Cleft lip and palate

Presented by:
Manisha poudel
CMS-TH
FINAL YEAR

Overview

- Introduction
- Incidence
- Embryological background
- Etiology
- Predisposing factor
- Associated syndromes
- Diagnostic consideration in cleft lip and palate
- Classification of cleft lip and palate
- Problems associated with cleft lip and palate
- Management of cleft lip and palate

Introduction

- The dictionary meaning of cleft is a crack, fissure,split or gap.
- Cleft lip and palate is a congenital birth defect which is characterized by complete or partial cleft of lip and/or palate
- Not life threatening unless associated with other syndrome
- Severity may vary from trace of notching of upper lip to complete non fusion of lip, primary palate and secondary palate

Incidence

- The approximate incidence is 1 in 700 live births, among them 25% are bilateral and 85% are associated with cleft palate. Isolated cleft palate occurs in 1 in 2000 live births .
- Negroids having least incidence (0.4/1000) and mongoloid and afghans(4.9/1000) having the highest incidence.
- Cleft lip is more common among males and cleft palate is more commoly among females.
- Unilateral clefts accounting for 80% of incidence and bilateral for remaining 20%.
- Among unilateral clefts, clefts involving left side are seen in 70% of cases.

In context of Nepal

- 51 clefts was identified among 30,592 live births during year 2005 to 2010.
- Birth prevalance of cleft of lip +cleft palate was 1.64/1000 live birth per year.
- 19 clefts of lip alone(birth prevalance 0.61/1000 per year).

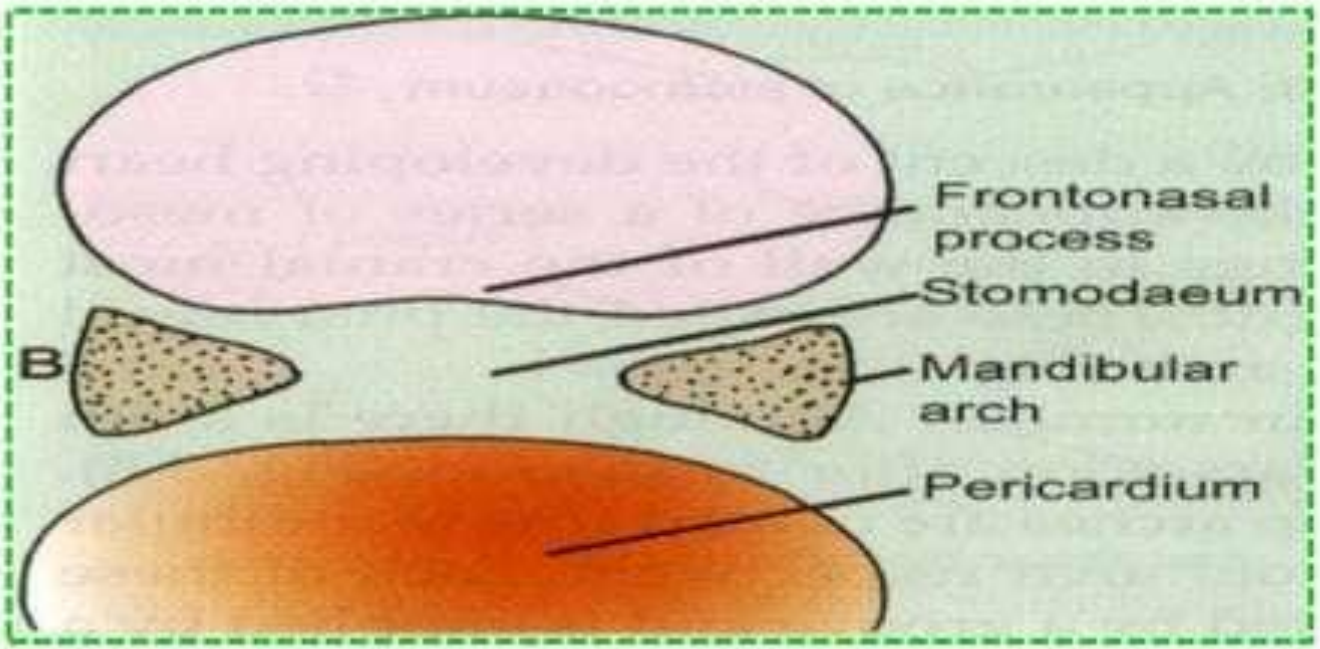
- 21 cleft lip and palate (0.67/1000 per year)
- 11 cleft palate only(0.35/1000 per year)
- CLP and CL are common in male whereas CP is common in female.

-Source:Article on prevalencene of CL And CP in tertiary hospital in Eastern Nepal by Singh VP,Sagatani R,Sagtani A

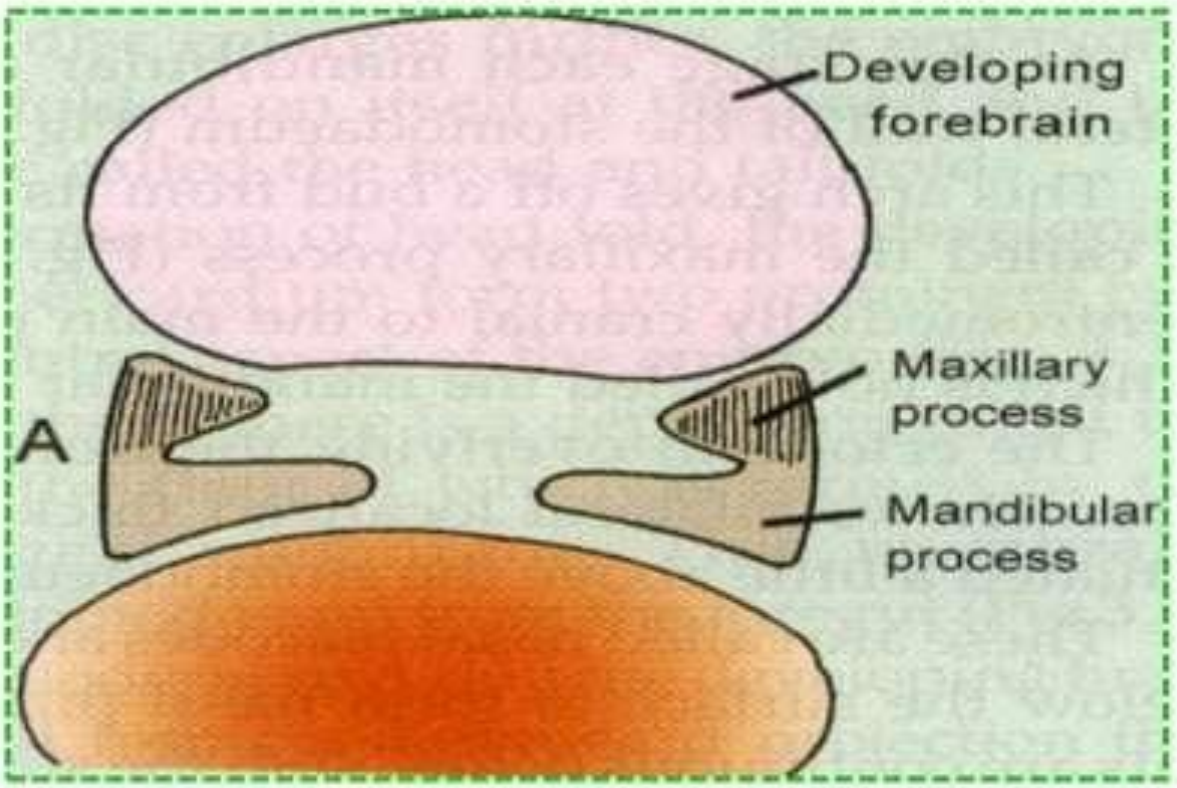
Embryological Background

- Face is formed by fusion of number of embryonic processes.

- Around the 4th week of intrauterine life, five brachial arches develop at the site of future neck.

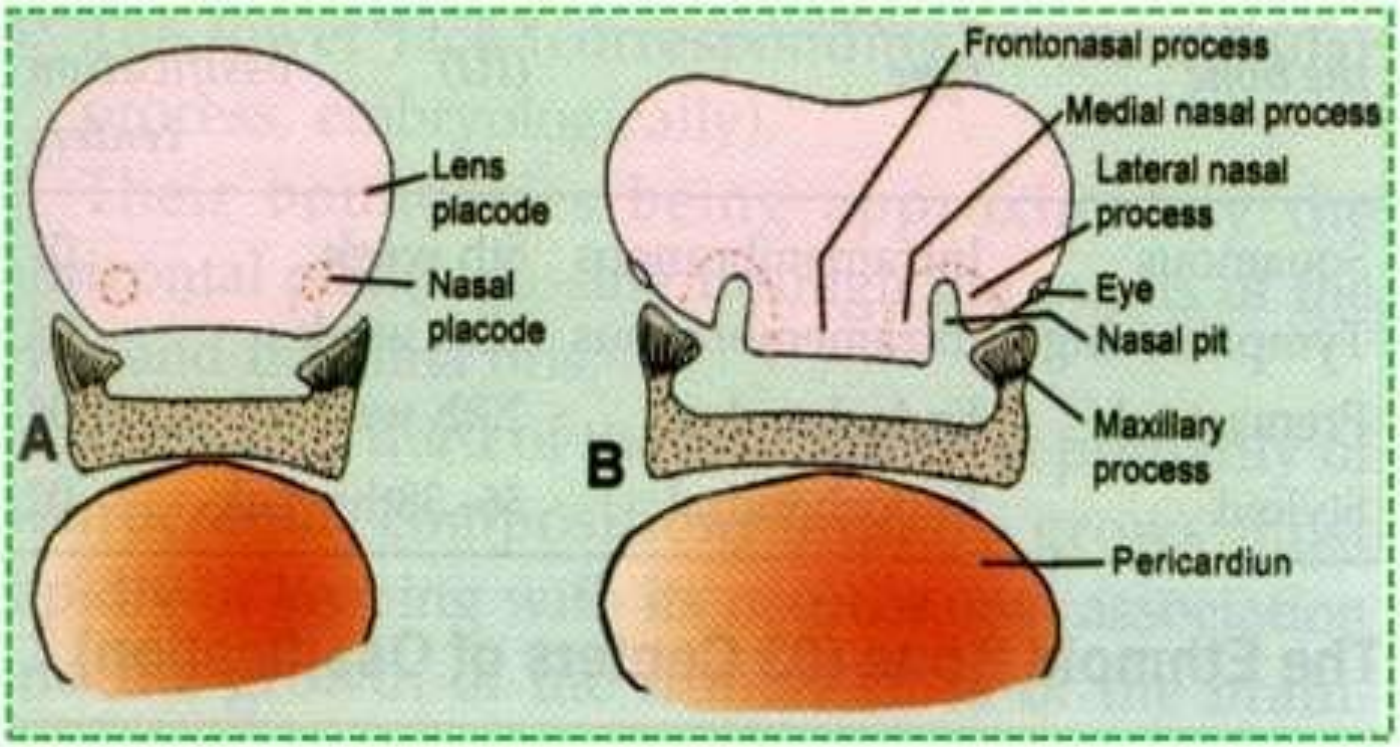


- The first arch, mandibular arch plays a role in development of nasomaxillary complex.



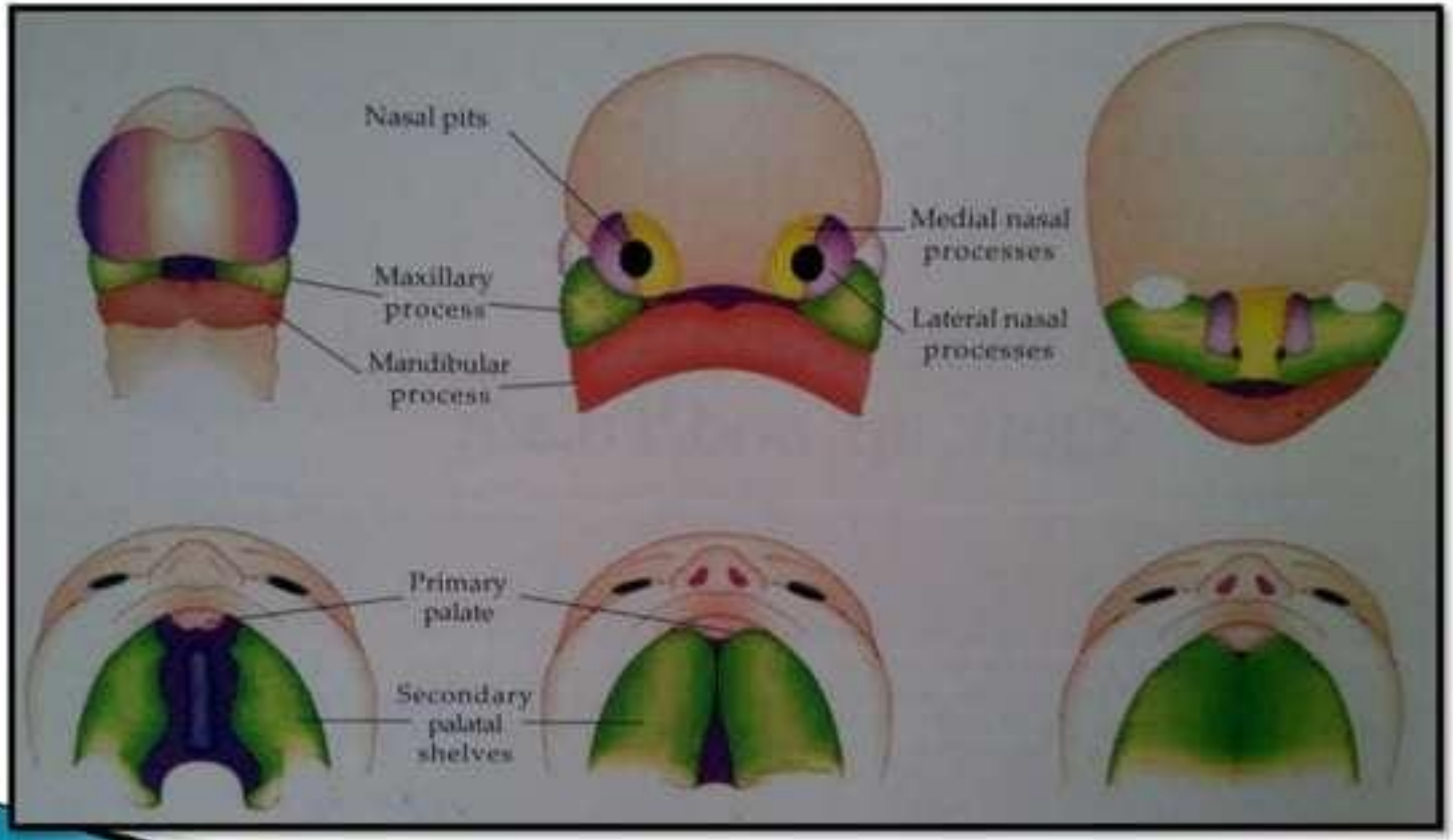
- Mandibular arch gives rise to maxillary process from the dorsal end.

5-6th week



- With the formation of nasal pits, frontonasal process gets divided into a medial nasal process and two lateral nasal processes.

- Maxillary process fuse with medial and lateral nasal processes to form upper lip and primary palate respectively

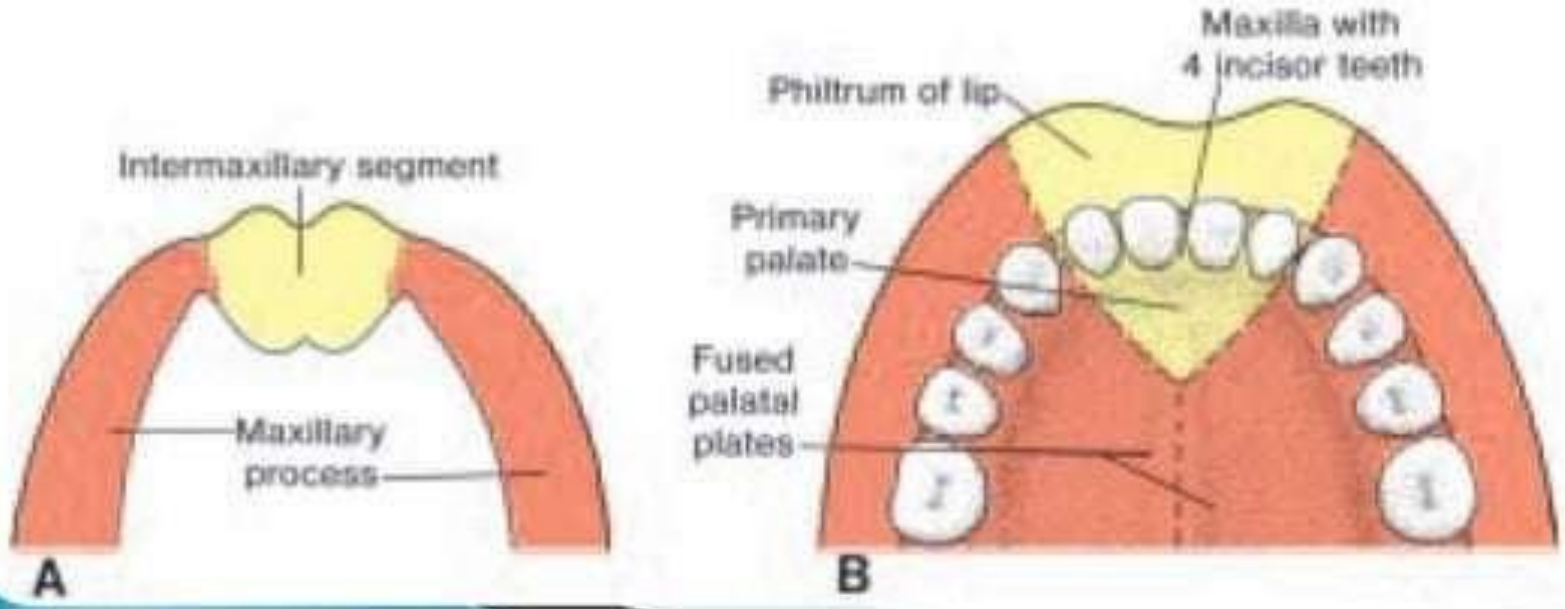


Development of palate

Development begins in 6th week

Develops from-

1. Primary palate(from medial nasal process)
2. Secondary palate(from maxillary process)



- Palate is formed by contibution of

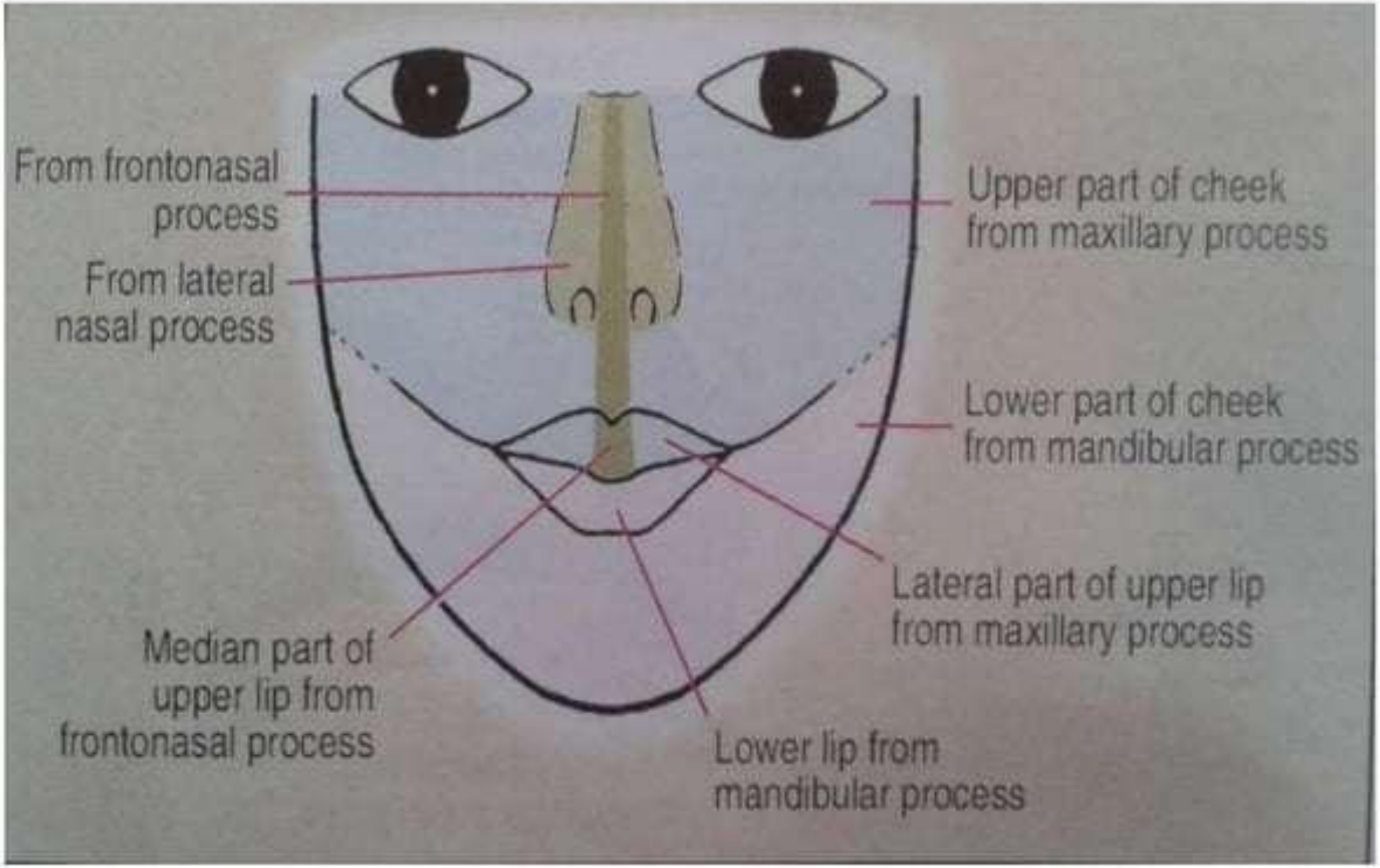
1. Maxillary process
2. Palatal shelves given off by maxillary process
3. Fronto-nasal process

Fronto-nasal process give rise to premaxillary region while palatal shelves form rest of palate.

- Fusion of palatal shelves begin at 8th week which continues till 12/17th week.
- Initially the palatal shelves are covered by an epithelial lining.
- As they join epithelial cells degenerate.
- The connective tissue of the palatal shelves intermingle with each other resulting in their fusion.

Development of Lip

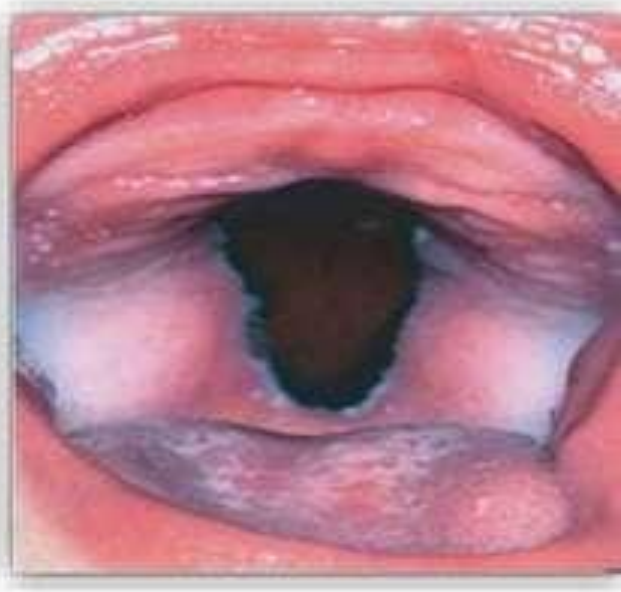
- Lower Lip is formed by the fusion of mandibular process of two sides.
- Upper Lip is derived from medial nasal and maxillary processes.
- Failure of merging between the medial nasal and maxillary processes at 5 weeks'gestation,on one or both sides,results in cleft lip.


From frontonasal process
From lateral nasal process
Upper part of cheek from maxillary process
Lower part of cheek from mandibular process
Lateral part of upper lip from maxillary process
Median part of upper lip from frontonasal process
Lower lip from mandibular process

- If cleft of lip extends deep into primary palate, it results in cleft of alveolus too.
- Occasionally, cleft of lip and alveolus may have bands of soft tissue bridging across the two sides called simonnarts band.

- Cleft of palate occurs in number of ways:
  - Defective growth of palatal shelves
  - Delayed or total failure of shelves to elevate and attain a horizontal position
  - Lack of contact between shelves
  - Post fusion rupture of shelves
  - Failure of mesenchyme consolidation.

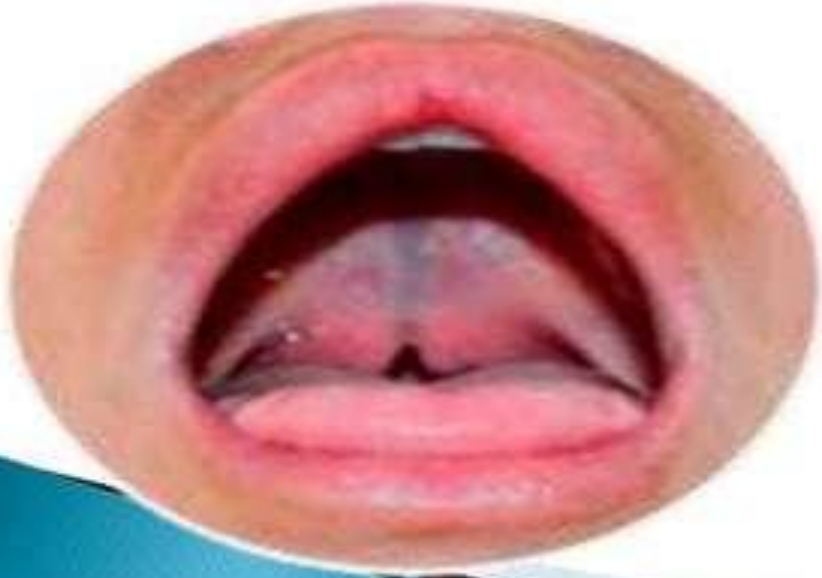
Isolated cleft of palate:



- It is a separate entity and appears to be under strong genetic influence.
- More common in females .
- Severity from mild notching of tip of uvula to cleft extending the soft palate alone or into secondary hard palate upto incisive foramen.
- Usually associated with pierre robin syndrome.

Submucous clefts:

- Present on palate as bony defects but covered with oral mucosa
- The submucosal clefts most often affect the posterior part of the palate at the posterior nasal spine.



- And may be accidentally discovered on routine occlusal X-ray or could be located on careful clinical palpation of the palate.

- Occurs only in hard palate and continue to open cleft of soft palate or it may occur as a submucous cleft of the soft palate with or without notching into the hard palate.

Etiology

- Many workers are of view that clefts occur due to a number of causes and no single etiology can be pinpointed.

- Heredity: Drilien reported that 1 in 3 children with clefts had some relatives with similar congenital defects.

Family history is available in about 12- 20% of cases.

- Tranforming growth factor alpha(TGFA)
- Tranforming growth factor beta 3(TGFB3)
- AP2 and MSX1

are the genes that have been identified as major role in the development of cleft lip and cleft palate.

- Environment: can be divided into 4 categories

i) Womb environment
ii) External environment
iii) Nutrition- micronutrient and folic acid deficiencies
iv) Drugs

Certain drugs acts as teratogen that cause birth defects like

- Anti-abortificant drugs
-Anti emetics
-Antiepilectic drugs(phenytoin, valproic acid)
-Thalidomide
- Dioxin, retinoic acid, maternal alcohol use, and maternal cigarette smoking

Some of the known teratogens are:

- Rubella virus
- Cortisone
- Mercaptopurine
- Methotrexate
- valium
  - Infections like rubella, syphilis and toxoplasmosis
  - Maternal alcohol use was found to cause interruption in the migration and differentiation of neural crest cells
  - Embryos exposed to maternal smoking have increased risk of having clefts

Multifactorial etiology:

- Recent studies show that etiology of cleft lip and palate cannot be attributed solely to either genetic or environmental factors.

- IT seems to involve more than one factor.

- They argue that unless a person is genetically susceptible, the environment factors may not by themselves cause clefts.

Predisposing Factors

- *Increased maternal age*: women who conceive late have increased risk of having offsprings with clefts
- *Racial:* Mongoloids have greatest incidence of clefts
- *Blood supply*: Any factor that reduces blood supply to nasomaxillary areas during embryological development predisposes to clefts

Associated syndromes

Cleft lip may be associated with the following syndromes:

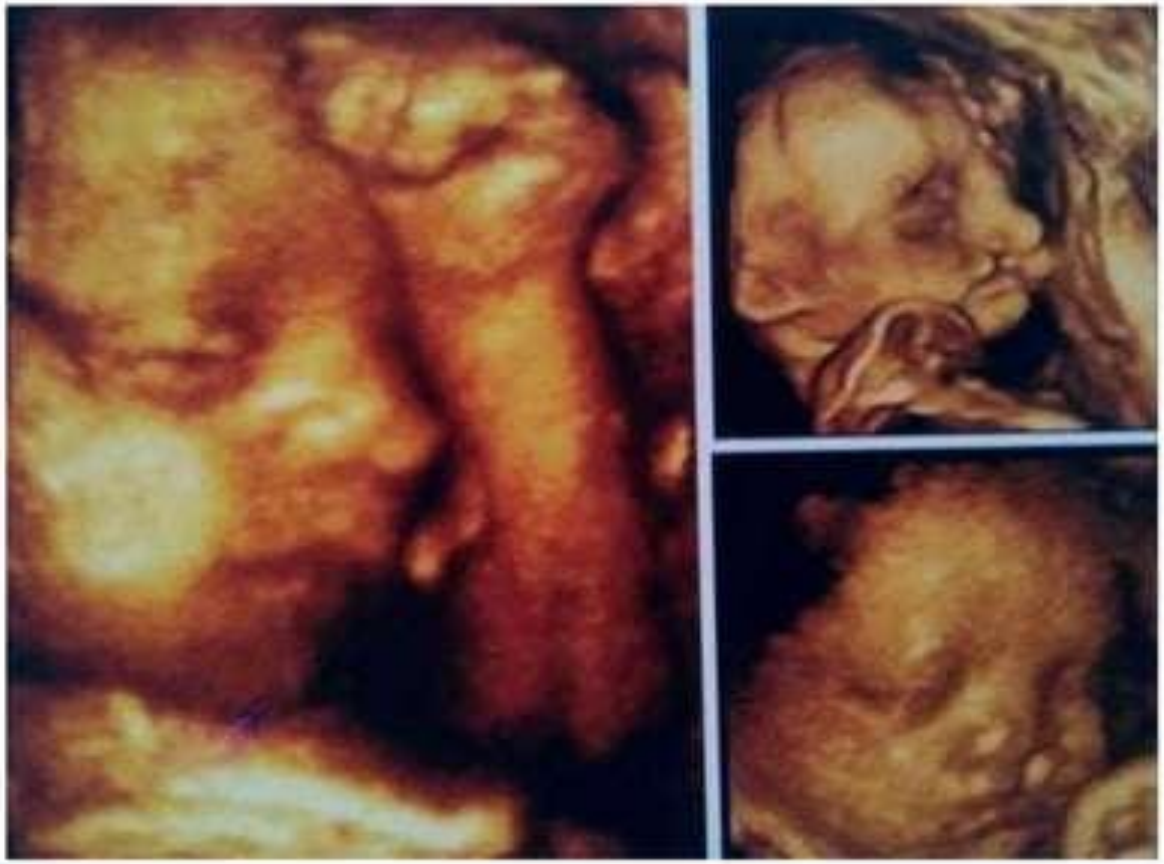
- Down's syndrome
- Wardenburg's syndrome (abnormities of pigmentation of hair,iris and skin,deafness)
- Vander Woude's syndrome(lips pits)
- Orofacial digital syndrome
- Treacher collins syndrome
- Pierre Robin syndrome
- Klippel-Feil syndrome

- According to certain studies, up to 30% of cleft lips and palates and 50% of pure palatal clefts may be related to a syndrome.

(Marazita 2002,Calzolari at al.2007)

Diagnostic considerations in cleft lip and palate

- Ultrasonography and 3D ultrasonography enables utero diagnosis of clefts especially in 3rd trimester.



Advantage of early diagnosis before birth include:

1. Time for parent education on the management of the baby to be born.
2. Allows psychological preparation of the parents and allow them to have realistic expectations.
3. It gives opportunity to investigate the presence of other chromosomal abnormalities.
4. Gives parent the choice of continuing the pregnancy.

5. Helps in getting prepared for the neonatal feeding and care.
6. Opportunity for fetal surgery.

Risks:

- Hereditary risk of children of parents with cleft or slibling of children with cleft is approx. 4%.
- Risk is significantly smaller(0.6%) for second degree relatives.

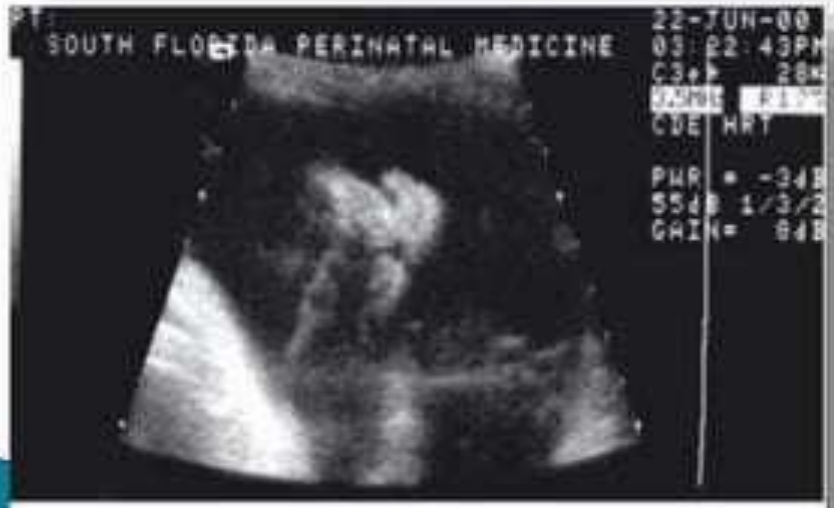


Fig. 2.2. Unilateral cleft lip

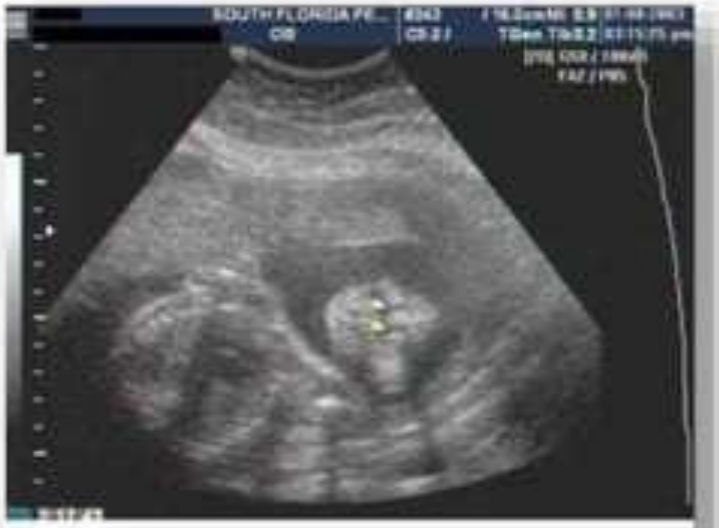


Fig. 2.3. Bilateral cleft lip and palate

- If more than one family member has a cleft,this increases the risk of inheritance.
  (Harper 2004,Sivertsen et al. 2008)

Abbreviation of cleft types

- Cleft of lip is denoted as CL.
- Cleft of lip along with alveolus is denoted as CLA.
- complete cleft extending from a unilateral cleft lip and primary palate passing through the mid-palatal suture to the soft tissue uvula is denoted as UCLP(unilateral cleft lip and palate).

- Bilateral cleft of lip and premaxilla which extends down to the bifid uvula is denoted as bilateral complete cleft of the lip and palate (BCLP).

- Isolated cleft of palate can be abbreviated as CPO.

Classification of Cleft lip and palate

Classification system can broadly classified into:

1. Typical and Atypical orofacial clefts
2. Syndromic and Non-Syndromic Clefts

Atypical clefts

- Lateral transverse
- Tessier type of facial cleft
- Median clefts

Non-Syndromic clefts

- individuals have no other physical or developmental anomalies though they may show subnormal growth or other parameters.
- It has been suggested that about 70% of cases of CL/P and 50% of CPO are non-syndromic.

Syndromic cleft :

May appear as a part of congenital anomalies (MCA). In a multiple congenital anomaly syndrome, cleft patients can be further grouped into:

1. Monogenic syndrome,
2. Chromosomal aberrations,
3. Part of an association, or part of a complex of multiple congenital anomalies of unknown aetiology.
4. Teratogenic syndromes.

Other known Classification

1. Davis and Ritchie classification

Morphological classification based on the location of cleft relative to alveolar process

Group I– prealveolar clefts involving only lips and are subclassified as

- Unilateral
- bilateral
- Median

Group II– post alveolar clefts that comprises hard and soft palate clefts upto the alveolar ridge

Group III– alveolar clefts. Complete clefts involving the palate, alveolar ridge and lips.can be subdivided into–

- can be subdivided into
  - Unilateral
  - Bilateral
  - Median

2) ***Veau's classification***

Group 1 – cleft involving soft palate only

Group 2 – cleft of hard and soft palate extending upto incisive foramen

Group 3 – complete unilateral clefts involving soft palate, hard palate, lips and alveolar ridge

Group 4 – complete bilateral clefts affecting the soft palate, hard palate, lips and alveolar ridge

Fogh Anderson (1942)

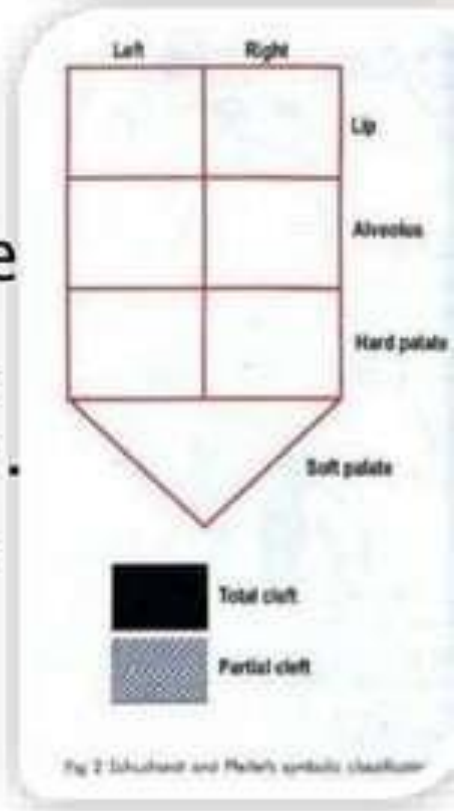
Group 1: cleft of lip. Can be subdivided into
single – unilateral or median clefts
double – bilateral clefts

Group 2 – cleft of lip and palate
Single – unilateral cleft
double – bilateral cleft
Group 3 – clefts of palate extending upto incisive foramen

Schuchart and pfelter's symbolic classification

It makes use of chart made up of a vertical block of three pairs of rectangles with an inverted triangle at bottom

- Inverted triangle represents soft palate while the rectangles represent the lip, alveolus and hard palate as we go down.
- Areas affected by clefts are shaded on chart.



Kernahan's stripped 'Y' classification

- Symbolic classification
- Uses a stripped 'Y' having numbered blocks
- Each block represents a specific area on the oral cavity

- Block 1 and 4 – lip
- Block 2 and 5 – alveolus
- Block 3 and 6 – hard palate anterior to incisive foramen
- Block 7 and 8 – hard palate posterior to incisive foramen
- Block 9 – soft palate

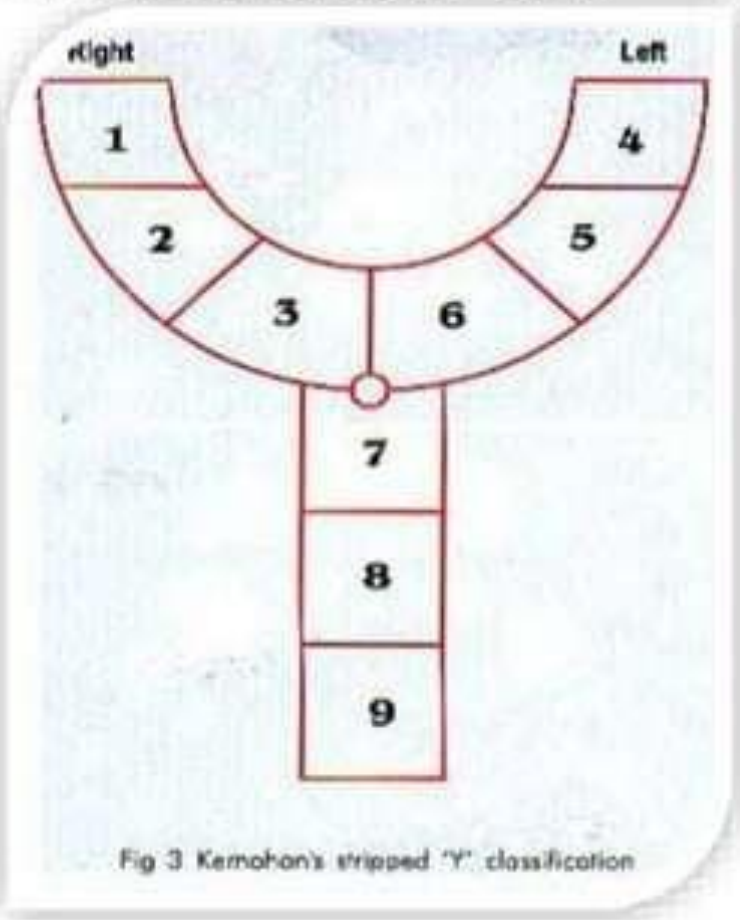
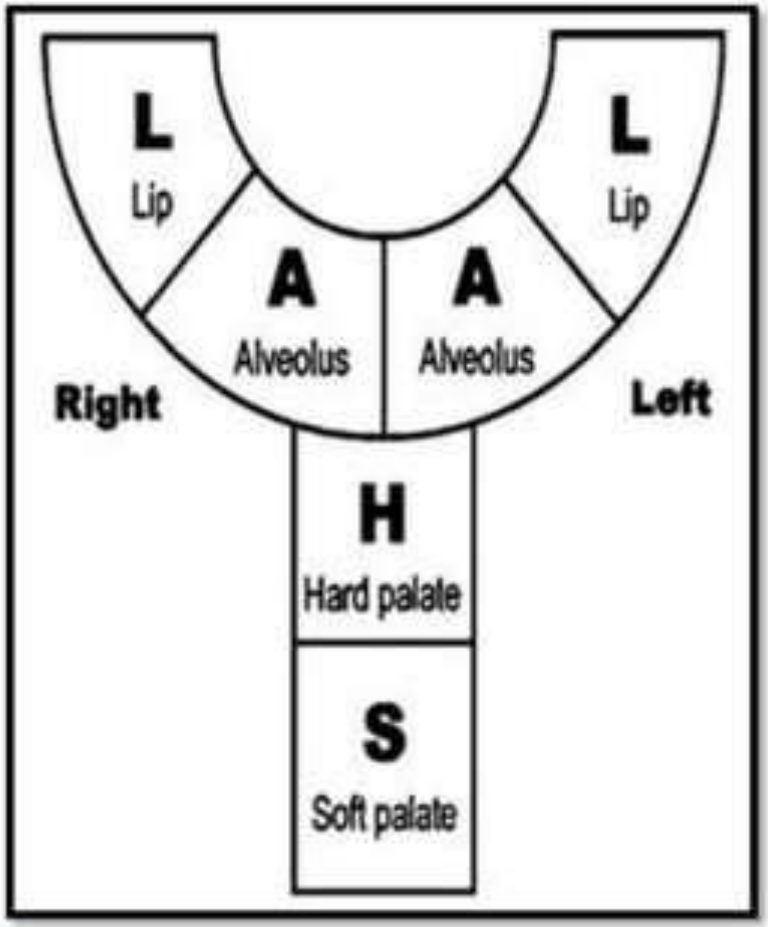


Fig 3 Kernahan's stripped 'Y' classification

Lahshal classification

simple classification presented by okriens in 1987.

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



Goslon yardstick

Three of the authors have mentioned clinical features that they considered to be most important in categorizing the severity of malocclusion. They are

a) Anteroposterior arch relationship

b) Vertical labial segment relationship

c) Transverse relationship

a)Anteroposterior arch relationship

- Class III incisor relationship is the least satisfactory and severe form whereas class II, div I is favorable for orthodontic correction

b) Vertical labial segment relationship

A deep overbite is preferred over an openbite.

c) Transverse Relationship:

- Canine crossbites are considered worse than molar crossbite

Goslon index

Group 1 – (Excellent) no orthodontic treatment required

Group 2 – (Good) minimum orthodontic treatment required

Group 3 – (Fair) Complex orthodontic treatment required

Grooup 4 – (Poor) Complex orthodontic treatment required along with surgery

Facial Growth in cleft lip and Palate

1.Prenatal Growth

Various forces which influence the facial growth in utero are:

a)Over maxillary segment on non-cleft side:

- Pull of lip and cheek muscles
- Tongue pressure
- Relatively unstrained nasal septum growth

b)Over maxillary segment on cleft side:

- Instrinsic Deficiency
- Pressure from alar base due to stretching of the nostrils.

Due to above mentioned forces,deficiency produced in cleft lip and palate babies are:

a)Incomplete unilateral cleft lip and palate:

-Severe deviation of midline away from cleft.

-Smaller maxillary segment shows retro-positioning or growth inhibition and collapse.

-Nose is deviated towards normal side.

b)In bilateral cleft lip and palate cases

-Premaxilla tilts forward and/or shifts to one side due to tongue pressure.

2.Facial growth in unrepaired cleft lip and palate Cases

-A functionally normal facial skeleton develops in unrepaired cases expect for presence of local bony defect due to intrinsic deficiency in immediate area of cleft.

-Due to absence of normal lip pressure abnormal development of dento-alveolar process can occur in vicinity of cleft lip.

3.Facial Growth following Surgical Repair

a)Effect of lip repair:

-Tight upper lip following repair significantly inhibits the facial growth in antero posteior direction.

-Increased tightness in lower part of repaired lip near free border leads to retroclination of dentoalveolar structures.

b)Effect of palate repair:

-Palate repair may inhibit the growth of maxilla and due to scar contracture,reduction in maxillary arch may occur.

Problems associated with clefts

1)Dental problems
2) Aesthetic problems
3) Hearing and speech problems
4) Psychological problems

1) **Dental problems**

- Congenitally missing teeth(mostly upper lateral incisors)
- Presence of supernumerary, neonatal and natal teeth
- Ectopically erupted tooth
- Enamel hypoplasia
- Microdontia, macrodontia
- Fused teeth
- Gemination, dilaceration

- Tendency towards class III skeletal pattern
- Posterior and anterior cross bite
- Deep bite
- Spacing/ crowding
- Protruding premaxilla

2) ***Esthetic problems***

- Facial disfigurement
- Orofacial structures can be malformed and congenitally missing
- Deformities of nose can also occur

3) Hearing and speech problems

-Children with cleft often have associated speech and language disorder.

- Assessment of speech therapist is required as early as 9 months of age

- Patient with delayed development of speech may have receptive language problems that arise because of the collection of fluid in middle ear

- Hearing loss may also occur due to ossicular malformation

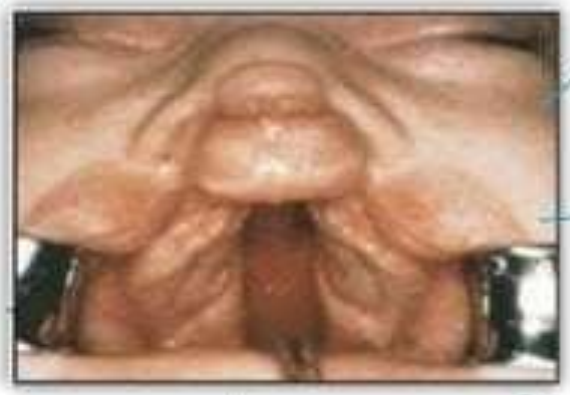
- Speech problems are more severe if surgery is delayed

- Usually an operated cleft palate patient present short palate, decreased mobility of soft palate due to scarring and presence of oronasal fistula, all which contribute to velopharyngeal insufficiency

4)Psychological problems

- Patients are under a lot of psychological stress.

Management of cleft lip and palate



ENT surgeon

Social worker

Genetic scientist

Nursing support

Plastic and oral surgeon

Speech therapist

Orthodontist

Prosthodontist

psychiatrist

Ophthalmologist

Pediatric dentist

Multidisciplinary cleft palate team

Schedule of treatment for clefts

Birth to 1 month

Initial assessment

Presurgical orthopaedics

3 months

Primary lip repair

9 to 18 months

Palate repair

2 years

Speech assessment

3–5 years

Lip revision surgery

8–9 years

Initial interventional orthodontics in preparaton for alveolar bone grafting

Continuing speech therapy

10 years

Alveolar bone grafts

12-14 years

Definitive orthodontics

16 years

Nasal revisional surgery

17-20 years

Orthognathic surgery

Advanced conservative treatment

Parent Counselling at birth

Parents are usually not prepared to face this problem.

Sometimes, they have a feeling of guilt that they had done something wrong during pregnancy.

They should be informed that there is nothing known which they could have done earlier to prevent its occurrence.

The management regarding surgery,dentistry and speech therapy should be explained properly along with possible outcomes.

Primary team or core team

- The **cleft surgeon/plastic surgeon** undertakes primary and secondary repair.
- The **speech therapist** monitors speech from 9 months onwards and institutes measures for normal development of the speech.
- The **audiologist** quantifies and locates the cause of hearing problems.
- The **orthodontist** monitors dental development, occlusion, skeletal problems and institute interceptive therapy, dentofacial orthopaedics and prepares for secondary alveolar bone graft.

Others specialist required:

- **Oral surgeon**: Secondary alveolar bone graft and orthognathic surgery if required.
- **Plastic surgeon**: Correction of nose deformity, secondary deformities of lip and scar revision.
- **Specialist cleft nurse** who can monitor the neonates during early days after birth and give feeding advice.
- Clinical **geneticist** to resolve genetic basis of the cleft, and advice on recurrence risk.

- **Paediatric dentist/dentist** to maintain and monitor dental health and oral hygiene.

- **ENT surgeon/audiologist** to take care of recurrent ear infections, insert grommets and hearing tests

- With the increasing advances in treatment of CLP, interdisciplinary approach is considered effective than multidiscilpinary team.

Care of cleft patients

Immediately on birth

- Feeding and psychological problems are the biggest issues.

A cleft lip or palate makes feeding of baby more difficult.

The major problems with feeding a baby with cleft are problems with sucking and with formula coming through the nose.

The following specialists are required to evaluate the child:

- Neonatologist, paediatrician
- Feeding specialist nurse
- Geneticist to assess for syndromic associations
- Clinical psychologist.

Newborn children with clefts present the risk of aspiration and airway obstruction which may lead to acute asphyxia in children with small mandibles like in Pierre Robinson syndrome.

- Such cases may require tracheostomy at birth.

- Feeding dificulties are common, so specialized feeding bottles such as haberman feeder and Mead Johnson bottle are helpful.

Haberman feeder

Mead Johnson bottle

First few weeks

- Recurrent chest and throat infections: care by the neonatologist/ and paediatrician.

First few months

- Primary surgery of lip and anterior palate: done by a cleft surgeon who could be an oral surgeon/plastic surgeon/ paediatric surgeon.

Stages in management

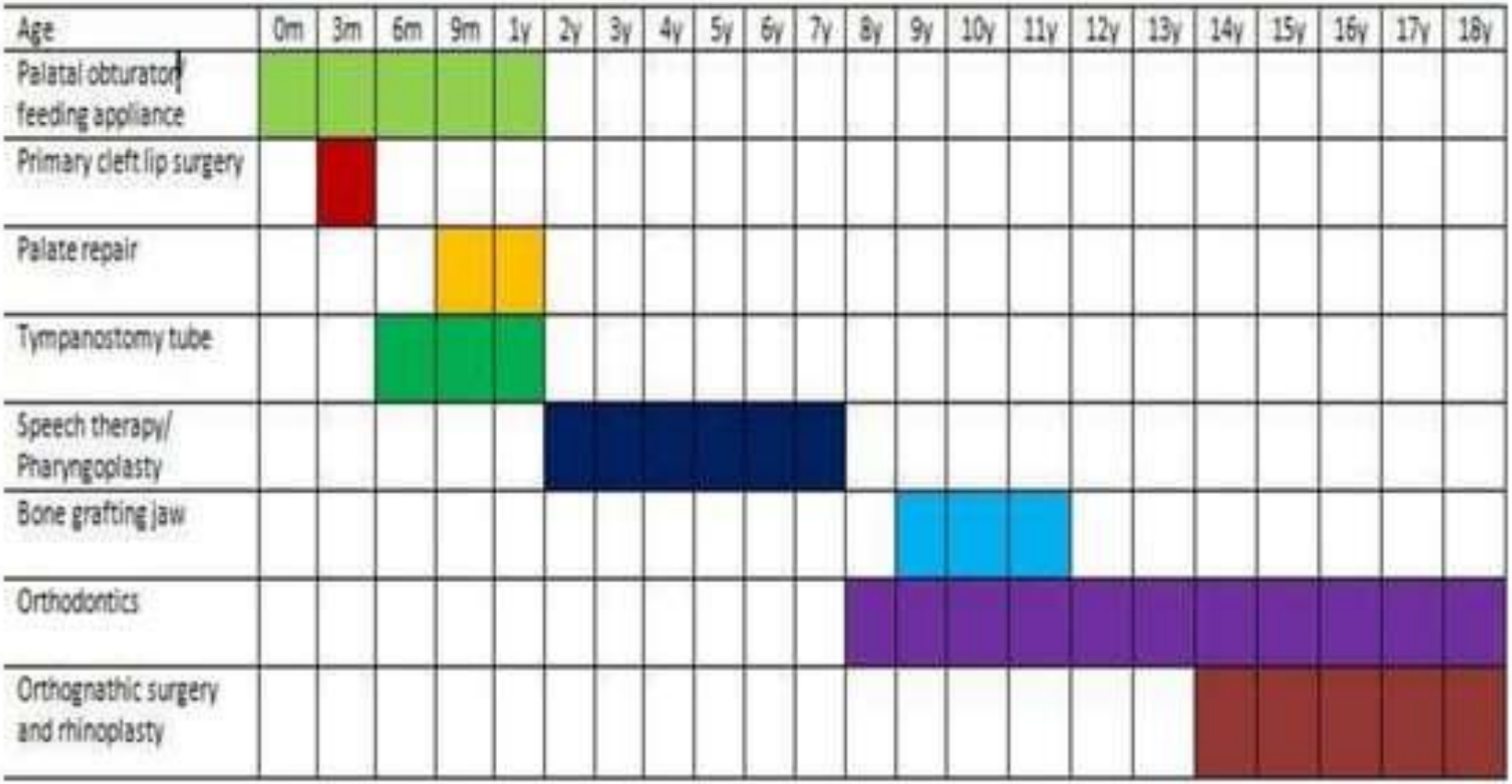
Management of cleft lip and palate can be divided into following stages:

Stage I- treatment done from birth to 18 month of age

Stage II- from 18 th month to 5th year of life(primary dentition stage)

Stage III- treatment carried out during mixed dentition stage from 6th to 11th year of life

Stage IV - treatment done during permanent dentition stage (12-18 years)



m- months, y- years

Stage I treatment:

Includes:

i. Fabrication of a passive obturator
ii. Presurgical orthopedics
iii. Surgical management of cleft lip
iv. Surgical management of cleft palate

Passive maxillary obturator:

- Is an intraoral prosthetic device that fills the palatal clefts and provides false roofing against which child can suckle
- Reduces the feeding difficulties like insufficient suction, choking, excessive air intake

- Obturator is fabricated using cold cure acrylic after selective blocking of all the undesirable undercuts

- Clasp aid in retention, in case insufficient retention, wings made of thick wire can be imbedded in acrylic and made to follow cheek contour extraorally.

Presurgical orthopaedics

1. It facilitate the creation of good functioning palate.
2. Normalize tongue position.
3. Help in speech development.
4. Improve symmetry of nose and cleft of maxilla.
5. Psychologically boost patient and parents as the patient get continued supervision.

Surgical lip closure:

Primary closure of lip is undertaken at age of 3 months or 10 weeks when child is fit to undergo general anaesthesia.

Millard has suggested rule of 10 .

- Approximately 10 weeks of age
- 10 pounds (4.54 kg)
- Bood haemoglobin not less than 10 gram%

Two techniques have been popular:

a. Tenninson's triangular flap procedure
b. Millard's rotation flap

Other technique is:

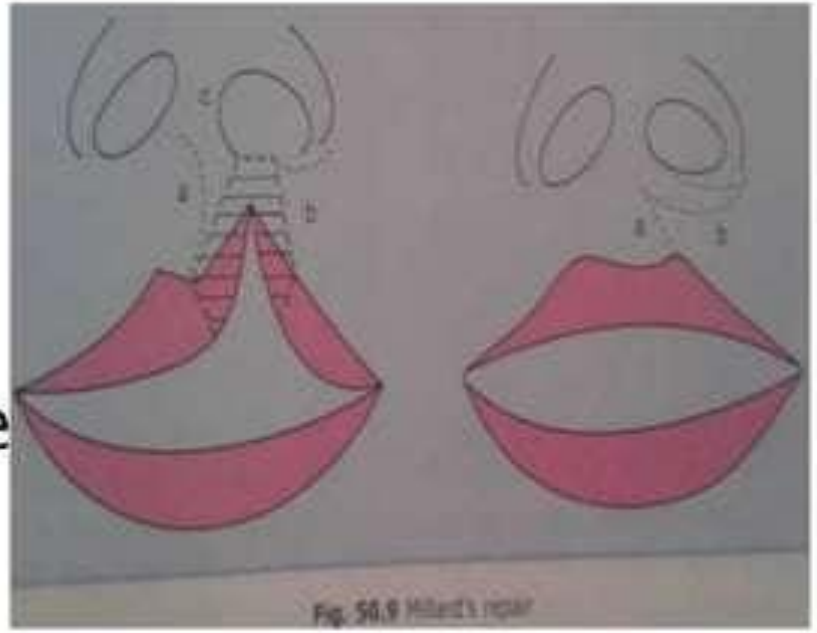
-Veau repair

Where a=rotational flap

b=advancement flap

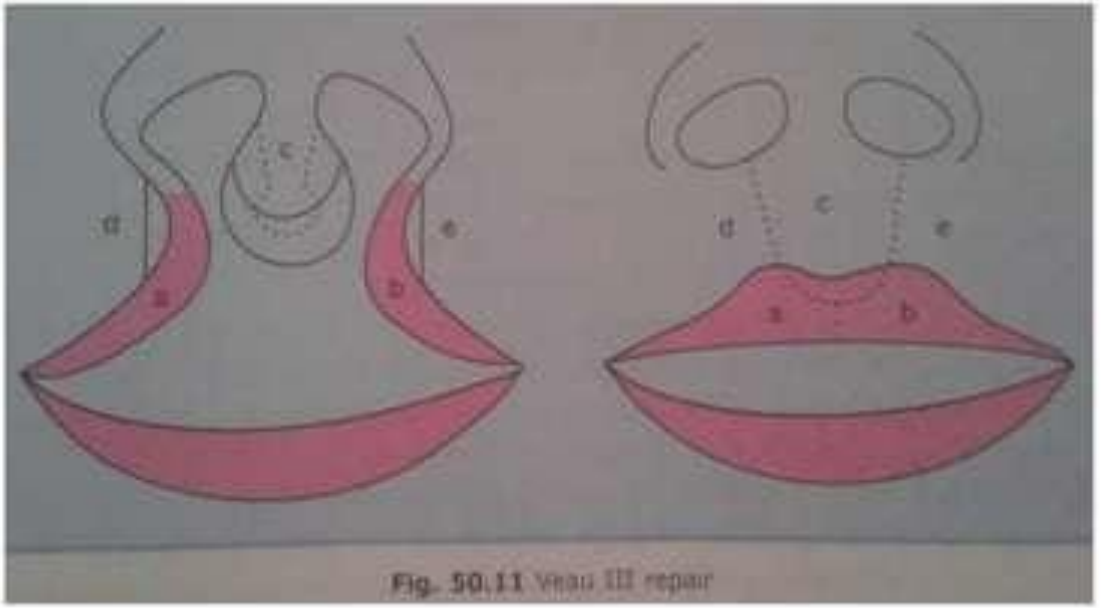
c=columella flap

a and c are planned on medial side of Cleft.After full thickness Of lip is cut along the marking which is filled by b planned on lateral side In this method minimal Tissue is discarded and the Result can be modified during surgery.



Millard's repair

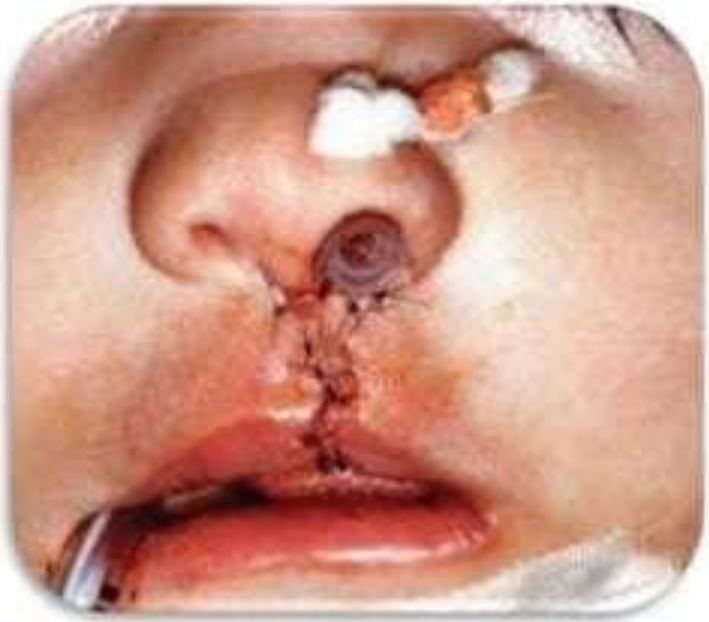
Tennison-Randall repair



Veau repair

Surgical palate closure:

- Should be attempted between 12-24 months of age.
- Facilitates normal speech, hearing and swallowing.



- The tension of lip closure centralises premaxilla and then the other side of lip is closed at 4 months of age.
- Vomerine flaps from right and left sides are used to close the anterior palate, which is done at 8-12 months using von langenback technique.
- Lip revision and columella lengthening are done at age of three years.

Oslo protocol

- The Oslo protocol evolved at the Oslo Cleft Centre, which is one of the two centralized care centres in Norway.
- Their protocol does not follow preoperative orthopaedics.
- Millard's procedure is carried out for lip repair at the age of 3 months.

- In cases with an associated cleft of the alveolus and palate, a cranial based single layer vomer flap is sutured under the alveolus palate periostium at the time of lip closure.

- In light of the present knowledge, ongoing research and different long-term and inter-centre studies, the Oslo protocol has been observed to generate good treatment outcome.

Closure of the secondary palate

- Remaining hard and soft palate closure is done at the age of 18 months by von Langenbeck pattern palatoplasty.
- Alveolar bone grafting is done at the age of 8–10 years.

Stage two treatment:

Comprises treatment carried out during primary dentition period.

Procedures carried out during this phase:

- Adjustment of intraoral obturator to accommodate the erupting deciduous teeth.
- To maintain a check on eruption pattern and timing.
- Oral hygiene instructions.
- Restoration of decayed teeth.

Orthodontic treatment is not normally recommended for primary dentition as it may damage permanent dentition follicles.

However , in patients with:

- Moderately underdeveloped maxilla and no class III hereditary defect

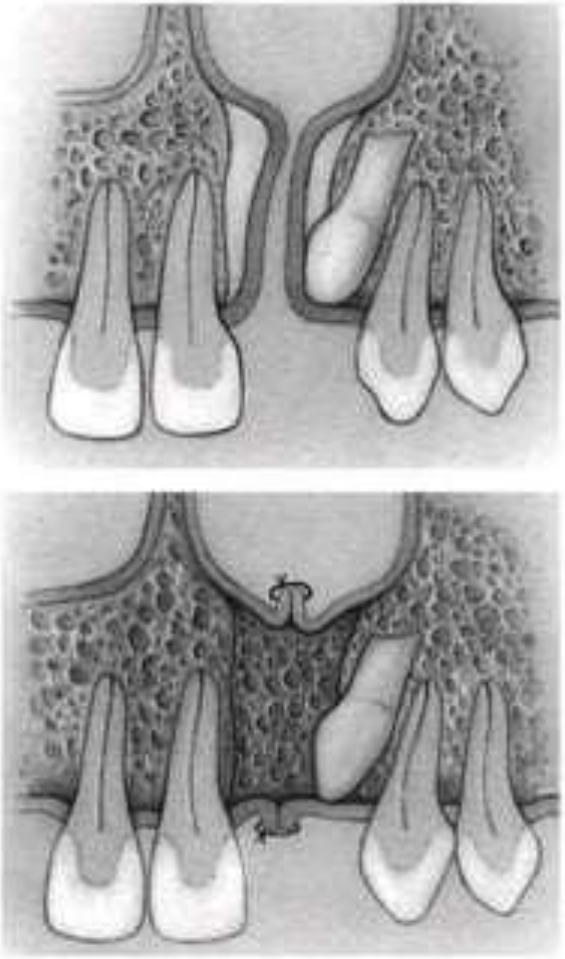
reverse headgear treatment should be advocated at age of 4 – 7 years.

- Parents should understand the value of tooth brushing .
- Parents may be nervous to brush in region of cleft especially following primary lip and palate surgery.
- They should be shown in detail about how to brush.
- A low fluoride children toothpaste containing no more than 600 ppm fluoride is recommended for children under 6 years.
- Twice brushing daily is recommended.
- In addition, twice yearly professional application of topical fluoride varnish is useful.

Stage three treatment

- Carried out during mixed dentition phase.
- As in the early years, the main emphasis throughout the mixed dentition stage should be on prevention of dental disease.
- In this phase, secondary alveolar bone grafting is common.

Alignment of the teeth



- A child with cleft palate may need surgery after intial cleft palate repair to replace missing bone in front of mouth and roof to the mouth.

- Successful grafting provides osseous envionment to permit spontaneous eruption of canine in grafted area and so should be undertaken after eruption of permanent incisors but before eruption of permanent canine.

- Alveolar bone grafting provides bony bridge to cleft in alveolar area.

Benefits of SABG:

1. Provides bony support for alar base to minimize nasal deformity.

2. Elimination of oronasal and nasolabial fistulae,hence avoiding nasal reflux of fluid and air.

3.Stabilization of maxillary segments,so as to facilitate future secondary corrective osteotomy if required.

4.Facilitation of teeth eruption into cleft site and achieve orthodontic movement adjacent to cleft site.

Timing of SABG:

- It is done at the age when growth inhibition effects of surgery are minimized and it can help maxillary canine and lateral incisor to erupt through the cancellous bone.

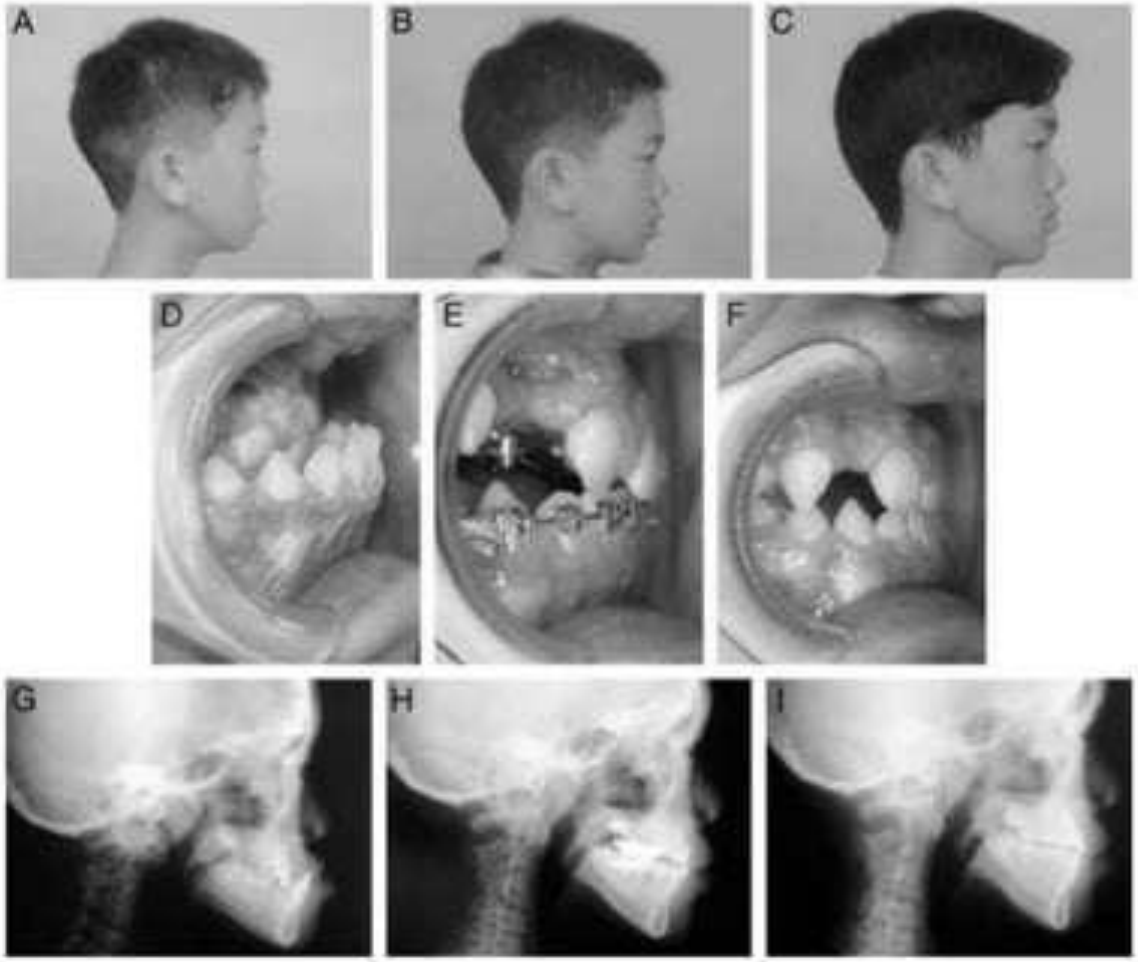
- It is done in mixed dentition stage after eruption of permanent incisors but before eruption of permanent canine.

Assessment for the need for bone graft

- Required careful clinical and radiological assessment
- Teeth in the vicinity of cleft area need to be assessed
- All retained deciduous teeth, supernumerary teeth and rudimentary teeth are usually extracted before bone graft

Pre bone graft orthodontics

- Maxillary arch expansion is performed preparatory to secondary bone grafting for which quad helix is appliance of choice.
- Nowadays repetitive weekly protocol of alternate rapid maxillary expansion and constriction are performed.



Clinical result of maxillary protraction using 2- hinged expander, repetitive weekly Protocol of Alt-RAM and intraoral protraction springs

Surgical technique

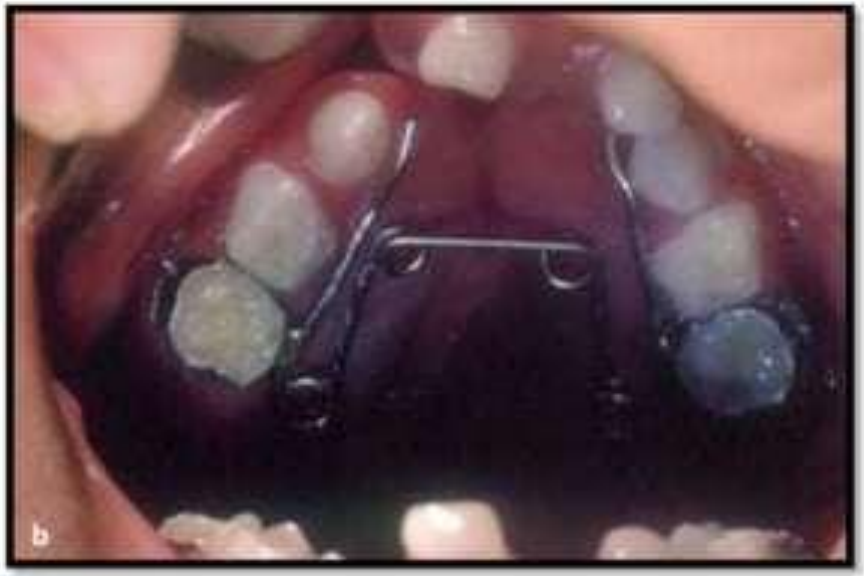
- Two surgeons work simultaneously, one on donor site and other on host site.
- It involves incision around margin of cleft alveolus
- Full thickness mucoperiosteal flap is raised to allow space for bone graft.
- Gingival mucoperiosteal is the most recommended one.

- Iliac bone is harvested, packed in cleft alveolus space. the flap is then sutured to ensure complete seal.

- Post bone graft follow up requires retention of the expansion either by full bonded appliance or by reinserting a passive expansion appliance. some include surgical exposure of canine and orthodontic traction.

Orthodontic procedures carried out during mixed dentition phase are:

1. Correction of anterior crossbite using removable or fixed appliance can be used like Z springs
2. Buccal segment crossbites can be treated using quad helix and expansion screws which are pre bone graft orthodontics



Stage four treatment

- Consist of treatment during permanent dentition.
- Presence of permanent dentition usually signs for the definitive orthodontic treatment.
- All local irregularities like crowding, spacing, crossbites and overjet overbite problems are corrected.
- Patients with hypoplastic maxilla may be given facemask to advance maxilla.

- Regular oral hygiene monitoring and instruction is necessary.
- Dietary counselling.
- Patients are to be made aware of excessive sugar intake.
- Following orthodontic treatment procedures, the patients should on retention phase to maintain orthodontic correction

Prosthesis can be given in case of missing teeth

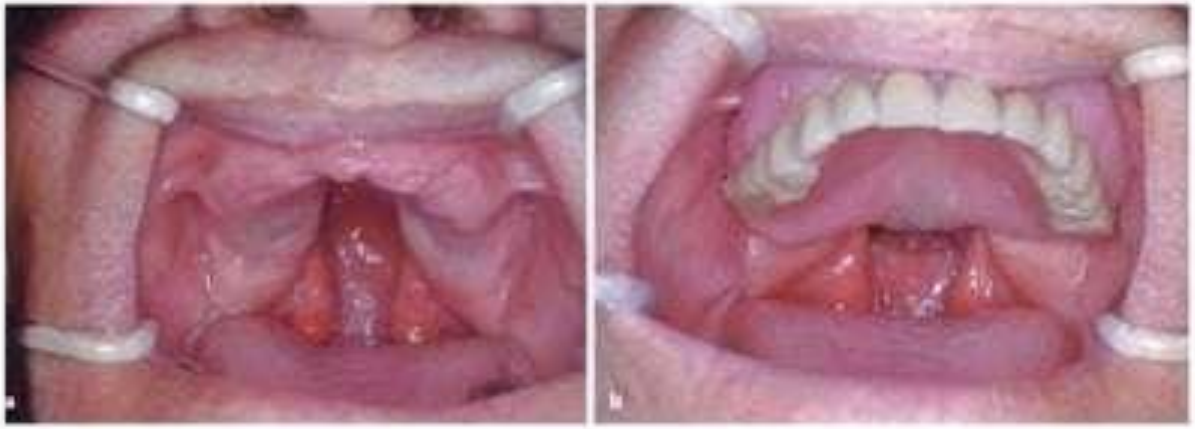


Fig. 38.10. A permanent cast gold speech appliance with partial palatal coverage for an adult with ten missing teeth

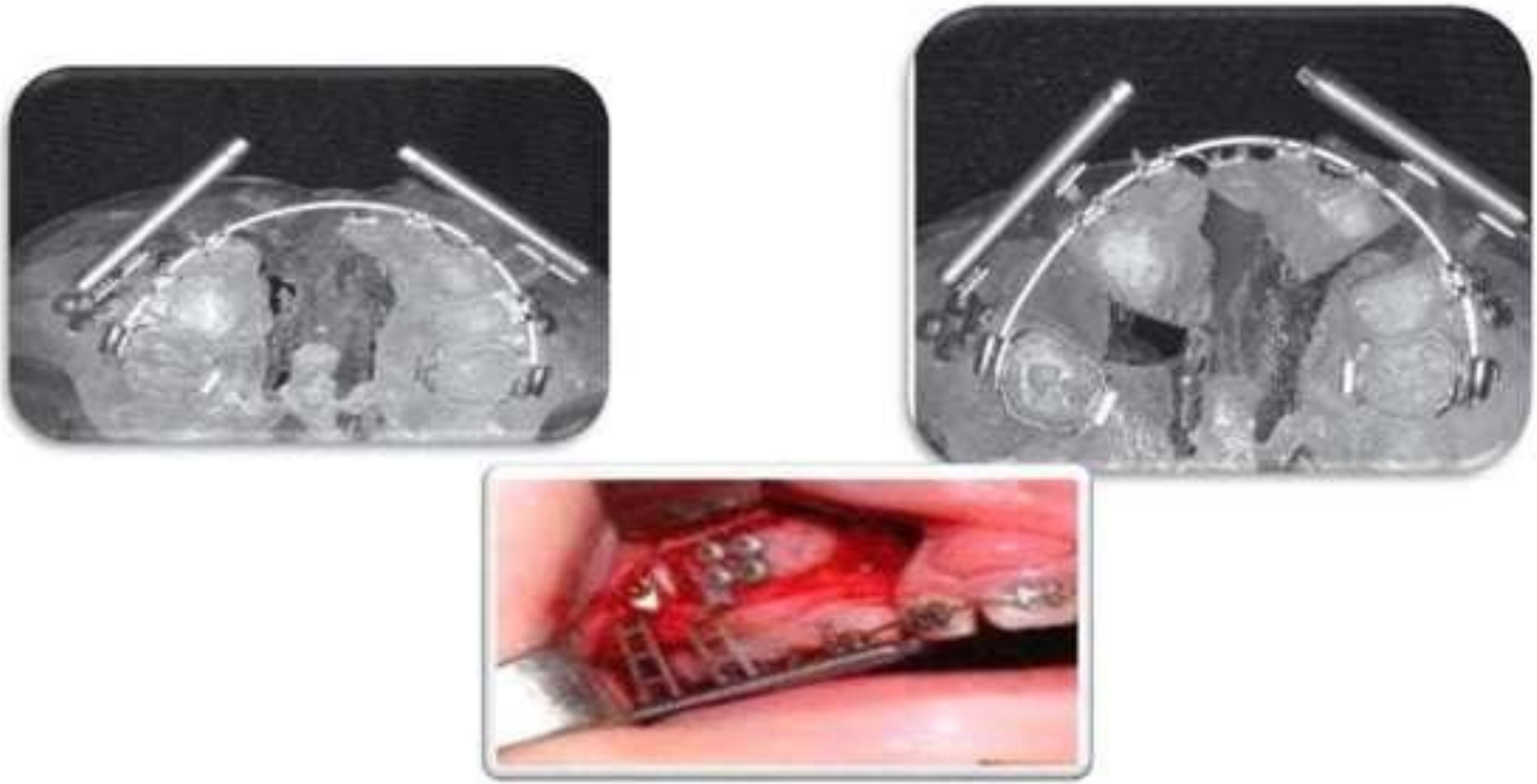


fig: Intraoral distraction device and segmental osteotomy for interdental distraction osteogenesis

Table 6C.1. Timing and sequencing of surgical-orthodontic treatment (conservative).

Age	Orthodontics	Surgery
After birth	CBCLP-external elastics (off head bonnet) over protruding premaxilla - no obturator	
3–4 weeks		Lip adhesion
6 months		Millard Forked Flap
18–30 months		von Langenbeck[a] (simultaneous closure of the hard and soft palate)
4–5 years	Correction of buccal crossbite only using a fixed quad helix palatal expander	
5–7 years	Fixed palatal retention	
7–8 years	Align anterior teeth prior to secondary alveolar bone graft (SABG)	Secondary bone graft using cranial or iliac crest bone
9–13 years	Full banded treatment with or without maxillary protrachon (Delaire faciai mask)	Nasal tip revision
13–17 years	Full orthodontics. Evaluate need for surgicaiorthodontics (Distraction osteogenesis or Lefort I)	Maxillo-mandibular surgery[b] Nasal-lip revision
17–18 years	Postsurgical orthodontics followed by prosthetics	Nasal-lip revsions

Post surgical complications

Cleft lip surgery

Unilateral

- Dehisence
- Infection
- Thin white roll
- tension

Bilateral

- Dehisence
- Thin white roll

Cleft palate repair

-Fistula

Velopharyngeal incompetence

-Continued VPI

-Stenotic side ports

Alveolar bone grafting

-Infected donor site

#Hematoma

-Failed grafts

#Dehisence

#Palatal prosthesis

Midfacial advancement

Le fort osteotomies

- -Malocclusion
  - -Infection
  - -Necrosis

Rhinoplasty

- -Alar stenosis

Role of ENT specialist,Speech pathologist and speech therapy

Ear

Problems

In cleft palate patients due to abnormal function of eustachian tube there is an increased risk of otitis media.

The parents are counselled for possible hearing loss.

ENT specialist, Audiologist and speech specialist work together to note the middle ear problems and progress in speech.

Speech therapy is started from 6 months of age and if needed continued till adulthood.

Surgical treatment of maxillary growth defects

- Roughly 1 in 4 patients with CLP develop defects in growth of upper mandible and midface.
- Resulting severe malocclusion can have a major detrimental impact on mandible function and facial appearance,which can be pschyological difficult for teenagers.
- A growth defect in maxilla cannot be corrected through orthodontics alone, but orthognathic surgery is required to correct alignment of maxilla.

- An maxilla growth defect is most often treated by Le fort I osteotomy.
- Distraction of maxilla,whereby maxilla is gradually pulled to desired position,is also possibility.
- Severe growth defect may require both procedures: distraction during the growth stage and osteotomy towards the end of growth.

- Mandible osteotomy is sometimes required to correct the facial structures.
- The nasal deformity typical of CP may be more pronounced as a result of LE Fort 1 osteotomy.
- A thorogh rhinoplasty operation is thus performed at this stage.

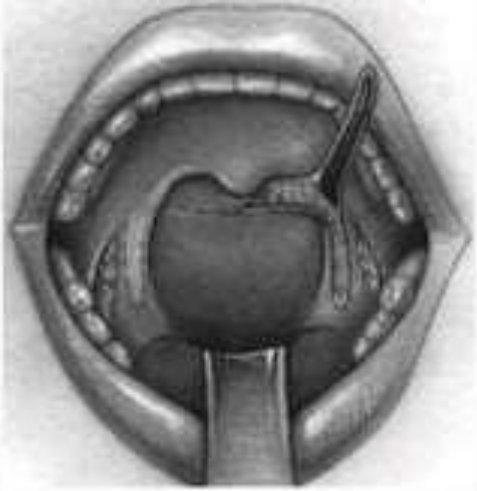
Lip and Nose Revision

- Nasal surgery(rhinoplasty) and lip surgery(revision cheiloplasty) may be necessary to improve the appearance and function of nose and lip which have been distorted with growth after initial surgery.

- The nose may appear flattened or there nay be asymmetry of the nose.

- There may be nasal obstruction due to a small nostril or deviated septum.
- Surgery to revise the appearance of lip and nose may take place before the child starts school or during teenage years,depending on recommendation of plastic surgeon.

Pharyngoplasty



- Children with repaired cleft palate may have a resulting condition referred to as "VPI" (Velopharyngeal Incompletence).
- This means that too much air escapes through the nose during speech,resulting in nasal speech.
- This occurs because the repaired soft palate is too short or does not move adequately.

- This condition is diagnosed primarily by the trained ear of speech pathologist.
- However,special diagnostic procedures such as nasoendoscopy and videofluoroscopy of speech may be required to directly visualize the soft palate during speech.
- This helps in directing the type of intervention ,which is the most appropriate.
- .

- With the goal of successful communication for the child with cleft lip and palate, the speech pathologist regularly monitors the development of using and understanding language and the development of speech abilities including pronunciation of words,the sound of voice and amount of nasality during speech

- Operation to improve the fuction of soft palate are pharyngeal flap or pharyngoplasty procedures.

- In this operations,some of the tissue from palate and back of throat are repositioned to help close off the escape of air through the nose.

Conclusion

- The key to successful rehabilitation of cleft lip and palate include flexibility and a interdisciplinary approach.

- Patient should be treated with sympathy and concern.
- Parents should not panic with the condition rather should provide special attention to such child .

REFERENCES

- Orthodontics the art and science fifth edition
  S.I Bhalajhi
-Textbook of pedodontics
  Shova Tandon
- Orthodontics -diagnosis and management of malocclusion and dentofacial deformities
  Om Prakash Kharbanda