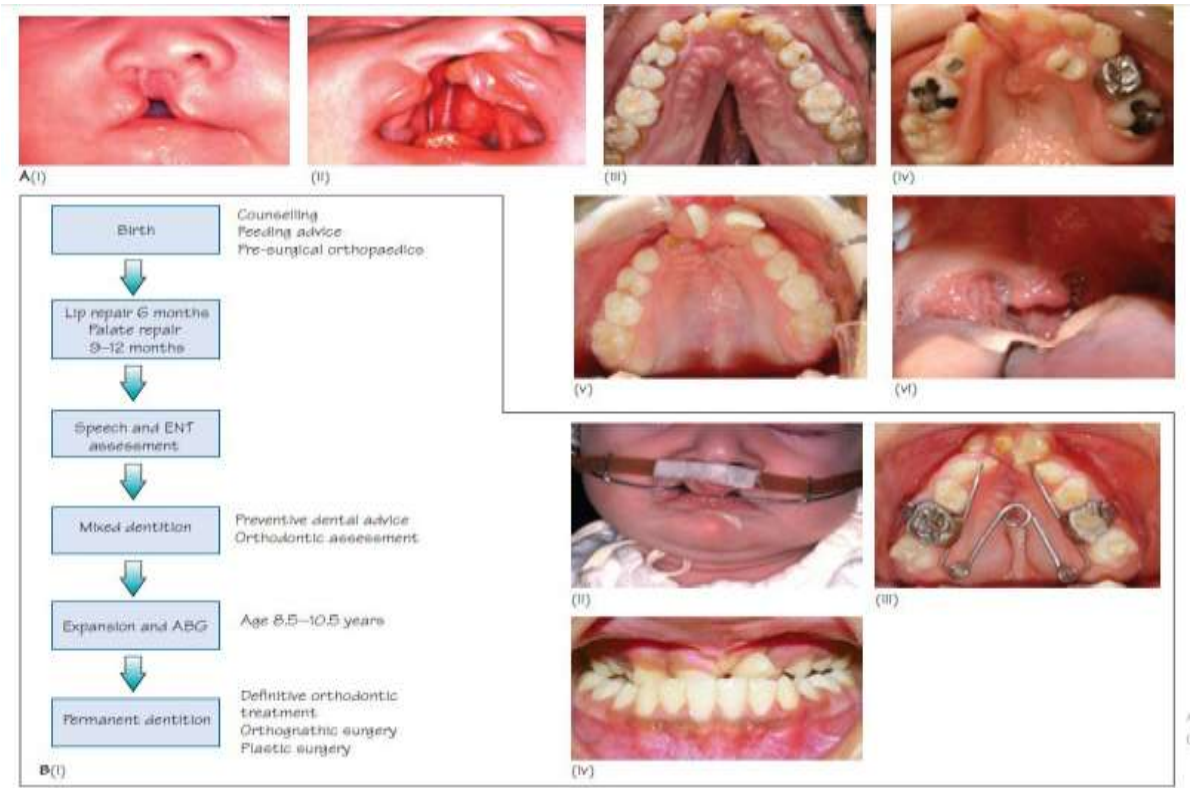
GOSLON 1 Isolated dental anomalies Orthodontic treatment could be performed due to esthetic reasons

GOSLON 2 Lateral crossbite, palatotrusion of upper incisors Removable and fixed appliance treatment GOSLON 3 Lateral crossbite; possible complete crossbite of one half of the arch Removable and fixed appliance treatment with additional transpalatal bars and hyrax appliance

GOSLON 4 Severe malocclusion with crossbite on the bone basis Orthognathic surgery; MARPE

GOSLON 5 Severe malocclusion with crossbite on the bone basis with additional open bite Orthognathic surgery

The treatment of patients with clefts is a long procedure—most of the patients start their treatment during early childhood, according to Roguzi ´nska at al. [14], at the mean age of 4.83 years and lasts for more than 9 years for unilateral clefts and 4.53 years and over 10 years, respectively, for bilateral clefts. Orthodontic procedures require removable and fixed appliances [14]. Removable appliances are used to gain space for the teeth or keep the space if there was premature loss; therefore, transversal screws are used in those kind of appliances . The novel techniques in orthodontic diagnostics are based on dental scans, which is especially helpful in patients with clefts as the 3D image is more accurate and precise and therefore the individual appliances produced for the patients are expected to fit patients' dental arch better.



Prosthodontics: Prosthodontist should be a part of the cleft team. The result of smile attractiveness and naturality depends mainly on the quality of prosthodontic approach. In the past, the majority of dental restorations concentrated around veneers and dental crowns. The issue of prosthodontist is to improve the visual aspect, especially of the damaged and malformed teeth. Dental bridges and

removable prostheses were replacing the missing teeth [15,16]. Right now, the most desirable reconstruction of the missing teeth is dental implant. The high survival rate is observed among the dental implants placed in the alveolar bone grafts, although long-term esthetic follow-ups would be desired [17,18]. The pink esthetics due to thinner gingival margin and lower bone levels is worse in individuals with clefts, although the peri-implant parameters remain similar to the control group. The best results were obtained when the bone grafts were performed 3 months before the implant placement [19].

Plastic and Orthognathic Surgery: Plastic and orthognathic surgery pertains to adulthood of the individual. It should include lip revision to correct labial shape and outcome, secondary palatoplasty (correction of velopharyngeal dysfunction), correction of maxillary hypoplasia, rhinoplasty and velopharyngeal incompetence surgery . Due to the characteristic nasal speech of the patients with cleft, their improvement in velopharyngeal function is required to correct them into the non-nasal speech . Maxillary hypoplasia is one of the most visible stigmata of the cleft. Oral distractors or orthognathic surgery should cause less visibility in the cleft malformations . Osteotomy (most frequently Le Fort I) is performed to improve the patient's life quality and facial appearance. It should be combined with bone grafting to avoid velopharyngeal function (VPF) disturbances, but still, the patients should be informed before the Le Fort I osteotomy that they may require more surgeries to improve their speech [20]. Most of the patients would be willing to have a rhinoplasty simultaneously when the Le Fort procedure is performed . In patients with clefts, the usual revision rhinoplasty requires cartilage grafts .

Multi disciplinary approach: The facial deformation, congenital pain and need for of repair procedures may influence a patient's life [21,22]. The will to look better and nicer is the psychosocial problem of individuals with cleft. The need for acceptance pushes these individuals to put posts on the internet with positively stigmatized words such as beauty [23]. Therefore, the need for psychologist might be crucial. It has been shown, though, that improvement of smile and occlusion with orthodontic treatment act the same when compared to healthy individuals; there is no difference in life quality among those two groups [24]. Patients with clefts present masticatory muscle function overload, which may require orthodontic and prosthetic treatment as well as physiotherapy .The ideal treatment planning to restore the proper bite, intercuspidation and function would require 11 facebows and articulators in order to not overload the temporomandibular joint and plan the equal pressure on all points on the teeth .

III. CONCLUSION:

The role of the orthodontist is to support the surgeon with all aspects of craniofacial growth, dental development, occlusion, and treatment planning, so ideal outcomes can be obtained.[With the addition of nasal alveolar molding as well as maxillary distraction osteogenesis, the traditional protocols for cleft management have been expanded. 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. 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.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.

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