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Cleft Palate : A literature review

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In Partial Fulfillment for the Bachelor of Dental Surgery

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Certification of the Supervisor

I certify that this project entitled **"Cleft Palate: A Literature Review"** was prepared by fifth year student **Banan Flaih Hassan** under my supervision at the College of Dentistry / University of Baghdad in partial fulfillment of the graduation requirements for the bachelor degree in dentistry.

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Dedication

To my mother who is a strong warrior that fought to protect and shield me in dire situations, my father who I greatly love and deeply miss, my sister who gave me strength and my close friends for their love and support, and lastly to my special friend for always being by my side.

Banan

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Abbreviation	Phrase
CP	Cleft Palate
CL	Cleft lip
VPI	Velopharyngeal insuficiency

Introduction

Orofacial clefts, including cleft palates (CP), are one of the most common birth defects. CP have a multiplicity of effects on the individual and society in terms of economic costs, loss of productivity, psychosocial effects, and increased morbidity and mortality at all stages of life. Etiology is complex, involving a number of genetic and environmental factors, In the developed world, most scientists believe that clefts occur due to a combination of genetic and environmental factors (e.g., maternal illness, drugs and malnutrition) **(Shkoukani *et al*., 2014)**. Complications can include difficulty with nursing or feeding the child, increased oronasal infections, and challenges with speech development and appearance **(Bath Balogh and Fehrenbach, 2011).**

All the preceding facial clefts involve the lip, but some may extend into the palate as unilateral and bilateral cleft lip and palate defects. Because the palatine shelves meet in the midline, both unilateral and bilateral clefts of the palate are in the midline clefts. Clefts must, however, extend around the medial palatal segment before they proceed in the midline. Just as cleft lip (CL) can occur alone, clefts of the palate may occur as an isolated defect. These palatal clefts can extend just a short distance into the posterior of the palate, can appear in the anterior, or can appear in both locations. However, most cleft palates occur in combination with cleft lips **(Chiego and Denial, 2018).**

Clefts of lip and palate can occur isolated or together in various combination and/or along with other congenital deformities particularly congenital heart diseases. They are also associated features in over 300 recognized syndromes **(Guarishanker, 2011).**

In developed countries, CL and CP is typically identified before birth by ultrasonography. Early detection allows time for parental education about the

potential causes of the CL and CP and procedures that the child may need after birth **(Nelson *et al*., 2009).**

Multidisciplinary care is needed to provide comprehensive treatment for cleft palate beginning at birth and until adulthood. Care for children born with these defects includes plastic surgery, nursing, maxillofacial surgery, otolaryngology, speech therapy, audiology, psychological counseling, genetic testing and counseling, dentistry, and orthodontics **(Burg *et al* 2016)**.

All surgical techniques have the goals of restoring functional speech, swallowing, and aesthetics. A multidisciplinary team is necessary for the long-term pre- and postoperative care of CP patients to handle complications, associated anomalies, and to optimize function and quality of life **(Bath-Balogh and Fehrenbach, 2011).**

Aim if the study

This study was designed to identify the etiology of CP, determine the overall prevalence of CP explain the appropriate diagnosis, summarize the importance of collaborations among professional team members to improve care coordination for long term outcomes of patients with cleft palate and review the various treatment options.

Chapter one

Review of literature

Review of literature

1.1 The Palate

The palate forms the roof of the mouth and separates the oral and nasal cavities. It is divided into the immovable hard palate anteriorly and the movable soft palate posteriorly. As their names imply, the skeleton of the hard palate is bony while that of the soft palate is fibrous.

The human face develops early in gestation, during the fourth through seventh weeks of the embryonic period, and the palatal processes begin to close during the eighth week. These two structures are closely related in time of development and sometimes have related malformations **(Chiego and Daniel, 2018).**

1.1.1 Formation of the palate

Development of the palate begins during the 5th week of human embryogenesis and is divided into two regions: the primary and secondary palates . The primary palate arises from the intermaxillary segment. The secondary palate includes both the hard and soft palate posterior of the incisive foramen**,** Palatogenesis involves the initiation, growth, morphogenesis, and fusion of the primary and secondary palatal shelves from initially separate facial prominences during embryogenesis to form the intact palate separating the oral cavity from the nostrils. **(Nanci, 2018)**.

Around the 5th week, The intermaxilarry segment arises, the intermaxilarry segment gives rise to the primary palate. The primary palate will form the premaxillary portion of the maxilla .This small portion is anterior to the incisive foramen and will contain the maxillary incisors **(kumar, 2015).**

The development of the secondary palate starts as paired outgrowths, which initially grow vertically flanking the developing tongue and subsequently reorient to the horizontal position above the dorsum of the tongue in a process known as palatal shelf elevation . With growth and expansion of the mandible the tongue moves down, allowing the palatine shelves to grow toward the midline where they meet and fuse with each other **(Figure 1.1) (Nanci, 2018)**.

The secondary palate fuses anteriorly with the primary palate with the incisive foramen being the landmark between the primary and secondary palate,and anterodorsally with the nasal septum, to form the intact roof of the oral cavity. Complete fusion of the primary and secondary palate is a complex process involving growth of the component tissues, epithelial to mesenchymal transformation, cell migration, and programmed cell death at fusion sites, Failure of fusion of the palatal shelves with the primary palate and/or with each other results in cleft palate with varying degrees of disability **(Bath-Balogh and Fehrenbach, 2011).**

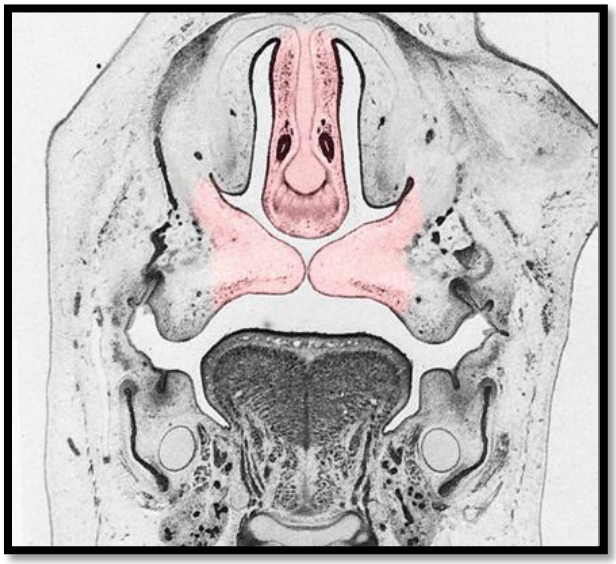


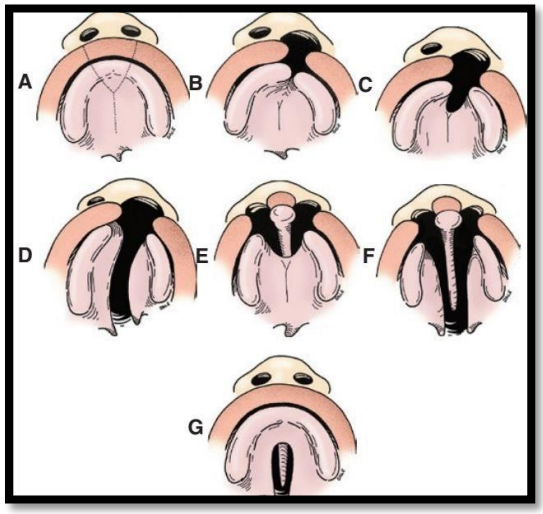
Figure (1.1) : Formation of the secondary palate. 8 weeks,and the elevation coincident with depression of the tongue **(Nanci, 2018).**

1.2 Cleft palate

Cleft palate: The failure of fusion of the palatal shelves of the maxillary processes, resulting in a cleft of the hard and/or soft palates. Clefts arises during the fourth developmental stage. Exactly where they appears is determined by locations at which fusion of various facial processes failed to occur, this in turn is influenced by the time in embryologic life when some interference with development occurred **(Proffit *et al*., 2012).**

1.2.1 Classification of the cleft Palate

Clefts affecting the palate are grossly classified as unilateral (incomplete vs. complete), bilateral (incomplete vs. complete), or submucous. A number of descriptive classifications have been presented. In 1931, Veau classified clefts into four groups: (1) soft palate cleft only; (2) cleft of soft and hard palate; (3) unilateral cleft lip and palate; (4) bilateral cleft lip and palate **(figure 1.2) (Burg *et al*., 2016 ; Nanci, 2018).**



Figure(1.2) : Palatal clefts seen from a ventral view. A, Normal fusion. B, Cleft of lip and alveolus. C, Cleft of lip and primary palate. D, Unilateral cleft lip and palate. E, Bilateral cleft lip and primary palate. F, Bilateral cleft lip and palate. G, Cleft palate only. **(Nanci, 2018)**

1.3 Clinical Features

The various clinical findings in patient with cleft lip and palate can be categorized under two headings:

1.3.1 Dental problems in palate

Various abnormal dental conditions includes:

1. **Natal and neonatal teeth**:

Existence of teeth at birth or during the neonatal period is an unusual occurrence. This condition is also termed as predeciduous teeth, fetal teeth, natal/neonatal teeth. Natal teeth are present at birth, whereas neonatal teeth erupts during the 1st month of life **(Uzamis *et al*., 1999)**.

Presence of natal and neonatal teeth does not appear to influence primary or secondary dentition in clefts. Most natal teeth among clefts are located in the lateral margin of the premaxillary and maxillary segments unlike in non-cleft neonates **(Figure 1.3)(kadam *et al*., 2013; aljamal *et al*., 2010)**.

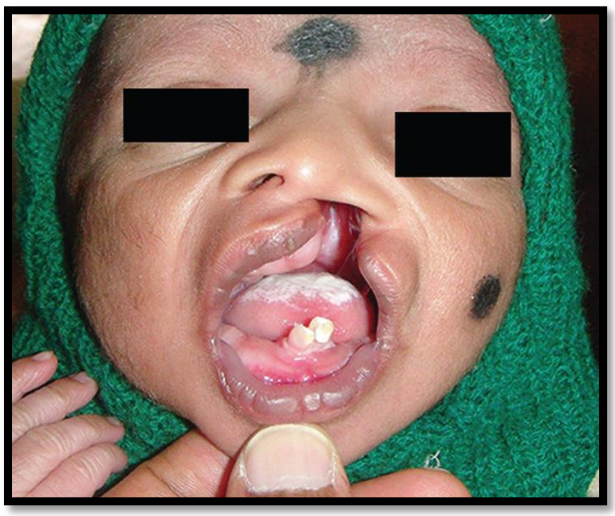


Figure (1.3) : A 6-week-old infant with left-sided complete lip and palate with paired mandibular central incisor natal teeth **(Kadam *et al*., 2013)**.

2. **Microdontia**

A tooth that is much smaller than the normal shape of the teeth, and does not “fill” its space in the dental arch, or a tooth that appears small because of lack of proper shape, Small teeth (microdonts) frequently are found with cleft lip and palate **(Figure 1.4) (Rullo *et al*., 2015; Luzzi *et al*., 2021)**. This is usually more common in cases where lateral incisors are not missing. Generally peg shaped upper lateral incisors are seen **(Kadam *et al*., 2013)**.

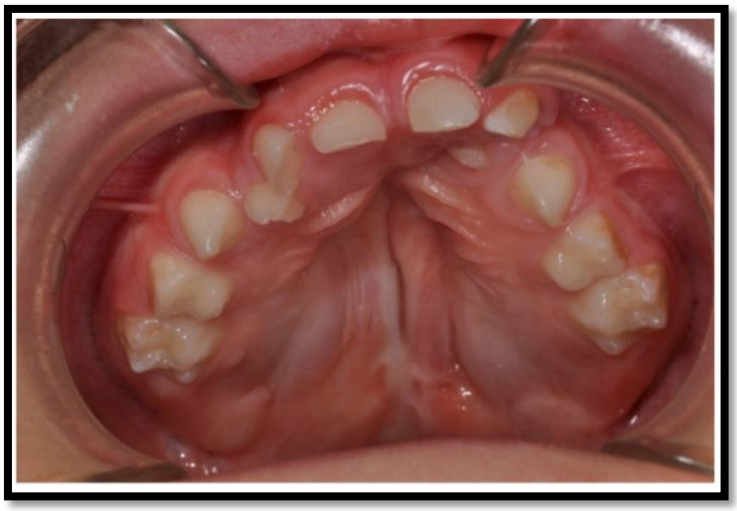


Figure (1.4) : Microdontia with cleft palate **(Luzzi *et al*., 2021)**.

3. **Ectopic eruption**

It is the eruption of a tooth in an abnormal position. Clefts also contribute to the ectopic eruption of primary lateral incisors which may erupt palatally adjacent to or within the cleft side while permanent canine on side of alveolar clefts may erupt palatally **(Qureshi *et al*., 2012)**.

4. **Enamel hypoplasia**

a hereditary condition in which the dental enamel shows either a break in continuity or surface loss, often because of insufficient calcification **(Rullo *et al*., 2015)**. Enamel hypoplasia was found to occur more frequently in cleft lip and palate subjects compared with non-cleft populations, especially involving the maxillary central incisors **(Jamal *et al*., 2010)**.

5. **Delayed tooth maturation**

Several growth factors are of major importance during craniofacial development, and these factors may be overexpressed or underexpressed when a cleft defect occurs. This aberrant expression can modify odontogenesis and cause abnormalities of the dental lamina **(Tan *et al*., 2012)**.

1.3.2 Other associated conditions

1. **Speech difficulties**

Due to the dysfunction of maxillary levator veli palatini muscle, phonation are affected. Retardation of consonant sound (p, b, t, d, k, g) is most common findings **(Mitchel *et al*., 2000; Timmons *et al*., 2001).**

2. Ear infection:

Due to improper function of maxillary tensor veli palatini muscle, which opens the Eustachian tube, otitis media is observed in these patients. In a case where infections frequently occur, results that can lead to hearing loss may occur. **(Sharma *et al*., 2009).**

3. Feeding problems:

A child with a cleft palate can have difficulty sucking through a regular nipple due to the gap in the roof of the mouth. An infant's ability to suck is related to two factors: the ability of the external lips to perform the necessary sucking movements and the ability of the palate to allow the necessary build-up of pressure inside the mouth so that food stuff can be propelled into the mouth. Most babies require a personalized or special nipple to properly feed. It may take a couple of days for the baby and parents to adjust to using the nipple before going home. Most babies learn to feed normally with a cleft palate nipple **(Mitchell *et al.*, 2000)**.

1.4 Etiology

Clefts of the palate, like those of the lip, are multifactorial malformations, involving both genetic and environmental factors. The aetiology is not related to maternal age. 20% of cleft palates are monogenic, 5% are caused by teratogens, 1% are associated with chromosomal abnormalities and over 20% are of unknown etiology **(Berkovitz *et al.*, 2016)**.

The etiologic factors can be grouped under the following :

1.4.1 Genetic factors

Genetic cause includes Syndromic, and non syndromic, in syndromic cause cleft is associated with other malformation. And Non syndromic is when the cleft is mostly an isolated feature and occurs in the majority of individuals having a CL or CP (up to 60% cases). In this form, a cleft is neither a recognized pattern of malformation nor a known cause for the disorder can be identified **(Lakhanpal *et al.*, 2014).**

1.4.2 Enviromental factors

1- **Smoking**: The relationship between maternal smoking and CL and CP is not strong, but it is significant. Several studies have consistently yielded a relative risk. When maternal smoking was considered together with a positive genetic background, the combined effect was more significant **(Kohli, 2012)**.

2- **Infections** : The classic example of an infectious agent causing a congenital defect is the rubella virus, which induces German measles. Among the wide spread malformations that result from this infection of the mother are cleft palate and deformities of the teeth **(Nanci, 2018)**.

3- **Alcohol use**: Heavy maternal drinking, apart from causing fetal alcohol syndrome, also increases the risk of CP **(Kohli, 2012)**.

4- **X-ray radiations :** The teratogenic effect of x-ray radiation is well understood, and many defects, including CP, can result from the irradiation of pregnant women. In addition to affecting the embryo directly, x-ray radiation also may affect the germ cells of the fetus, causing genetic mutations that lead to congenital malformations in succeeding generations **(Nanci, 2018)**.

5- **Others:** Environmental factor includes maternal diseases, stress during pregnancy and chemical exposure **(Lakhanpal, 2014)**. Decreased blood supply in nasomaxillary region **(Marwah, 2014).** Fetal exposure to retinoid drugs can results in severe craniofacial anomalies **(Sousa *et al*., 2009)**.

1.5 prevelance

Palatal clefts are one of the most common congenital abnormalities (approximately 1 : 2,500 live births) and are more frequent in females Than males (67% in females) **(Nanci, 2018).**

Overall incidence of orofacial clefting is around 1.5 per 1000 live birth (about 220,000 new cases per year) with wide variation across geographic areas, Isolated CL comprises about 25% of all clefts, while combined celfts accounts for about 45%. CL and palate combined occurs more frequent and more severe in boys than in girls. Unilateral clefts are more common than bilateral clefts with a ratio of 4:1, and for unilateral clefts, about 70% occur on the left side of the face. Syndromic clefts account for about 50% of the total cases in some reports with about 300 syndromes described. Although the percentage of cases directly linked to genetic factors is estimated to be about 40%, all clefts appear to show a familial tendency **(Allan *et al.*, 2014)**.

1.6 Diagnosis of cleft palate

CP requires a multidisciplinary approach, in fact, many specialists are involved in the diagnosis and treatment of alterations related to this condition. Gynaecologist can be a very important figure for an early diagnosis **(Kaufman, 1991).**

Diagnosis of Clefts in utero is now possible by ultrasound scanning from about 17 week of gestation, but some of these defects can be missed and false positive have been reported. Orofacial clefts are often not discovered until birth because this method can fail in case of small CP**,** More extensive facial clefts such as that seen in the frontonasal dysplasia

sequence is unusual **(Figure 1.5) (Eppley *et al*., 2005; Deng et al., 2021).**

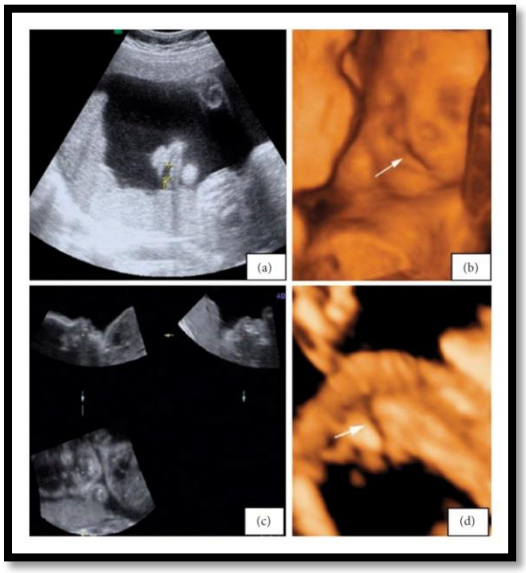


Figure (1.5) : Prenatal Diagnosis of Fetal Cleft Lip and Palate with Three-Dimensional Ultrasound Information Technology **(Deng et al., 2021).**

Also submucous clefts of palate may be present and it is very difficult to diagnose early **(McWilliams, 1991).**

When a CP is diagnosed antenatally, it may be helpful to arrange for a neonatologist or paediatrician to be available at the time of delivery to recognize possible respiratory difficulties or other congenital anomalies. Parents are advised of the condition and referred to the care team for further counselling **(kastan, 2008).**

Pediatrician has the role to identify and confirm the anatomical defects and to determine the clinical form of the abnormality (also identifying possible concomitant syndromes). The whole palate should be examined using a tongue depressor and palpation than can be useful to perceive submucosal alterations. The oral cavity should be examined also

for the presence or absence of teeth, degree of hard and soft palate clefting, presence or absence of the uvula, and any evidence of pitting of the lips or palate. Nasal regurgitation of fluids, a bifid uvula or a translucent central zone in palate are other important signs for the paediatrician **(Habel, 1996).**

So infants should be thoroughly examined in delivery room, identifying any airway problems and a complete physical examination must be performed to identify additional physical malformations that can suggest an associated genetic disorder **(Arosarena, 2007).**

1.7 treatment of cleft palate

The goals of repair of CP are **(Mosahebi and Kangesu, 2006)** :

1. Help patients to develop normal speech.
2. Restore dentition and oral functions.
3. Improve hearing.
4. Minimize facial difference.
5. Attain social acceptability of cleft individuals.
6. Increase assimilation into society (psychological support).
7. Restore/reconstruct facial and oral anatomy.

1.7.1 Surgical Treatment

Unlike the artistic nature of the cleft lip repair, the cleft palate repair is very functional in nature. The goal of the surgery certainly includes closure of the defect, but mostly focuses on quality of speech **(Agrawal, 2009).**

Multiple different methods of repair have been demonstrated and improved throughout the years, focusing on either lengthening of the palate, alignment of the muscle or both. Overall, the goals of palate repair are separating the oral and nasal cavity and creating a competent velopharyngeal valve for swallowing and speech, while preserving midface growth and development of functional occlusion **(Strong and Buckmiller, 2001).**

Today, most cleft surgeons focus on the type of repair to be performed in a period between 9 and 18 months of age. Evidence suggests that children do not benefit from palate repair after age seven, as significant speech abilities have already developed and changing the anatomy at this stage may hinder speech progress. **(Hopper *et al*, 2006).**

1.7.1.1 Surgical Techniques

1- von Langenbeck technique

It involves creating bipedicled mucoperiosteal flaps on both sides of the cleft. The nasal side of the cleft is closed first, then the bipedicled flaps are approximated to cover the oral surface of the cleft **(Figure 1.6) (Agrawal, 2009).**

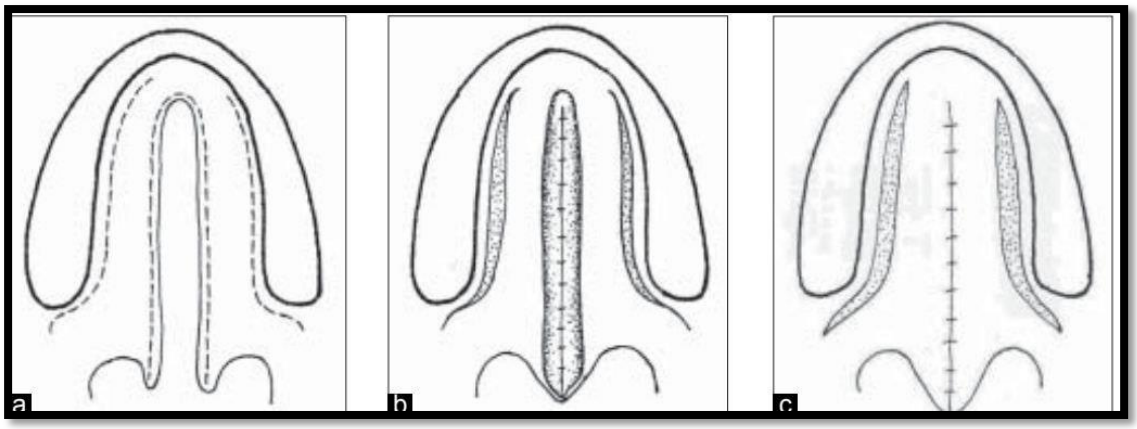


Figure (1.6) : Line diagram of von Langenbeck palatoplasty for an isolated complete cleft palate **(Agrawal, 2009).**

2- Two-flap Palatoplasty

In this procedure a full-thickness mucoperiosteal flap is elevated on each side of the cleft, which preserves the palatal neurovascular bundle **(figure 1.7)(Bardach, 1995)**.

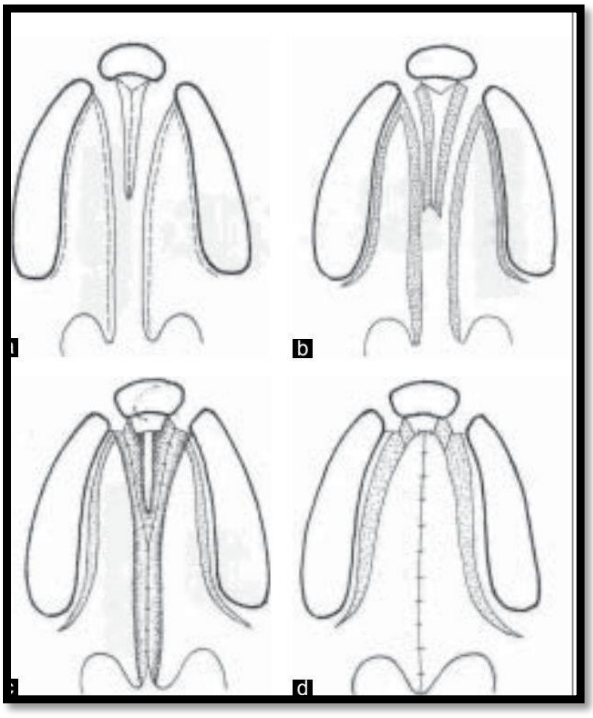


Figure (1.7) : Line diagram showing Bardach two-flap technique of palatoplasty in a bilateral cleft lip and palate**(Bardach, 1995)**.

3- Furlow Double Opposing Z-Plasty

It essentially consists of repairing palatal clefts using Z-plasties of the oral and nasal mucosa. The theoretical advantage is that the soft palate may be lengthened while preventing longitudinal scar contracture and palatal shortening **(figure 1.8) (Agrawal, 2009).**

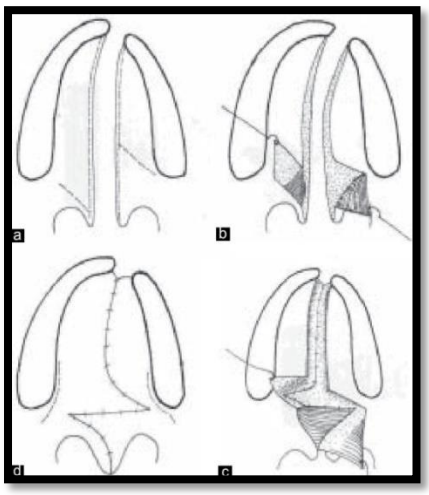


Figure (1.8) : Line diagram showing Furlow Z-plasty technique of palatoplasty in a unilateral cleft lip and palate patient **(Agrawal, 2009)**.

4- Vomer flap

Most of the surgeons utilize the vomer flap only for repair of the cleft anteriorly in the hard palate region and the alveolar region, many varieties of vomer flaps have been described for use in unilateral and bilateral cleft palates for nasal lining and oral mucosa resurfacing **(Figure 1.9) (Agrawal, 2006).**

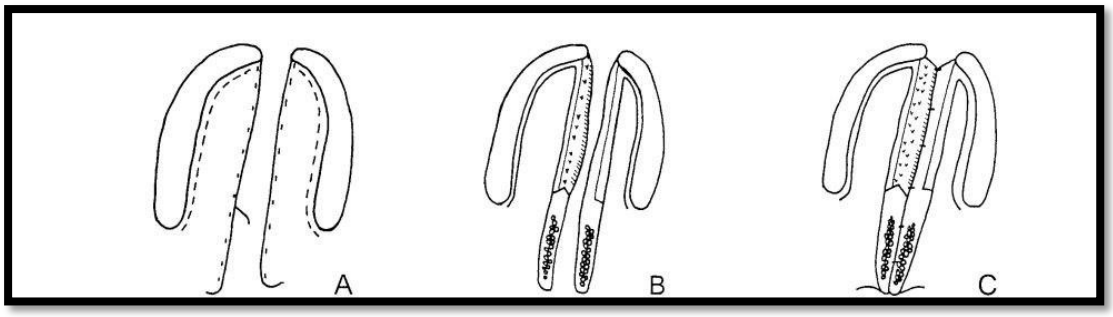


Figure (1.9) : -A vomer flap. A: Unilateral cleft lip and palate with marking for incision. B: After making incision and raising of vomer flap along with the nasal mucosa. C: After suturing of nasal lining. (Shading—raw surface of vomer flap, the small arrows—raw surface of the vomer plate, stipples deficient nasal mucosa) **(Agrawal 2009).**

1.7.2 Speech therapy

Individuals with a history of CP and CL may demonstrate any combination of speech sound errors, hypernasality, and nasal emission. Therefore, surgery or other forms of physical management are needed for correction. In contrast, Speech therapy is much more effective if it is done after normalization of the structure **(Kumar and Ann, 2011).**

A previous study predicted that most children born with cleft palate develop accceptable communication, speech and language therapists are left with the management of about 40% who have longstanding problems resulting in speech deficits. This relatively high proportion of children with speech problems indicates the importance of speech and language therapists continued involvement in the management of cleft palate **(Harding *et al*., 1996).**

1.7.3 Psychological Managment

Self perception plays a pivotal role in influencing an individual's self esteem and psychological adjustment affected by cleft lip and palate

anomaly. Additionally, parental influence also shapes ones psychosocial perception. The attitudes, expectations and degree of support shown by parents can influence a child's perception of their cleft impairment **(Sousa *et al*., 2009)**.

Surgery usually results in increased self esteem, self confidence and satisfaction with appearance. It can be used in young patients to improve esthetic appearance, an important factor in the psychological development of adolescents **(Rachmiel *et al*., 1999)**. However, it is necessary for oneself to develop positive self skills to deal with the post surgery situations, Unrealistic and high expectations post surgery may also lead to dissatisfaction, which may further affect an individuals self satisfaction **(Kapp, 1999)**.

1.8 Complications

Common complications of any palate surgery are as follows **(Agrawal 2009).**

• Immediate complications includes :

Haemorrhage

Respiratory obstruction

Hanging Palate

Dehiscence of the repair

Oronasal fistula formation

• Late complications

Bifid uvula

Velopharyngeal Incompetence

Abnormal speech

Maxillary hypoplasia

Dental malpositioning and malalignment

Otitis media

Even though repairing the cleft palate itself may be a one-time operation, treating the resulting dental and speech problems, along with the associated psychological implications, is a long-term effort usually not fully completed until the late teenage years **(Setó-Salvia and Stanier, 2014).**

Much of the debate regarding long-term outcomes of cleft repairs is centered on speech development and growth of the mid-face. Inadequate repair of the palatal muscles or inadequate length of the soft palate after palatoplasty may result in a structural defect or physiologic dysfunction of the velopharyngeal valve, resulting in the most common speech deficiency after cleft palate repair: velopharyngeal insufficiency (VPI). The inability to completely separate the oral and nasal cavities during speech leads to hypernasality, nasal emission, imprecise consonant pronunciation, decreased vocal loudness, and speaking in short phrases **(Hopper *et al*., 2006).**

1.9 Other associated Syndromes

Cleft palate is more likely to be associated with a syndrome or genetic defect **(Lewis *et al*., 2017).**

However, most cases of cleft lip and palate do not occur with other birth defects. Common syndromes associated with cleft palate include Van der Woude syndrome, Stickler syndrome, and velocardiofacial syndrome, Stickler and Van der Woude syndromes are autosomal dominant disorders. **(Abbott, 2014; Parker *et al*., 2010).**

1- **Stickler syndrome:** Stickler syndrome is a connective tissue disorder that can include ocular findings of myopia, cataract, and retinal detachment; hearing loss that is both conductive and sensorineural; midfacial underdevelopment and cleft palate **(Robin**

***et el*., 2021)**. Children affected with Stickler syndrome often have a cleft palate, a small jaw, and collagenopathy **(Shkoukani *et al*., 2014).**

2- **Van der Woude syndrome:** is a rare autosomal dominant condition with high penetrance and variable expression. Clinical manifestation of this autosomal dominant clefting syndrome includes bilateral midline lower lip pits, cleft lip, and cleft palate along with hypodontia**(Deshmukh *et al*., 2014)**. Van der Woude is the syndrome most commonly linked to CL but it also associated with CP **(Greives *et al*., 2014).**

3- **Velocardiofacial syndrome:** is a genetic condition, most commonly associated with cleft palate. Though symptoms may vary from child to child, many also suffer from congenital heart disease, speech problems, and immune problems **(Burg *et al*., 2016)**.

Chapter two

Conclusion

Conclusion

The primary aim in CP is to educate parents and future mothers and fathers. Cleft lip and palate are both birth defects that affect different structure and function such as speech difficulty, aesthetic, eating, nutrition etc. Patients with oro-facial cleft deformity needs to be treated at right time and at right age to achieve functional and aesthetic well-being.

The mental status of patients with CLP should be considered and supported by psychological rehabilitation and their morale should always be bolstered. Extensive dental treatment may be requires but it should not be made more extensive or complex than is necessary to achieve a reasonable standard of dental perfection. The multidisciplinary approach towards this problem led to a steady improvement in its end results.

References

References

(A)

- Abbott M-A.(2014) Cleft lip and palate. Pediatr Rev. ;35(5)177–181.
- Agrawal, K. (2009). Cleft palate repair and variations. Indian Journal of Plastic Surgery, 42(S 01), S102-S109.
- Allan E, Windson J, Stone C. (2014) Cleft lip and palate: Etiology, epidemiology, prevention and intervention strategies AnatPhysiol.;4:1–6
- Arosarena, O. A. (2007). Cleft lip and palate. *Otolaryngologic Clinics of North America*, *40*(1), 27-60.

(B)

- Bardach J. (1995) Two flap palatoplasty; Bardach's technique. Operative techniques Plastic Surgery. 2:211-4.
- Bath-Balogh, M. and Fehrenbach, M.J.(2011) Illustrated Dental Embryology, Histology, and Anatomy-E-Book. Elsevier Health Sciences.
- Berkovitz BKB, Holland GR, moxham BJ. (2018) *Oral Anatomy, Histology and Embryology*.
- Burg, M. L., Chai, Y., Yao, C. A., Magee III, W., & Figueiredo, J. C. (2016). Epidemiology, etiology, and treatment of isolated cleft palate. *Frontiers in physiology*, *7*, 67.

(C)

- Chiego and Daniel J. (2018) "Essentials of oral histology and embryology : a clinical approach"

(D)

- Deshmukh, P. K., Deshmukh, K., Mangalgi, A., Patil, S., Hugar, D., & Kodangal, S. F. (2014). Van der Woude syndrome with short review of the literature. Case reports in dentistry.
- Deng, X., He, S., Wu, Q., Weng, Z., Yang, M., & Liu, M. (2021). Prenatal diagnosis of fetal cleft lip and palate with three-dimensional ultrasound information technology. *Scientific Programming*, *2021*, 1-7.

(E)

- Eppley, B. L., van Aalst, J. A., Robey, A., Havlik, R. J., & Sadove, A. M. (2005). The spectrum of orofacial clefting. *Plastic and reconstructive surgery*, *115*(7), 101e-114e.

(G)

- Greives MR, Camison L, Losee JE. (2014) Evidence-based medicine: unilateral cleft lip and nose repair. Plast Reconstr Surg. 134(6):1372–1380.

(H)

- Habel A, Sell D, Mars M. (1996) Management of cleft lip and palate. Arch Dis Child. 74:360-6.
- Harding, A., & Grunwell, P. (1996). Characteristics of cleft palate speech. *International Journal of Language & Communication Disorders*, 31(4), 331-357.
- Hopper, R., Cutting, C., and Grayson, B. (2006). "Cleft lip and palate," in Grabb and Smith's Plastic Surgery. 173–199.

(J)

- Jamal, G. A. A., Hazza'a, A. M., & Rawashdeh, M. A. A. (2010). Prevalence of dental anomalies in a population of cleft lip and palate patients. *The Cleft palate-craniofacial journal*, *47*(4), 413-420.

(K)

- Kadam, M., Kadam, D., Bhandary, S., & Hukkeri, R. Y. (2013). Natal and neonatal teeth among cleft lip and palate infants. *National journal of maxillofacial surgery*, 4(1), 73-76.
- Kapp , K. A. (1995). Psychological interventions for the adolescent with cleft lip and palate. *The Cleft palate-craniofacial journal*, *32*(2), 104-108.
- Kasten, E. F. (2008). Team care of the patient with cleft lip and palate. *Curr Probl Pediatr Adolesc Health Care*, *38*, 138-158.
- Kaufman FL. (1991) Managing the cleft lip and palate patient. Pediatr Clin North Am ;38:1127-47.
- Kohli S, Kohli V. A (2012) comprehensive review of genetic basis of cleft lip and palate. *J Oral Maxillofac Pathol.* ;16:64–72.
- kumar G S. (2015) *"orban's oral histology and embryology"*

(L)

- Lakhanpal M, Gupta N, Rao N, Vashishth S. (2014) Genetics of cleft lip and palate- is it still patchy. JSM Dent.;2:1–4
- Lewis CW, Jacob LS, Lehmann CU. (2017) The primary care pediatrician and the care of children with cleft lip and/or cleft palate. *Pediatrics*. 139(5):e20170628.
- Luzzi, V., Zumbo, G., Guaragna, M., Di Carlo, G., Ierardo, G., Sfasciotti, G. L., ... & Polimeni, A. (2021). The Role of the Pediatric Dentist in the Multidisciplinary Management of the Cleft Lip Palate

Patient. *International Journal of Environmental Research and Public Health*, *18*(18), 9487.

(M)

- Marwah N. (2014) Textbook of Pediatric Dentistry. 3rd ed. Jaypee.
- McWilliams BJ. (1991) Submucous clefts of the palate: how likely are they to be symptomatic? Cleft Palate Craniofac J;28:247-9.
- Mitchell JC, Robert Wood RJ. (2000) Management of cleft lip and palate in primary care. *J Pediatr Health Care.*
- Mosahebi, A., & Kangesu, L. (2006). Cleft lip and palate. Surgery (Oxford), 24(1), 33-37.

(N)

- Nanci, A. (2018) Ten cate's oral histology,9th edition, Elsevier Canada

(P)

- Parker SE, Mai CT, Canfield MA.(2010) National Birth Defects Prevention Network. Updated national birth prevalence estimates for selected birth defects in the United States. Birth Defects Res A Clin Mol Teratol. 2010;88(12):1008–1016.
- Proffit W, Fields H, Sarver D. (2012) *Contemporary orthodontics.* 5th ed. Elsevier Mosby;

(Q)

- Qureshi WA, Beiraghi S, Salazar VL. (2012) Dental anomalies associated with unilateral and bilateral cleft lip and palate. *J Dent Child.* ;79:69–73

(R)

- Rachmiel A, Aizenbud D, Ardekian L, Peled M, Laufer D. (1999) Surgically-assisted orthopedic protraction of the maxilla in cleft lip and palate patients. Int J Oral Maxillofac Surg. ;28:9–14
- Robin, Nathaniel H., Rocio T. Moran, and Leena Ala-Kokko. (2021) "Stickler syndrome."
- Rullo, R., Festa, V. M., Rullo, R., Addabbo, F., Chiodini, P., Vitale, M., & Perillo, L. (2015). Prevalence of dental anomalies in children with cleft lip and unilateral and bilateral cleft lip and palate. Eur J Paediatr Dent, 16(3), 229-232.

(S)

- Setó-Salvia, N., & Stanier, P. (2014). Genetics of cleft lip and/or cleft palate: association with other common anomalies. *European journal of medical genetics*, *57*(8), 381-393.
- Sharma RK, Nanda V. (2009) Problems of middle ear and hearing in cleft children. *Indian J Plast Surg.*
- Shkoukani, M. A., Lawrence, L. A., Liebertz, D. J., & Svider, P. F. (2014). Cleft palate: a clinical review. *Birth Defects Research Part C: Embryo Today: Reviews*, 102(4), 333-342.
- Sousa A, Devare S, Ghanshani J.(2009) Psychological issues in cleft lip and palate. J Indian Assoc Pediatr Surg.;14:55–58.
- Strong, E. B., & Buckmiller, L. M. (2001). Management of the cleft palate. *Facial plastic surgery clinics of North America*, *9*(1), 15-25.

(T)

- Tan, E. L. Y., Yow, M., Kuek, M. C., & Wong, H. C. (2012). Dental maturation of unilateral cleft lip and palate. *Annals of maxillofacial surgery*, *2*(2), 158-162.
- Timmons MJ, Wyatt RA, Murphy T.(2001) Speech after repair of isolated cleft palate and cleft lip and palate. *British J Plastic Surg.*

(U)

- Uzamis M, Olmez S, Ozturk H, Celik H. (1999) *Clinical and Ultrastructural study of natal and neonatal teeth J Clin Pediatr Dent*. 23:173-7