Cleft Lip and Palate: The Effects on Speech and Resonance

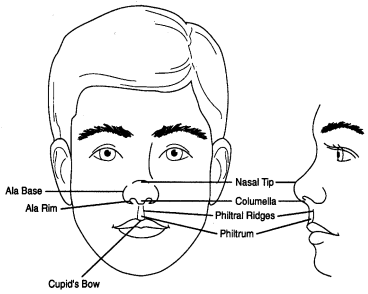
Ann W. Kummer, PhD, CCC-SLP
Cincinnati Children's Hospital Medical Center

Cleft lip and/or palate can have a negative impact on both speech and resonance. The following is a summary of normal anatomy, the types and causes of clefts, and the effects on speech and resonance.

Normal Anatomy

Nose

- **Columella** - the column that separates the nostrils and holds up the nasal tip
- **Ala base** - the base of the nostrils
- **Ala rim** - the rim of the nostrils
- **Philtrum** - the depression on the upper lip under the columella
- **Philtral ridges –** embryological suture lines above the lip that border the philtrum



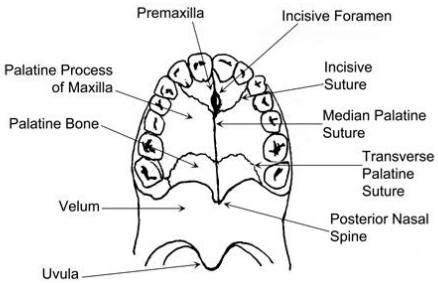
Facial Landmarks

Lip

- **Cupid's Bow** - the shape of the upper lip
- **White Roll** - border of the red part of the lips
- **Vermilion** - the red part of the lip

Hard Palate - consists of the premaxilla, the maxilla proper and the palatine bone.

- **Premaxilla** - triangular structure in the middle anterior portion of the palate. It is bordered by the incisive foramen and bilateral incisive structures, which extend between the lateral incisors and canines.
- **Palatine Process of Maxilla** - horizontal plates starting at the alveolar process, and bordered by the incisive sutures and the transverse palatine suture.
- **Palatine Bone** - horizontal plate which is bordered by the transverse palatine suture and completes the hard palate posteriorly.

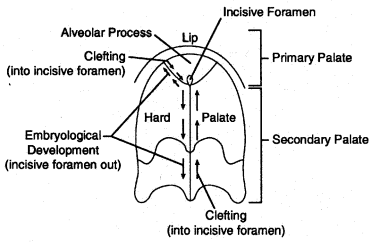


Velum (Soft Palate) - muscular portion of palate which is attached to the posterior edge of the palatine bone.

Cleft Lip/Palate (CLP): Types and Causes

Primary Palate (also called pre-palate or intermaxillary segment)
- Anterior to the incisive foramen and includes lip and alveolus
- Clefts can be:
  - complete (thru the lip and alveolus to the incisive foramen) or incomplete (i.e., lip only)
  - unilateral or bilateral

Secondary Palate
- Posterior to the incisive foramen and includes hard and soft palate
- Clefts can be:
  - complete (including the hard palate to the incisive foramen), incomplete (i.e., a portion of the velum only) or a submucous cleft



Embryology
- Primary Palate- lip and alveolus - 7 wks gestation
- Secondary Palate- hard and soft palate - 9 wks gestation

Embryological development goes from the incisive foramen out to the lip and then to the uvula; clefting occurs from the perimeter (the lip or end of the uvula) in to the incisive foramen. Development occurs independently.

Sequence of Palatal Closure
- Mandible grows forward
- Tongue drops down and goes forward
- Palatal shelves move from vertical to horizontal and begin to close at the incisive foramen

Pierre Robin Sequence (pronounced Robann)
- Micrognathia is the underlying cause:
  - Can be due to mechanical forces in utero
  - Can be part of a syndrome
- **Sequence:**
  - Micrognathia (small jaw) which causes…
  - Glossoptosis (posterior tongue position) which causes…
  - Wide bell-shaped cleft palate

Submucous Cleft:
Some or all of the following:
- Bifid or hypoplastic uvula
- Zona pellucida (bluish area)
- Notch in the posterior border of the hard palate
- Abnormal insertion of muscles, causing an upside-down V-shape with phonation

Causes of Clefts

Cause is usually multi-factorial (genetic predisposition and environmental factors)

- Genetic factors
- Environmental teratogens: maternal nutritional deficiencies or metabolic imbalance; infections (rubella or CMV); drugs (valium, Dilantin); environmental toxins; radiation

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Effects of Cleft Lip and Palate on Speech

Basic Principles

- Whenever there are abnormalities on the *outside* of the head (face and/or skull)… always look for corresponding *structural abnormalities* on the *inside* of the head.
- Whenever there are abnormalities on the *inside* of the head (face and/or skull)… always look for corresponding *functional abnormalities.*
- Outside anomalies: Typically affect appearance and aesthetics
- Inside anomalies: Typically affect function (cognition, language, speech, resonance, hearing, feeding, swallowing, etc.)
- Structural anomalies can affect speech by causing:
  - Obligatory distortions:
    - Function (articulation placement) is normal
    - Speech distortion is due to abnormal structure only
    - Treatment: Correct structure
    - Examples: Lateral lisp, despite normal tongue position, due to interference of maxillary teeth; hypernasality due to velopharyngeal insufficiency
  - Compensatory errors:
    - Function (articulation placement) is abnormal
    - Articulation placement is altered in response to structural abnormality
    - Treatment: Correct structure and then speech therapy to correct function
    - Examples: Lateral lisp due to abnormal tongue position to avoid interference of maxillary teeth; pharyngeal fricatives to compensate for VPI

The main causes of defective speech following a history of cleft lip/palate are as follows:

Primary Palate Clefts

- Nasal deformities
  - Include deviated septum, nasal cavity blockage, choanal atresia, and stenotic naris
  - Can cause hyponasality or cul-de-sac resonance
- Short upper lip
  - May be relative due to position of premaxilla, due to dysmorphology or the repair
  - Affects bilabial competence at rest and production of bilabial phonemes

- Dental/occlusal abnormalities
  - Dental abnormalities: Missing teeth in the line of the cleft, supernumerary or malpositioned teeth, anterior or posterior crossbite
  - Malocclusions: Open bite, protruding premaxilla, Class II or Class III malocclusion
  - Can cause palatal-dorsal productions for anterior sounds
  - Particularly affect articulation of sibilants (/s/, /z/, / ʃ/, /ʒ/, /ʧ/, /ʤ /)
  - Can affect labio-dentals (f, v); lingual-alveolars (t, d, n, l); bilabials (p, b, m)
  - Speech may include obligatory distortions (due to abnormal structure) or compensatory errors (abnormal structure and function). Obligatory distortions cannot be corrected with speech therapy!!!

Small Oral Cavity Size

- Low, flat or narrow arch can cause oral crowding
- When there is crowding, the tongue will seek an opening and affect articulation
- A small cavity size can also cause cul-de-sac resonance (which sounds like mumbling)

Effect of an Oronasal Fistula

- Size: Larger are more symptomatic.
  - If large enough, can cause hypernasality, nasal emission and compensatory articulation
- Location: Above tongue tip will be symptomatic for tongue-tip sounds

Maxillary Retrusion/ Midface Deficiency

- Can restrict the pharyngeal and nasal airway
- May cause hyponasality

Hearing Loss

Normal middle ear function

- At rest, Eustachian tube is closed
- During swallowing, the tensor veli palatini muscle opens the Eustachian tube to release negative pressure and allow fluids to drain

With cleft palate

- Tensor veli palatini muscle is abnormal, so tube doesn't open
- Negative pressure builds and fluids can't drain out
- Causes temporary (conductive) hearing loss
- Can affect articulation and language development in the short term

Treatment of middle ear disease

- Insertion of PE (pressure equalizing) tubes
- Regular otologic (ear) care

Velopharyngeal Dysfunction: See other handout.