CLEFT LIP & PALATE

DR. SUJAY KUMAR B. M.D.S

READER,

VIDS & RC

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INTRODUCTION

- Face is that part of a body with which a person faces world , beautiful or unexceptional , well formed or malformed , the face is intimately related to person sense of self.
- Initial reactions to a person who are facially disfigured is almost negative .
- Clefts of the lip and /or palate, unfortunately, are by far the most common major facial malformation in mankind.

- It is not surprising that therefore to find that many patients who have facial malformations avoid social interchange or fail to realie their vocational capabilities.

- Health professionals may have negative response as well, but health professionals are able to translate these feelings into positive action by participating in the treatment of handicapped patients.

Formation of the Palate

The palate develops in 2 parts . viz;

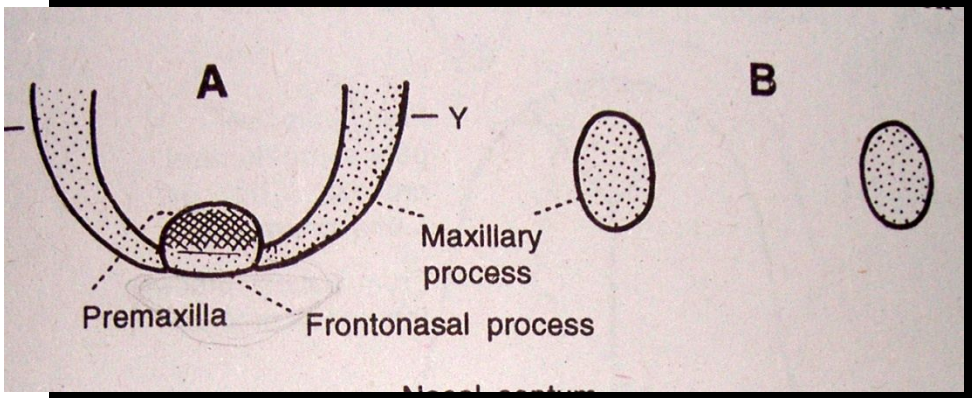
1. The primary palate
2. The secondary palate

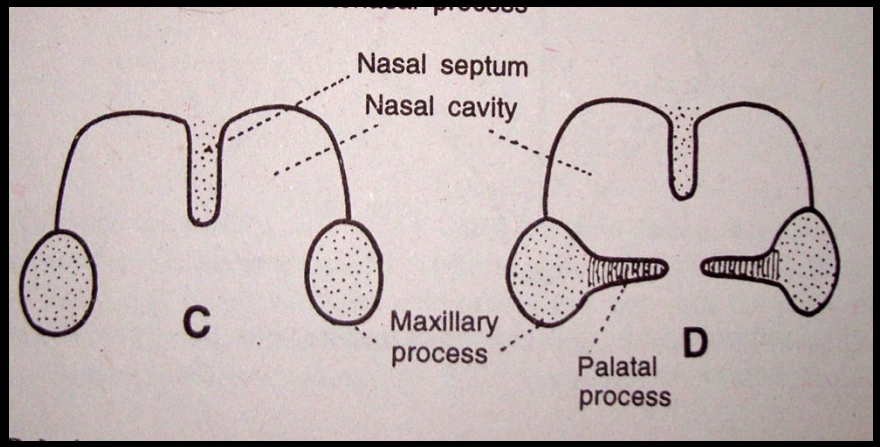
Palate is formed by the contribution of the maxillary processes and frontonasal process. The medial nasal process forms the small triangular, median part of the palate called the primary palate.

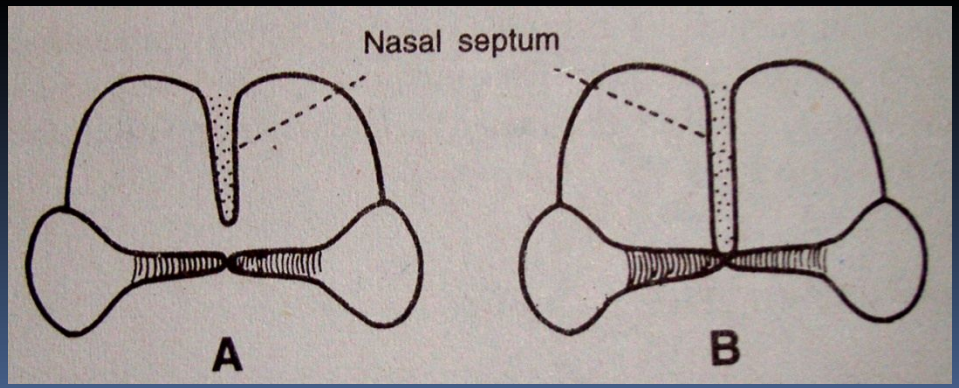
- The secondary palate is derived from the portions of the maxillary processes extend laterally on either side of the tongue during the 7th week of I.U.L.

- The maxillary processes gives off palatal shelves that grow medially. The union of the two palatal shelves is prevented initially by the presence of the tongue..

- With further growth the two horizontally placed palatal processes approach each other and fuse in the midline around the 9th week of I.U.L.


A
B
Y
Maxillary process
Premaxilla
Frontonasal process


Nasal septum
Nasal cavity
C
Maxillary process
Palatal process
D


Nasal septum
A
B

- Thus the shelves grow vertically down. The tongue developing from the occipital my tomes initially occupies the entire oronasal cavity. During the 7th week of I.U.L, the tongue descends in to the oral cavity.

- The descends of the tongue in to the oral cavity causes the elevation of the palatal processes from a vertical to a horizontal plane

The role played by the tongue in the elevation of the palatal processes and its subsequent fusion at the midline is a subject of much controversy.

CLEFT MAY OCCUR DUE TO:

1. Failure of the processes to come in contact
2. Failure of epithelial fusion after contact
3. Failure of mesenchymal consolidation
4. Rupture of the primary palate subsequent to fusion
5. Reduced facial mesenchyme
6. Incresed facial width
7. Distortion or malposition of the processes.

PROBABLE REASONS

1. Complete tongue obstruction over a time specific period (**Poswillo** and **Roy** and **Humphrey**).
2. Alteration in the shelf force:-
   - Due to alterations in mucopolysaccharide synthesis (**Ferguson**)
   - Administration of certain drugs like phenobarbitone and vit A. (**Smiley** and **R.Nanda**)
   - Alteration in the cranial flexure (**Harris**)
   - Disturbance in the epithelial fusion (**Smiley**)
   - Alteration in the vascularity of the region (**Cooper**)

CLASSIFICATION

- **Davis and Ritchie classifications (1922).**

This is a morphological classification based on the location of the cleft relative to the alveolar process.

Group I – Pre alveolar cleft:- They are clefts involving only the lip and are sub classified as:

Unilateral
Bilateral
Median

Group II - Post alveolar clefts:- This group comprises of different degrees of hard and soft palate clefts that extend up to the alveolar ridge

Group III - Alveolar clefts:- They are complete clefts involving palate, alveolar ridge and the lip. They can be subdivided in to ;

Unilateral
Bilateral
Median

Veau's Classification (1931).

- **Group –1**: They are clefts involving the soft palate only
- **Group –2:** They are clefts of the hard and soft palate extending up to the Incisive- foramen.
- **Group-3:** They are complete unilateral clefts involving the soft palate, the palate, lip and the alveolar ridge.
- **Group -4:** They are complete bilateral clefts affecting the soft palate, the hard palate, lip and alveolar ridge.

Fogh Anderson (1942)

- Group -1:-They are clefts of the lip.

  It can be subdivided in to :-

  Single - unilateral or median clefts.

  Double – Bilateral cleft

- Group-2: They are clefts of the lip and the palate. They are once again sub-classified into:

  Single – Unilateral clefts

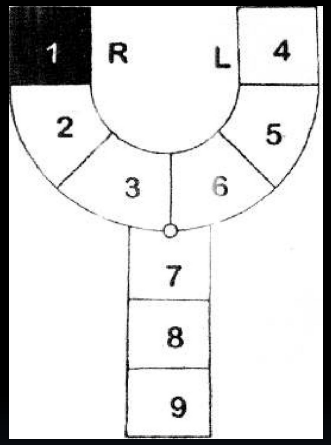
  Double – Bilateral clefts

- Group –3 : They are cleft of the palate extending up to the incisive foramen

Kernahan's Stripped 'Y' classification:

This classification uses a stripped 'Y' having numbered blocks. Each block represents a specific area of the oral cavity. Put forward by kernahan and stark.

Block 1 and 4	Lip
Block 2 and 5	Alveolus
Block 3 and 6	Hard palate anterior to the incisive foramen
Block 7 and 8	Hard palate posterior to incisive foramen
Block 9	Soft palate.



Lahshal classification:

- Presented by **Okriens** in 1987

- **LAHSHAL** is a paraphrase of the anatomic affected by the cleft.

L	lip
A	alveolus
H	hard palate
S	soft palate
H	hard palate
A	alveolus
L	lip

INDIAN CLASSIFICATION

- Proposed by **Dr. C. Balakrishnan** in1975

- Cleft lip only (GP.I)
- Cleft lip and alveolus (gp. 1-a)
- Cleft palate only (gp.2)
- Cleft lip and palate (gp.3)

ETIOLOGY.

Frazer realizing The impact of the problem wrote " No single factor causes all the clinically observed cases of cleft lip and palate. Even in the individual cases the etiology is for most part of the result of multiple factors ".

- Monogenic or single gene disorders
- Polygenic or multifacotrial gene disorders
- Teratogenic
- Chromosomal abnormalities
- Familial
- Heterogeneity
- Sex predominance
- Racial incidence

- Hereditary: - Acc. To fogh and Anderson less than 40%, cases are genetic in origin. Acc. To Drilien 1 in 3 children with clefts had some relatives with similar congenital defects.

20% of isolated cleft are genetic in origin.

- **Congenital: -** Congenital anomaly , which is already present at birth. It can be hereditary or genetically determined or induced by environment or teratogens.

- **Infections: -** Like rubella, influenza, toxoplasmosis etc.to the mother during pregnancy may cause the defect.

Drugs: -

- Aminoptrein [an antifolic drug] is an abortifacient. A foetus survived of such abortion drugs can become malformed.
- All cytotoxic anticancer drugs such as alkylating agents can cause the defect.
- Cortisone is suspect teratogens.
- Alcoholic mother may give birth to a child with foetal alcoholic syndrome, which may be associated with cleft palate.
- Thalidomide also has a similar effect.

Teratogens

- Several specific agent known to damage the embryo (eg: Rubella virus) some times causes cleft lip or palate. Presumably when acting an genetically predisposed embryo. The susceptibility of the embryo to these teratogens is dependent on the time and period of administration of these agents.

- **R.Nanda** has noted the time between the first and ninth week of pregnancy to be the most critical and sensitive period.
- Vit.A
- Phenobarbitone
- mercaptopurine, cortisones , methotrexate, valium , Dilantin and Aspirin

- Further the mere presence of these environmental factors during critical period of embryo genesis will not result in the defect ,There should also be a genetic susceptibility or sensitivity to the action of these teratogens.

Radiation: -

Such as x rays, gamma rays etc. these are ionizing radiations and are capable of producing either somatic or genetic effects.

Diets:

Deficiency of riboflavin folic acid and hypervitaminosis can act as environmental teratogens.

GENETIC INFLUENCE

- Monogenic or single gene disorder:

Approximately half of the recognized syndromes associated with cleft are due to single gene disorders with equal distribution of autosomal dominant inheritance and autosomal recessive.

Single gene inheritance may give rise to mendelian patterns of inheritance , either isolated cleft lip and palate or in multiple malformation associated with cleft lip , lip with or without cleft palate

Autosomal dominant inheritance:-

- Clefting-ankyloblepharon filiform
- Adentum syndrome
- Ectrodactyly
- Clefting syndrome
- Vander woude syndrome(asociation of lower lip pits or clp)

Autosomal recessive syndrome:-

- Appert ayndrome
- Bixer syndrome
- Bowen-armstrong syndrome
- Juberg-harward syndrome
- Robert syndrome

CHROMOSOMAL ABBERATIONS

Cleft lip and palate occurs as a feature of several syndromes resulting from chromosomal aberrations. Notable among them being trisomy D and E syndrome.

PREDISPOSING FACTORS

- **Increased maternal age:**

  Women who conceive late have an increased risk of having an off spring with some form of clefting. The cause remains unknown.

- **Racial**

  Some races are more susceptible to clefts than the, Mongoloids show the greatest percentage of incidence.

- **Blood supply:-**

Any factor that reduces the blood supply to the nasomaxillary complex during the embryological dev. predisposes to cleft.

Problems associated with Cleft Lip and Palate

- **They can be broadly classification as: -**

  Dental

  Esthetic

  Speech and hearing

  Psychologic

Dental problems

- The presence of the cleft is associated with division, displacement and deficiency of oral tissue.
- Congenitally missing teeth (most commonly the upper laterals)
- Presence of natal or neonatal teeth
- Presence of supernumerary teeth
- Ectopically erupting teeth
- Anomalies of tooth morphology
- Enamel hyperplasia

- Microdontia
- Fused teeth
- Aberrations in crown shape
- Macrodontia
- Mobile and early shedding teeth due to poor periodontal support.
- Posterior and anterior crossbite
- Protruding premaxilla
- Spacing /crowding.
- Difficulty in mastication and swallowing.

Esthetic problems

- The clefts involving the lip can result in facial disfigurement varying from mild to severe. The oro-facial structures may be malformed and congenitally missing.

- Deformities of nose can also occur. Thus esthetics is greatly affected.

Hearing and Speech: -

- The first two years of the child are very crucial from the point of speech development and it is the same time when the 1ry surgeries are done. Physiological integrity of the structure involved in speech and adequate neuro – sensory – motor functions are essential for development of the normal speech.

- Receptive language problem may arise in children with cleft plate because of the fluid in the middle ear.

- Hearing loss may also occur is these patients due to ossicular malformations and /or improper aeration of the Eustachian tube.

- Clinically an operated cleft palate child usually presents with short palate or decreased mobility of soft palate due to Scarring and oro- nasal fistula,
- Thus causing velo- pharyngeal insufficiency, hypernasality, nasal escape of air, misarticulations and poor intelligibility of speech. High nasality could be due to oronasal fistula or inadequate velo-pharyngeal seal.

- Acrylic or chrome cobalt obturators, which are still very popular in India, were given to prevent nasal escape of air. The modified obturator called speech bulb appliance is useful in cases where palatal lift or soft palate closure is needed to improve velo-pharyngeal seal.

PSYHCOLOGICAL PROBLEMS

- They are under lot of psychological stress due to their abnormal facial appearance they have to put up with staring, curiosity, pity etc.
- They also face problems in obtaining jobs and making friends.
- Studies have shown that these patients are badly in academics.
- This is usually as a result of hearing impairment, speech problems and frequent absence from school.

Dental occlusion-

- Maxillaray buccal teeth are usually in normal buccolingual relationship with mandibular teeth in cleft palate cases.however in cases of unilateral and bilateral clefts maxillary incisors are protruded.
- In bilateral clefts incisors show excessive eruption and canines are inclined towards the cleft.

Musculature –

- In adults with bilateral clefts-there is severe underdevelopment and atrophy of the lip muscle.
- In unilateral clefts upper lip may be slightly less protrusive than normal.

MANAGEMENT

- The cleft child has a lot of dentoalveolar and maxillo mandibular problems, which are quite different from the routine orthodontic patient

- The maxilla is more often seen to be retruded, and this effect is primarily

seen as a post surgical problem. Further more, there is a progressive decline of the maxillary prominence in both UCLP and BCLP patients as the child grows through adolescence.

- The arch deficiency and dentoalveolar mutilation is further complicated by congenitally missing lateral incisors, supernumerary and fissural teeth adjoining the cleft site, ectopically erupting maxillary canines and a general hypoplasia of the maxillary incisors. Anchorage planning and management of tooth movement is thus complicated.

Aims of cleft treatment:

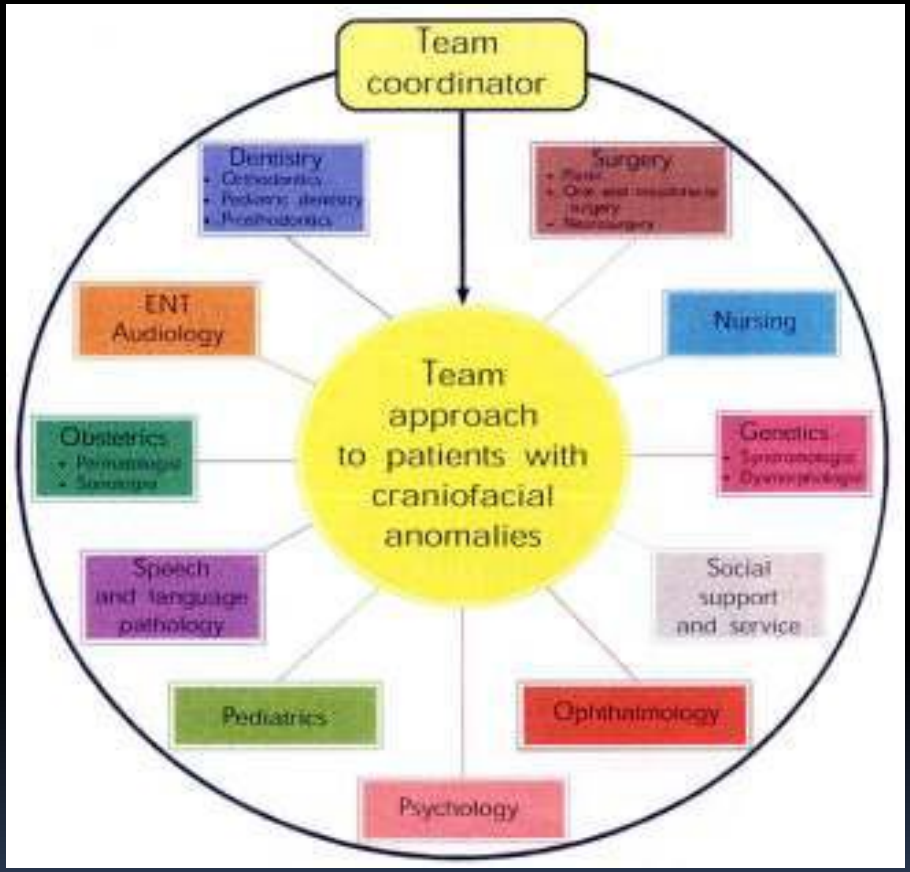
- The ultimate goal is to attain normal form and function (especially speech and mastication) with the least possible damage to growth and development through surgical intervention.

Specific treatment objectives are –

- Provide a long mobile palate capable of completely closing off the orophanynx from the nasopharynx.
- Produce A full upper lip with a symmetrical cupid's bow and reconstruction of the columella and alar architecture of the nose.
- Achieve an intact, well aligned dental arch with a stable inter -arch occlusion.

MANAGEMENT TEAM:-

- Paediatrician
- Orthodontist
- Surgeon
- Otolaryngologist
- Audiologist
- Speech pathologist
- Social worker
- Psychiatrist
- Geneticist
- Prosthodontist
- Paediatric dentist
- Radiologist
- Neurologist
- Neurosurgeon



Pre Natal

Procedure:

Pre natal ultrasound scan

Cleft team :

- Counselor
- Geneticist
- Surgeon

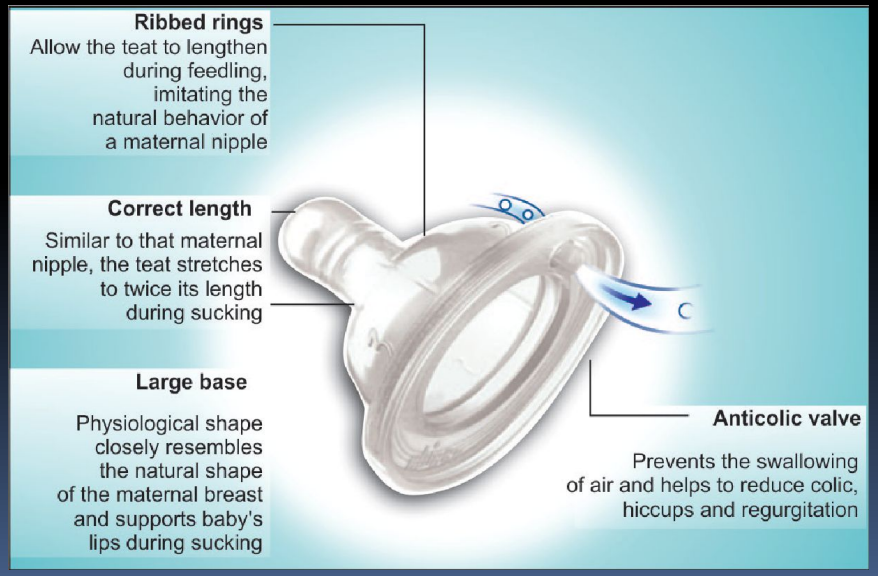
New born

Procedure:

- Mointor feeding
- Oral evaluation
- Medical examination

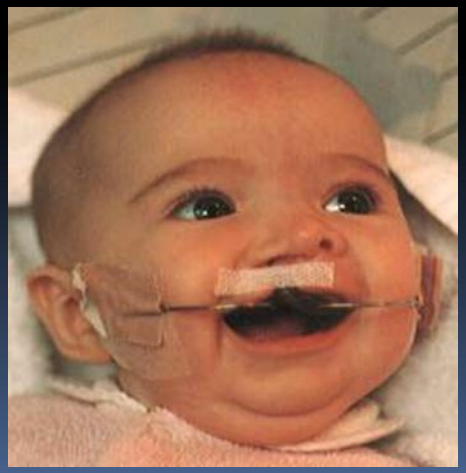
Cleft team :

- Paediatrician
- Paediatric dentist



0 - 3 months

0–3 months	Consultation with surgeon Feeding intervention Naso-alveolar molding Ear examination	Plastic surgeon Paediatric dentist Orthodontist ENT surgeon



3 – 6 months

Procedure:

- Repair of cleft lip

Cleft team :

- Plastic surgeon
- Oral surgeon

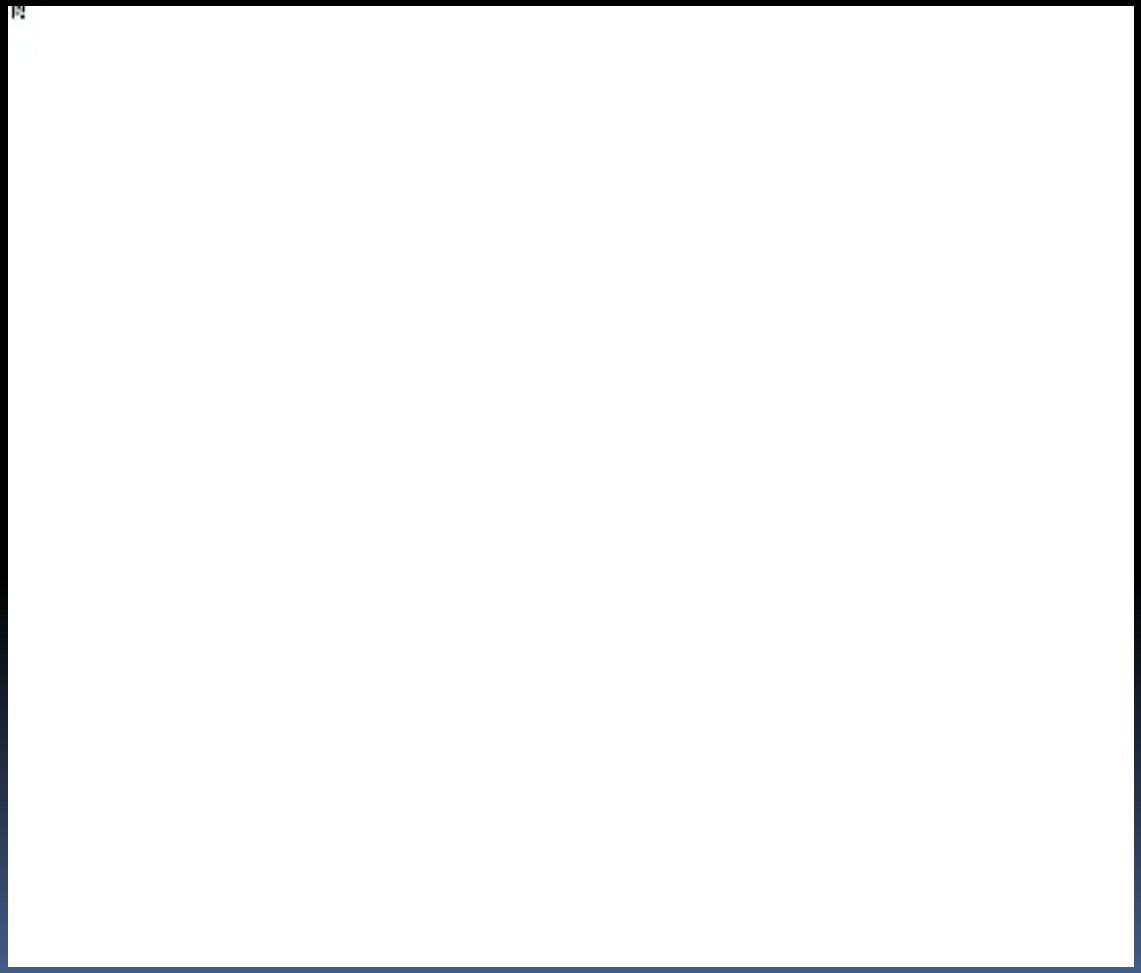
6–12 months	Repair of cleft palate Hearing assessment Dental assessment and early intervention	Plastic surgeon Audiologist Paediatric dentist
12 months	Audiometry Speech and Language development	ENT surgeon Speech pathologist
2–5 years	Dental care and clinical prevention Speech and language therapy	Paediatric dentist Speech pathologist
6–12 years	Dental anomalies management Orthodontic treatment Alveolar bone graft	Paediatric dentist Orthodontist Maxillofacial surgeon
13–18 years	Orthodontic treatment Prosthodontic rehabilitation Rhinoplasty Orthognathic surgery	Orthodontist Prosthodontist ENT surgeon Maxillofacial surgeon

Palatal obturators

- It serves as feeding aid by preventing aspiration of liquids.
- It realigns the cleft maxillary segments into harmonious alveolar arches .
- It helps to prevent upper respiratory tract infections that tend to occur to greater than normal degree in cleft patients.

- It forces the tongue to occupy a normal position rather than to lie in between cleft maxillary segments.

- It provides psychological support for parents who see themselves that certain rehabilitation procedures are available for the baby immediately after the birth



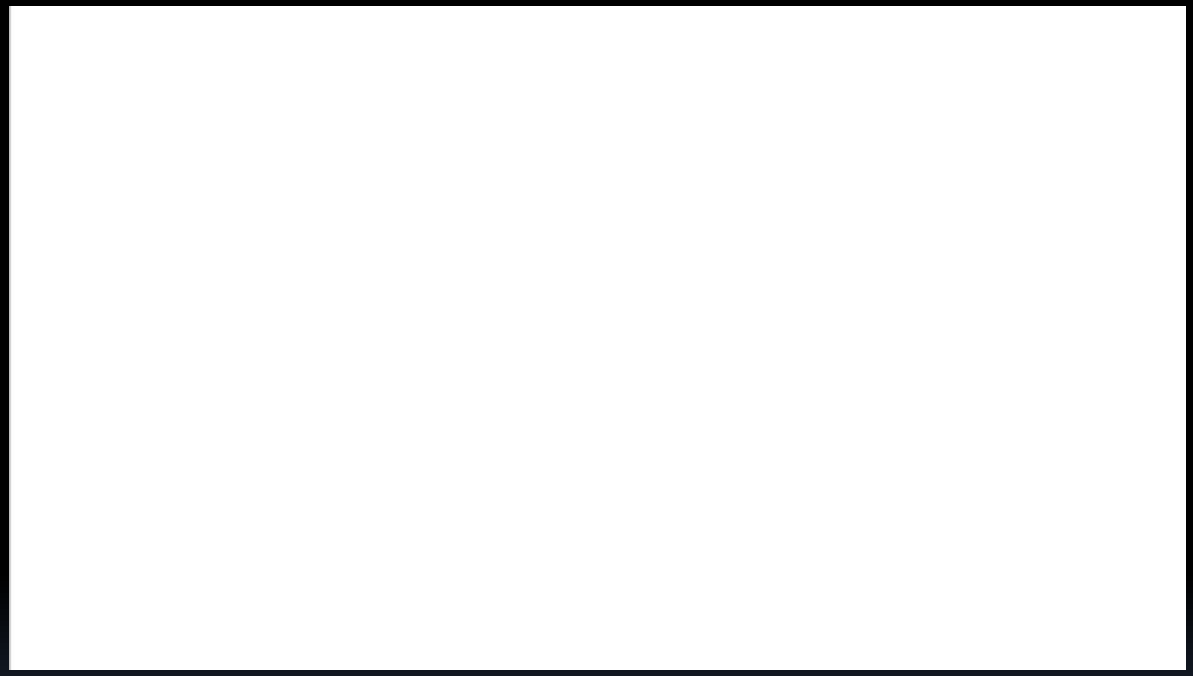


Fig. 75.8 A clear acrylic feeding plate with floss ligature

Fig. 75.9 A thermoform acrylic-silicone feeding plate

During feeding following guide lines should be followed:

1. The infant is held upright in the lap at about 45^{o} to 60^{o} angle to decrease nasal regurgitation.

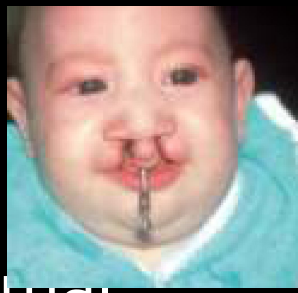
2. Burping the infant after ½ of feed is necessary because excessive air is swallowed.

3. Adjust the flow of the milk dropping in the mouth to the ability of the child to swallow and limit the feeding to maximum ½ an hr.

4. Observe the child for choking , cyanosis or abdominal distention. During feeding , widened eyes or choking indicate too rapid flow of liquid and needs to be adjusted

NAM- Naso-alveolar molding

Surgical treatment



- The goal of repair is normal looking lip and normal looking nose which will not be distorted by the growth of aging

Timing of operation

- The age of repair may from within 24 hrs of birth up to 6 months or even 12 months. ideally most cleft should be repaired by 6 – 12 weeks of i.e when patient is of 10 pound weight ,10 gms% of Hb, 10 weeks old.

Various surgical techniques are

- Randall graham lip adhesion
- Rose Thompson straight line repair
- Tennsion"s lower one third triangular flap repair
- Modification of Tennsion"s lower one third triangular flap repair
- Millard rotation advancement repair
- Millard rotation II advancement repair

DECIDUOUS DENTITION

(18months to 5 years)

ORTHODONTIC MANAGMENT

- *Treatment at this stage can produce only ephemeral results and such results would be poor temporary compensations for deeper skeletal abnormalities which become increasingly manifest later.*

- **As a rule, there should be no orthodontic treatment for deciduous dentition,** apart from where functional or comfort bites occur with a mandibular slide, in which case the primary canines may be moved orthodontically or ground down to avoid interference.

- *Chin cap therapy may also be used for mandibular prognathism.*

- *Minor cross bites occur quite often, and the deciduous lateral incisor next to the cleft may be absent (especially in cases of median facial dysgenesis), hypo plastic or duplicated.*

- The tooth may even partially erupt into the palate, but should be retained as well as dentally maintained, especially where it lies in the arch, *as an extraction may lead to bone resorption adjacent to the cleft.* This would result in a wider alveolus cleft would obviously be more difficult to close later stage.

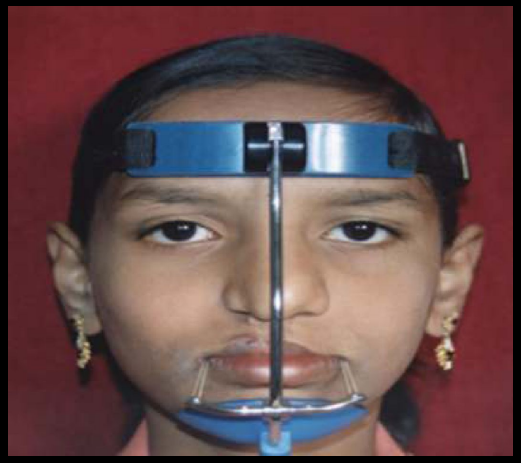
MIXED DENTITION
(6th year to 11nth year.)

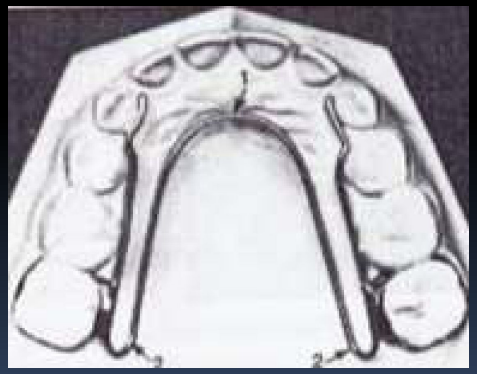
The aim of the treatment :-

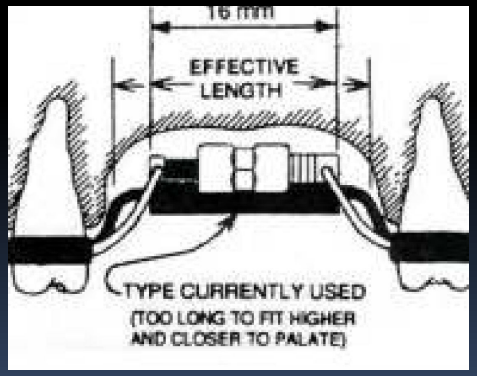
1. Symmetry within the upper dentition and related to the facial midline.
2. Normally functioning occlusion with correct position of upper incisor teeth.
3. Favorable transverse and sagittal posterior occlusion

Various expansion appliances used are

- Telescopic maxillary expander
- Fan shaped maxillary expander
- Spring jet for slow palatal expansion
- Butter fly expander
- Rapid maxillary expander
- Modified hyrax appliance for inclined abutment teeth
- Nickel titanium expander
- Quad helix expansion appliance






EFFECTIVE
LENGTH
TYPE CURRENTLY USED
(TOO LONG TO FIT HIGHER
AND CLOSER TO PALATE)

- During the treatment correction of anterior cross bite, improvement in facial profile is fairly predictable, although variable.
- Studies of this treatment indicates maxillary advancement, maxillary dental advancement and counter clockwise or posterior rotation of the mandible.

- Anterior cross bites occur more often in unilateral and bilateral cleft lip, alveolus and palate (LAP [u+b]) cases. Repositioning of the anterior dentition in the unilateral cleft deformity, once the permanent incisors have erupted, may lead to a successful over jet relationship with a normal functional dentoalveolar arch alignment.

- This may reduce pseudo-Class III dental and mandibular prognathic skeletal dentoalveolar arch growth.

- In cases of bilateral facial cleft deformities the anterior incisal cross bite is not caused by a retrognathic pre maxilla, but by a posterior tilting of the maxillary incisors or a rotation of the pre maxilla.
- Premature or pathological abrasion of the labial surface of these teeth must be prevented, and an anterior tilting of the maxillary incisors and/or orthopedic movement of the premaxilla is therefore indicated.

- A removable appliance with Adam's clasps for retention and a Z-spring or anterior expansion screw to move the incisors may be used, but a functional appliance such as a bite plate or even a Frankel's appliance to disengage the occlusion may also be chosen.
- Where only a minimal positive incisor overbite remains at the end of treatment, a longer period of retention may be indicated.

Pre surgical orthodontics

- Retroclination or cross bite is corrected. The correction of lateral incisor cross bite, which is usually present in cleft, is postponed until the permanent dentition.

- Before correcting the rotation and cross bite of teeth one should confirm the adequate bone support of the tooth on a radiograph.

- If insufficient bone support is available, de rotation may result in root exposure in the cleft and devitalization.

- If adequate bone support ,de rotation and cross bite correction are usually performed before the patient is considered for alveolar bone grating.

- But if the adequate bone support is not there then these procedures are performed after the alveolar bone grafting.

- If the cross bite or edge to edge bite causes functional shift of the mandible, then attempts should be done to relieve it by selective grinding or orthodontic treatment .

If Maxillary arch expansion is needed then this procedure should be performed before secondary alveolar bone grafting. The correction of maxillary arch collapse helps –

1. To prevent lateral shifts of the mandible
2. Improve sagittal mandibular position by cricumventing the adaptive mandibular prognathism
3. Provide area for the tongue
4. Promote normal maxillo mandibular developement and prepare the arch for secondary bone grafting as a part of prebone graft orthodontics.

The Quad Helix appliance in .036 Blue Elgiloy provides controlled force application to correct severe segmental dislocation. The typical expansion period lasts for 3 months with 2 activations at 6weeks intervals. The rate of the transverse expansion is 3mm/month. The optimal force is 200gm. on each side.

Advantages are: -

1.Easy to construct at the chair- side using ordinary laboratory pliers and minimal inventory

2.It offers the unique advantages of providing four sites of activation.

3 It exerts 3-diamensional control on the molars

4 It provides controlled force

5 Relatively less patient co-operation

6 Provides powerful anchorage preservation mechanism

PROTRACTION FACE MASK

Used between 5 and 8 years

AIMS OF THE TREATMENT

1. Correct midface skeletal deficiency
2. Eliminate anterior and / or posterior crossbite
3. Provide optimal space for spontaneous incisor eruption
4. Improve the soft tissue profile.

The introduction of the facial mask for early protraction by heavy forces to the maxillary complex in CLP patients was reported by Delaire and Colleagues.

The Quad –Helix appliance is used as anchorage for the facial mask.

No other fixation of the mask is needed than the two intra oral elastic bands from the hooks in the canine regions to a bar on the mask.

The force used for facial protraction is about 350gm on each side (Total 700gm.) .The facemask is used mainly at night for 10- 12 hrs. for 6 to 12months.

RAPID SAGGITAL CORRECTION IS ACHIEVED by :-

1.Maxillary base protraction

2.Canting of the maxillary plane upward

3.Remodelling changes in the anterior maxilla

4.Backward rotation of the mandible

RETENTION

- Fixed palatal arch
- A Function corrector III (FR-3)- active retainer only

when unfavorable growth pattern is seen.

PERMANENT DENTITION

Aims of the Treatment in the Permanent Dentition: -

1. Improving the dentofacial relationship.
2. Balancing the relationship between dental and skeletal components
3. Establishing favorable maxillo mandibular balance and proportion
4. Establishing normal incisal and buccal occlusion.
5. Establishing harmonious dental arches in both jaws.
6. Correcting axial inclination of teeth.
7. Correcting midlines.
8. Avoiding prosthetic replacement of teeth when possible.
9. Establishing functional occlusion in centric relation.
10. Establishing optimal lip contour and contact

Special precautions during orthodontic tooth movement.

- Avoid overzealous tooth movement into the cleft sites
- Mechanics should be gently placed.
- Orthodontic treatment is a prolonged procedure in CLP patients than the routine patients.
- The decision of orthodontics versus orthognathic surgery should be judiciously made.
- Long term retention after treatment should be advocated.
- Follow up should be advised on a 6 month basis till at least 21 years of age and the original and post treatment records should be reviewed at every such visit.
- Strict monitoring excellent performance of the child on personal oral hygiene and caries control efforts.

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