

Cleft Palate & Craniofacial Anomalies

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Department Chair & Professor

1



2

<https://cahs.ecu.edu/speechimaging/>

Cleft Palate Speech Imaging & Visualization Laboratory

3

Presentation Overview

8:30-9:30	Cleft Palate Overview
9:30-10:30	Review of Anatomy & Physiology
10:30-10:45	Break
10:45-12:00	Anatomy & Physiology Assessment
Lunch break	
1-2:30	Assessment & Treatment of VPI
2:30-2:45	Break
2:45-4:15	Assessment & Treatment of Cleft Speech Disorders
4:15-4:30	Questions


4

Cleft Palate Overview

5

5


Cleft Palate +/- Lip



- 2nd Most common in US
- Effects 1:880
- Multiple surgeries
- Lifelong team care

6

Cleft Palate +/- Lip



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7

Treatment Decision based on:

- Perceptual Speech Ax
- Imaging/Instrumentation







8

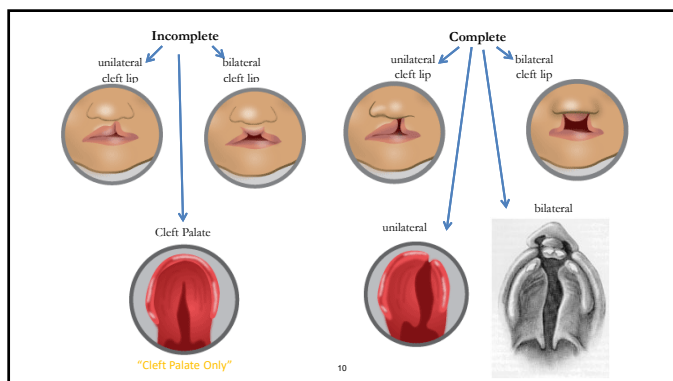
Cleft Palate

- **Complete Cleft** = before 9th week (goes all the way into nose); includes lip, alveolus, hard palate, and velum
- **Incomplete Cleft** = during 9th week (won't go into the nose entirely)

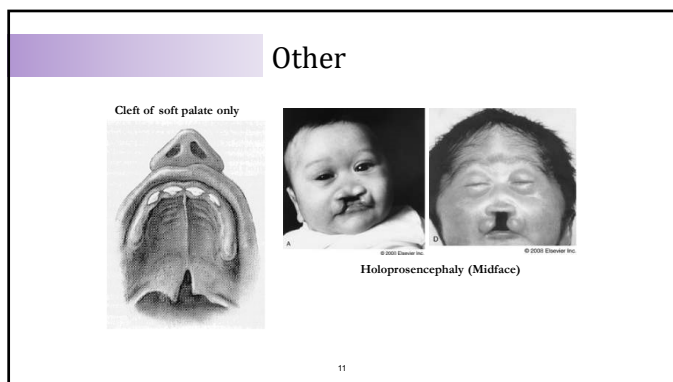
Types of Cleft Lip

 Normal	 Complete (Into Nostril)
 Incomplete	 Bilateral

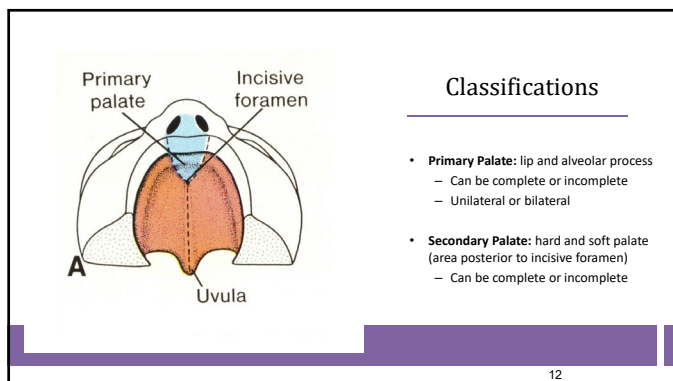
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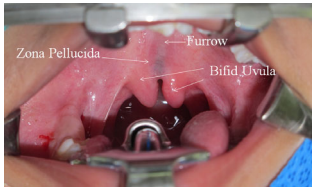


Classifications

- **Primary Palate:** lip and alveolar process
 - Can be complete or incomplete
 - Unilateral or bilateral
- **Secondary Palate:** hard and soft palate (area posterior to incisive foramen)
 - Can be complete or incomplete

12


Classifications Submucous cleft palate (SMCP)



- Mucous membrane is intact
- Patient may have history:
 - Hearing issues
 - Feeding issues/troubles
 - Onset of hypernasality
 - May be related to adenoid involution
- See:
 - bifid uvula
 - furrow along midline
 - zona pellucida
 - bony notch where posterior nasal spine should be
 - anterior insertion of levator muscle

13

13



Submucous Cleft Palate

14

Incidence

1 in 880 births (CDC)

Cleft types:

- 25% lip only (80% are unilateral, 70% of the time it is on the left)
- 25% palate only
- 50% lip and palate

Ethnicity:

- Most common in Native Americans, then Asians, Caucasians, African Americans

Gender:

- Males > females with combination clefts
- Males > females with severe forms
- Females > males with palatal clefts only

15

15

Clefts & associated abnormalities

- 14-15% have at least one other abnormality, varies based on cleft type
 - Lip: 7%
 - Lip/palate: 14%
 - Palate only: 24%
- Parental age and birth order have no *direct* effect

Hadadi et al., JPRAS 2017 (34) 5-15

16

Etiology

- Multifactorial Inheritance:** predisposition is exasperated by environmental factors
 - Genetic + Environmental
 - Genetic/Familial:* if mother or father has cleft palate and one child already has cleft palate, next child is 17% more likely
 - Environmental/Teratogens:* Drugs (Valium, Dilantin, Accutane), smoking, insufficient folic acid., maternal diabetes.
- Reported etiology:**
 - 20% inheritance
 - 3-5% chromosomal
 - 65% environmental or unknown

17




Syndromes

- Trisomy 13**
 - 60-80% will have CL/P
 - Holoprosencephaly: failure of brain to divide & causes midline cleft
- Wolf-Hirschhorn Syndrome**
 - Hypertelorism, microcephaly
- Van der Woude Syndrome**
 - Most common syndromic cause of CL/P
 - Lip pits in 80% cases
- FAS**
 - Numerous facial features + CLP

18

Syndromes

- **Stickler Syndrome**
 - Most common cause of cleft palate
 - Eye problems (myopia), micrognathia, flat facial profile, epicanthal folds, midface hypoplasia
- **Velocardiofacial Syndrome (22q11.2 Deletion Syndrome)**
 - Cleft palate &/or VPI (~20% have VPI)
 - Heart defects, dysmorphic facial features
 - Thin upper lip, long face, micrognathia, microcephaly, short stature, long tapered fingers.








19

19

Pierre Robin Sequence

- **Cleft Palate**
 - Horseshoe shaped cleft palate only
 - High vault
- **Glossoptosis & micrognathia**
 - Nasopharyngeal airway (tube~3-4mo)
 - Tracheostomy (~ up to 14 mo)
 - Mandibular osteogenic distraction








20

20

Craniosynostosis

- **Premature fusion of cranial sutures; very common among syndromes**
 - Growth is restricted perpendicular to the suture that is closed prematurely.
 - Craniotomy and skull reshaping
- **Syndromes**
 - Seathre-Chotzen Syndrome
 - Crouzon Syndrome
 - Apert Syndrome
 - Pfeiffer Syndrome

21

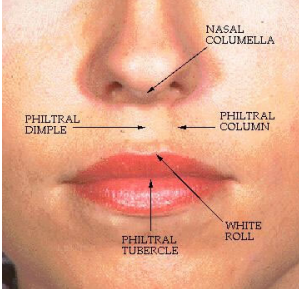
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Anatomy & Physiology Review

22

AP Review

23

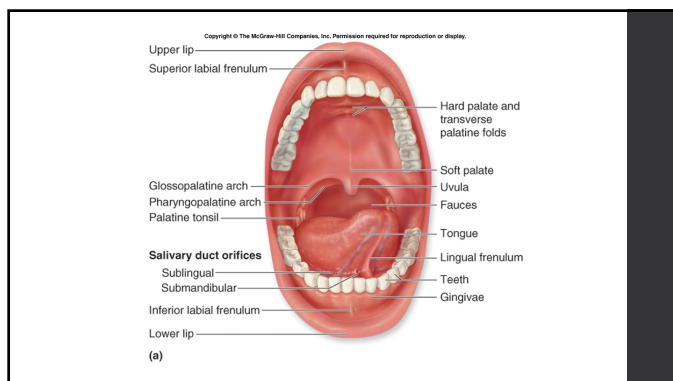


Facial Landmarks

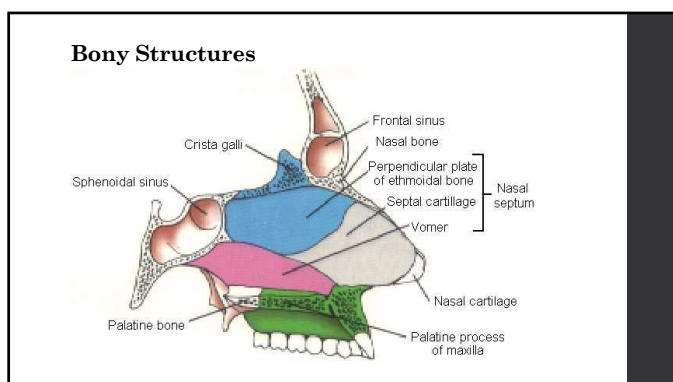
- Nasal tip
- Alar base and rim
- Columella
- Philtral ridges
- Philtrum
- Cupid's bow

The diagram shows a close-up of a person's face with arrows pointing to various facial features: NASAL COLUMELLA (bridge of nose), PHILTRAL DIMPLE (left side of upper lip), PHILTRAL COLUMN (center of upper lip), PHILTRAL TUBERCLE (center of upper lip), and WHITE FOLL (corner of upper lip).

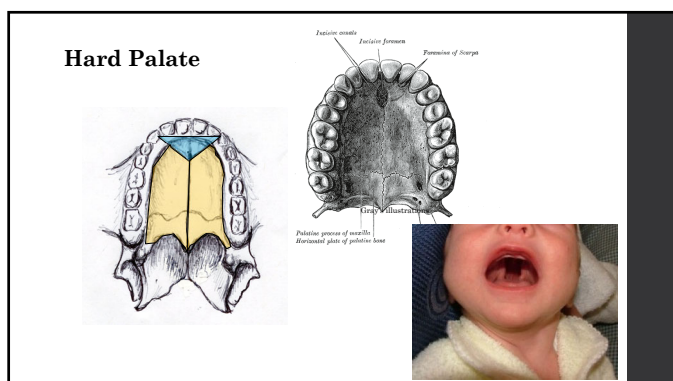
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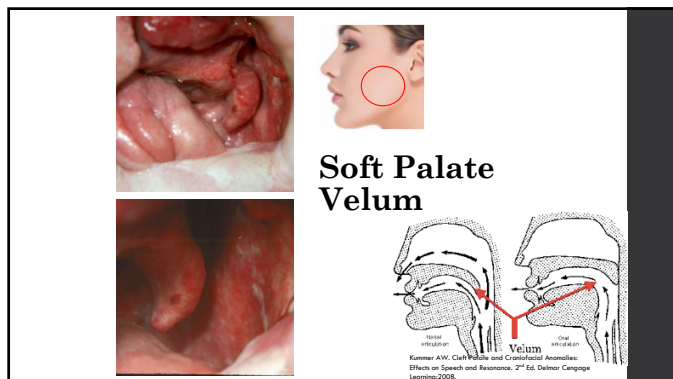
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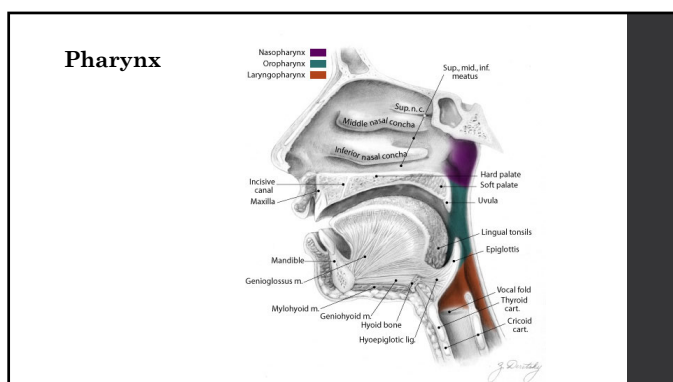
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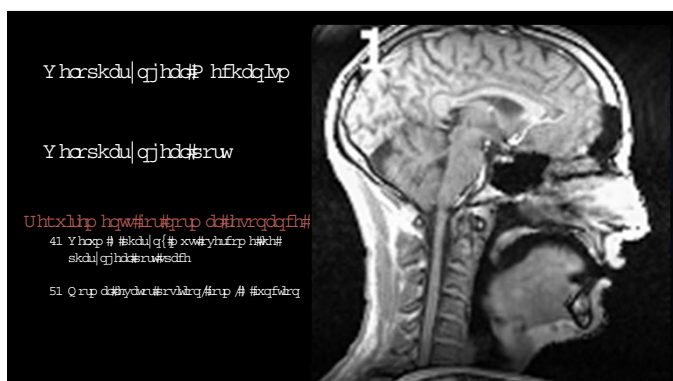
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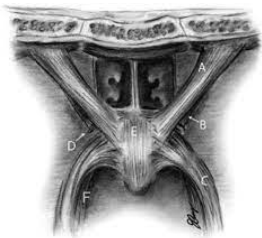
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30

Velopharyngeal Muscles

- Levator Veli Palatini (A)
- Tensor Veli Palatini (B)
- Musculus Uvulae (E)
- Palatoglossus (F)
- Palatopharyngeus (C)
- Superior Pharyngeal Constrictor
- Salpingopharyngeus

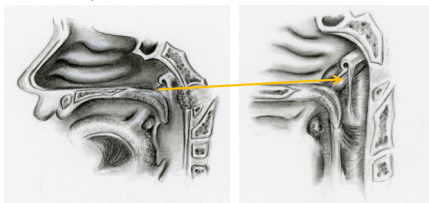


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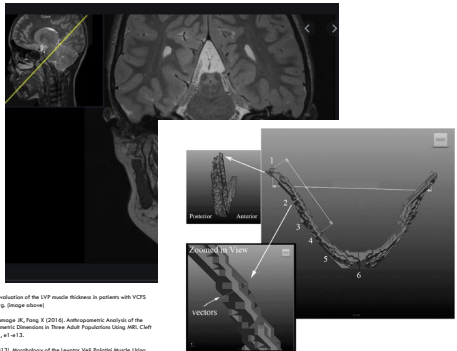
Velopharyngeal Muscles

1. Levator veli palatini:

- Mass of velum
- Responsible for velar elevation



32

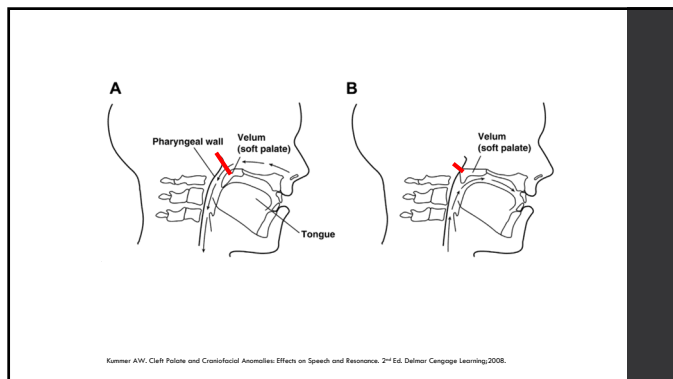


Park, Ahn, Hong, & Bae (2013). Evaluation of the VPM muscle thickness in patients with VCPD using MRI. J Korean Acad Radiol, 24(1), 103-108.

Perry, R., Kuffel, DR, Series SP, Gungor, M, Ford, J (2014). Anthropometric Analysis of the Velopharynx and Palatal Cross-sections Dimensions in Three Adult Populations Using MRI. Cleft Palate-Craniofacial Journal, 51(1), 44-51.

Perry, R., Kuffel, DR, Series SP (2011). Morphology of the Levator Veli Palatini Muscle Using Magnetic Resonance Imaging. Cleft Palate-Craniofacial Journal, 38(1), 44-79. [Image]

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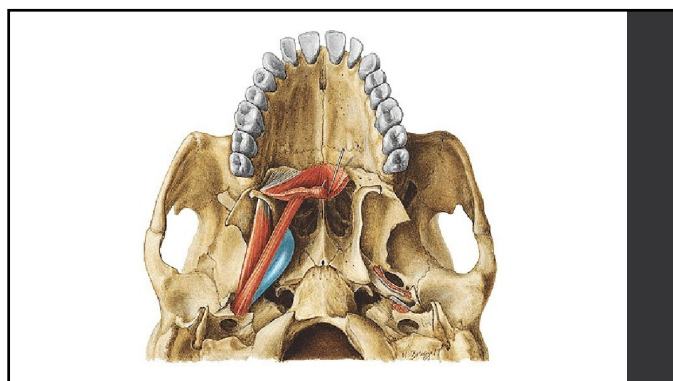
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Velopharyngeal Muscles

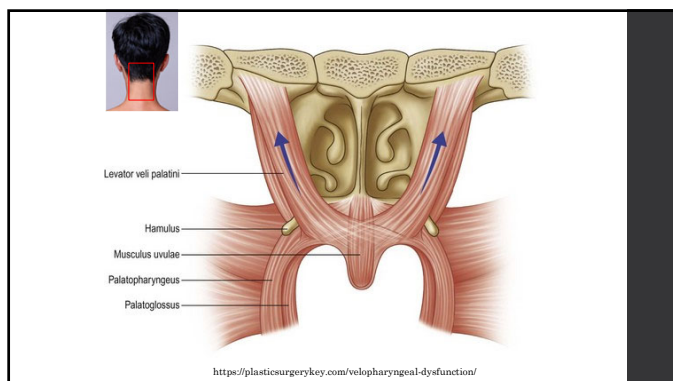
2. Tensor veli palatini:
Opens Eustachian tube (ME aeration and drainage)

*Limited contribution to VP function for speech

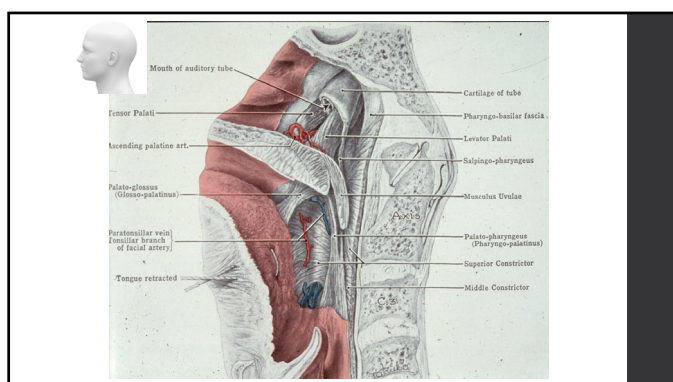
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36



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38

Velopharyngeal Muscles

3. **Superior pharyngeal constrictor**
 - Medial displacement of lateral pharyngeal walls
4. **Salpingopharyngeus**
 - Courses vertically along lateral pharyngeal walls; little functional significance

39

Velopharyngeal Muscles

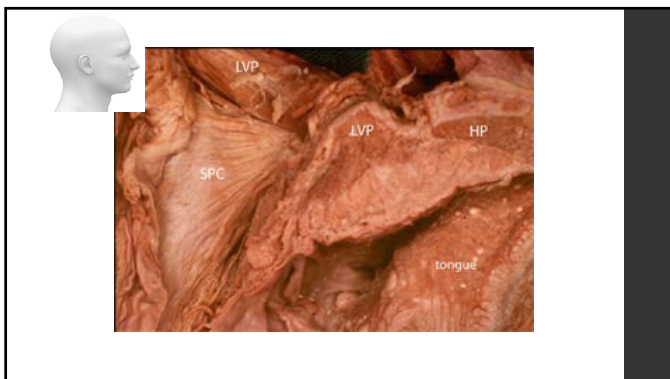
- 6. **Palatoglossus muscle**
 - Antagonist to levator
 - Depresses velum
 - Contained within the anterior faucial pillar

- 7. **Palatopharyngeus**
 - Horizontal fibers: sphincter action of lateral and posterior pharyngeal walls pulling them medially
 - Vertical fibers: lowering the velum; elevation of larynx

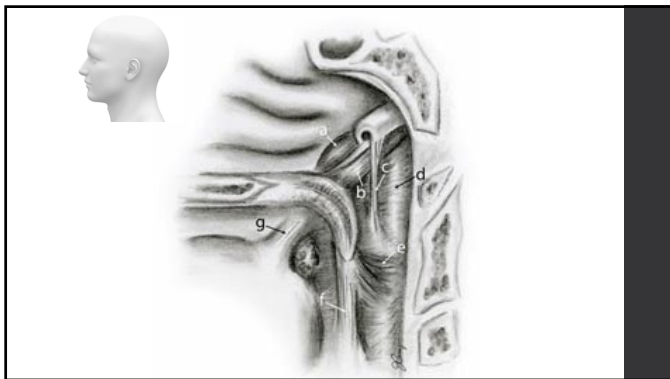
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46

Muscles of Velopharyngeal Closure

Closing the Velopharyngeal Port:

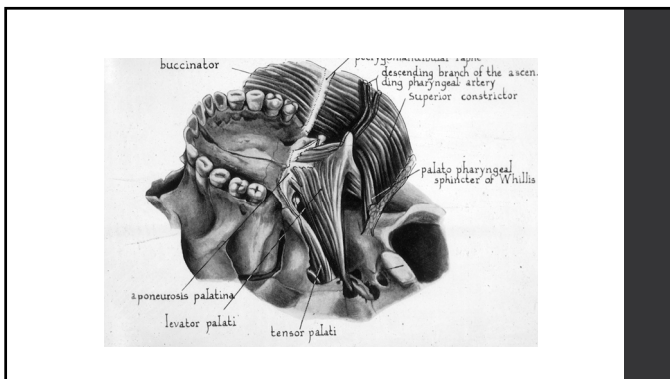
- * Levator veli palatini: Elevates/retracts velum
- * Superior pharyngeal constrictor: Medial displacement of lateral pharyngeal walls
- * Musculus uvulae: stiffness and bulk to velar knee

Opening the Velopharyngeal Port:

- * Palatoglossus: Depresses velum
- * Palatopharyngeus: lowering the velum; elevation of larynx

Olszewski, Woodson (2019). Palatal anatomy for sleep apnea surgery. *Sleep Medicine and Science*, 10. doi.org/10.1002/hs2.238

47

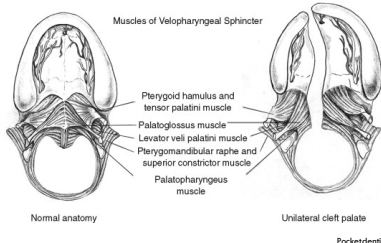


48

Cleft Vs. Normal Anatomy & Physiology

What is different?

- Variations in VP Muscles

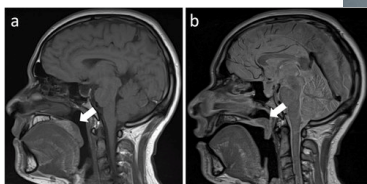


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Levator Veli Palatini

- Primary muscle for elevation and retraction of the velum
- Seen as a continuous sling in noncleft anatomy



Ettema, Kuehn, Perlman, and Alperin, 2002

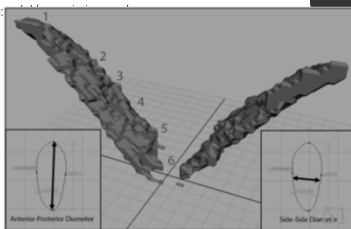
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Levator Veli Palatini in CLP

Overall, LVP is smaller for adults with cleft palate

- Smaller muscle volume; separated at midline in some cases
- Smaller circumference at the origin and midline
- Smaller anterior-posterior diameter at midline
- Smaller superior-inferior diameter at the point of insertion into the velum and midline



(Kotlarek et al., 2017)

51

Levator Veli Palatini in CLP

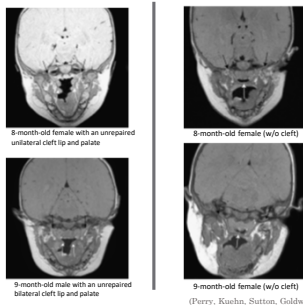
- Variable levator muscle length and thickness in adult males with cleft (Ha et al., 2007)
- Smaller measures of distance between points of levator origin, levator muscle length and levator thickness in adults with cleft compared to non-cleft (Ettema et al., 2002)
- Thinner levator muscle in children with repaired cleft palate (Tian et al., 2010)

Variations in LVP anatomy exists in individuals w/CLP even in existence of normal resonance.

52

52

Cleft vs. Non-cleft (Infants)

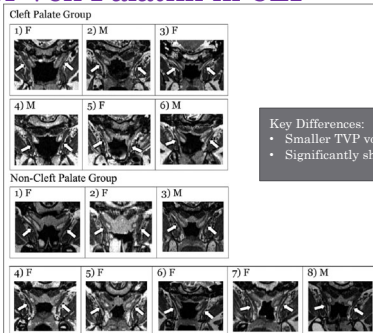


(Perry, Kuchin, Sutton, Goldwasser, & Jeros, 2011)

53

53

Tensor Veli Palatini in CLP



Key Differences:
 • Smaller TVP volume
 • Significantly shorter

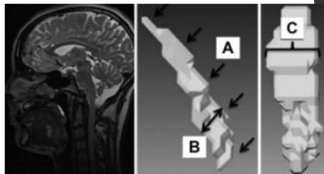
George et al. (2018). Differences in the Tensor Veli Palatini between Adults With and Without Cleft Palate Using High Resolution Three-Dimensional Magnetic Resonance Imaging. *Cleft Palate Craniofacial Journal*.

54

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Musculus Uvulae in CLP

- MU in participants with repaired cleft palate is significantly shorter and has less volume than participants without cleft palate.
- May contribute to velopharyngeal insufficiency in children with repaired cleft palate.



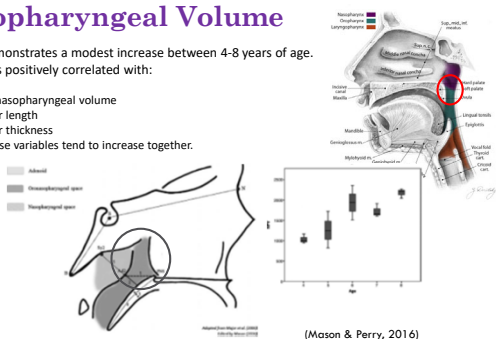
[Perry, Chen, Kotlarek, Haensler et al., 2019]

55

55

Nasopharyngeal Volume

- NPV demonstrates a modest increase between 4-8 years of age.
- NPV was positively correlated with:
 - Age
 - oronasopharyngeal volume
 - velar length
 - velar thickness
- These variables tend to increase together.



[Mason & Perry, 2016]

56

56

Nasopharyngeal Volume in CLP

- NPV is different between cleft types
- Participants with bilateral cleft lip and palate demonstrated greater NPVs than those with UCLP and submucous cleft palate



[Mason & Perry, 2016]

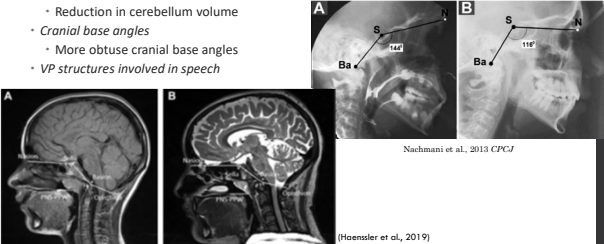
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57

Variations in Anatomy in 22q11.2 DS

Anatomical differences

- Brain volumes
 - Reduction in brain volume and white & grey matter
 - Reduction in cerebellum volume
- Cranial base angles
 - More obtuse cranial base angles
 - VP structures involved in speech

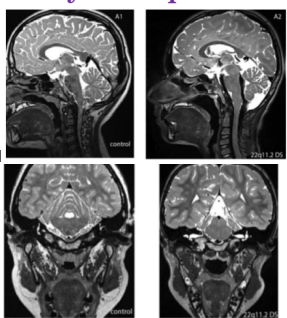


Nachmani et al., 2010 CPCJ
 (Hoensler et al., 2019)

58

Variations in Anatomy in 22q11.2 DS

- Thinner velum
 - Due to absence of MU
- Greater pharyngeal depth



- Shorter LVP
- Thinner LVP
- Narrower origin-to-origin distance
- Greater angle of origin
- No MU

(Kollars, Boylis, Kirschner, Bates, Smith, Fang, 2019)

59

Variations in Anatomy in SMCP

- Variability in physically overt features
- Bifid uvula
- Muscular diastasis
- Palpable notch of the hard palate
- Short palate with insufficient closure
- Hypoplastic or absent MU




Figure 46-1 A. Classic overt submucous cleft palate with a bifid uvula and a more palatally resulting from division of the buccal muscle, with the palate joined to the maxilla only by a thin overlying mucosa. B. A patient with an occult submucous cleft palate. The possibly start of a bifid uvula is visible; however, at rest, the submucous cleft palate is not clearly visible. C. There is some degree of pharyngeal muscular diastasis, resulting in a notch of the hard palate. Division of the uvula reflects the result of contraction of the buccal muscle, which is abnormal located in the palatopharyngeal position and insert on the posterior margin of the hard palate.

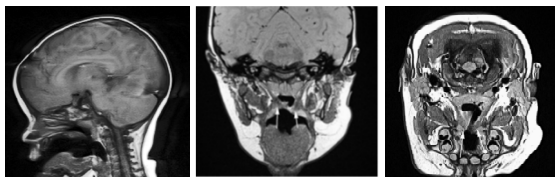
Gossain & Larrier
[https://www.kidney-international.com/article/S0095-9169\(14\)00000-0](https://www.kidney-international.com/article/S0095-9169(14)00000-0)

60

(Chadon, 1954; Cook, Shestakov, Duvall, & Lewis, 1978; Garcia Velasco, Yanes, Hernandez, & Marquet, 1988; Gossain, Conley, Marks, & Larson, 1996; Gossain, Conley, Santos, & Dreyer, 1999; Lewis, Cook, & Shestakov, 1985; Miller & Gilroy, 2009)

Variations in Anatomy in SMCP

- Unrepaired SMCP of a 15-month-old
- Discontinuous LVP sling with attachment of muscle bundles on hard palate

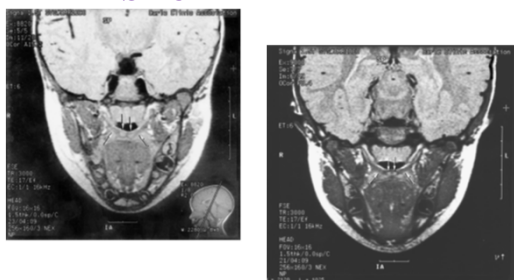


(Perry, Kushn, Wachtel, Bailey, Logothetis, 2012)

61

61

SMCP

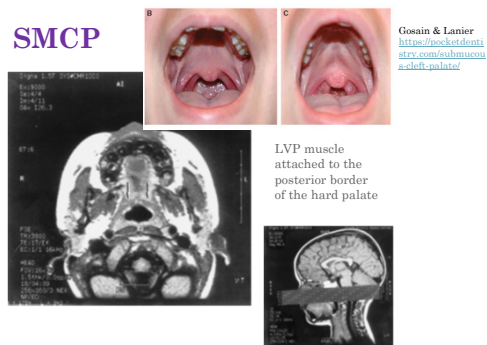


(Kushn, Ettema, Goldwasser, Burkmeier, Wachtel, 2001)

62

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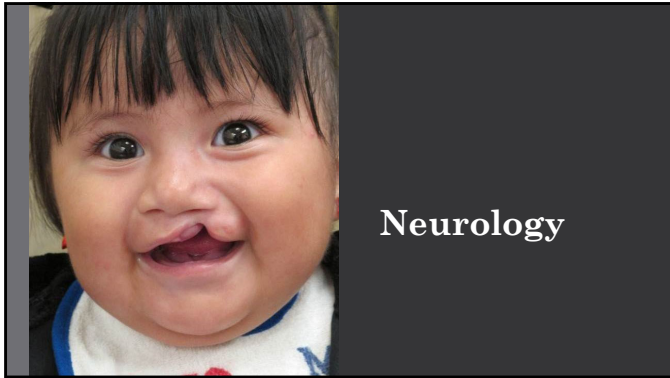
SMCP



(Kushn, Ettema, Goldwasser, Burkmeier, Wachtel, 2001)

63

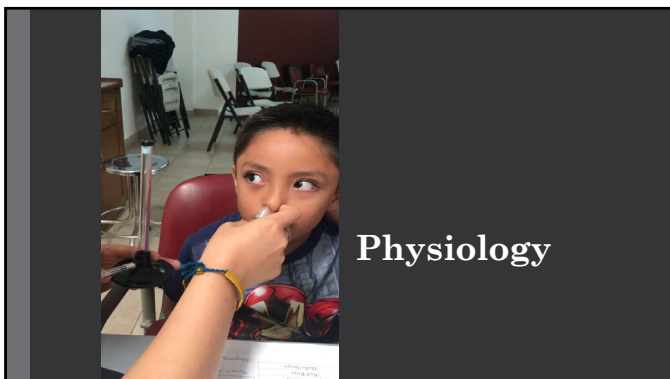
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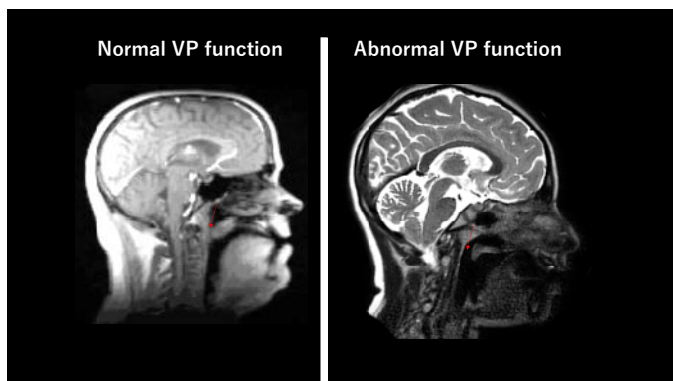
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Motor Innervation	Sensory Innervation
<p>Muscles for Velopharyngeal Closure come from the Pharyngeal Plexus</p> <ul style="list-style-type: none"> • Glossopharyngeal (CN IX) • Vagus (X) <p>Palatoglossus</p> <ul style="list-style-type: none"> • Hypoglossal (CN XII) <p>Tensor veli palatini</p> <ul style="list-style-type: none"> • Trigeminal (CN V) 	<ul style="list-style-type: none"> • Hard & Soft palate—greater and lesser palatine nerves (which arise from CN V) • Faucial and pharyngeal regions—glossopharyngeal nerve (CN IX) • Possible interaction with facial (CN VII) & Vagus (CN X)

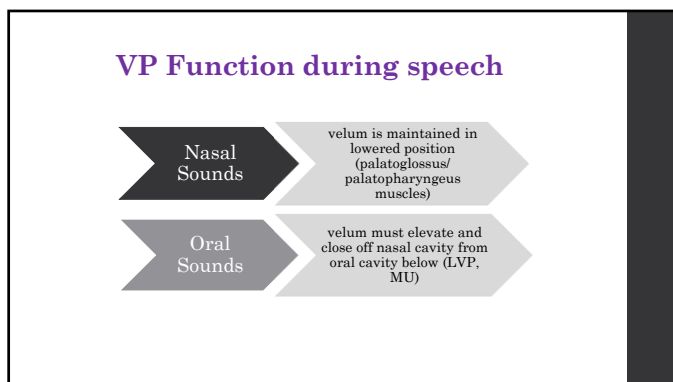
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66



67



68

Oral Sounds

1. Posterior and superior movement of velum
2. Anterio-medial movement of pharyngeal walls
3. Complete contact of velum against posterior pharyngeal wall

Cincinnati Children's Hospital, VPI Clinic;
Resource by Dr. Ann Kummer

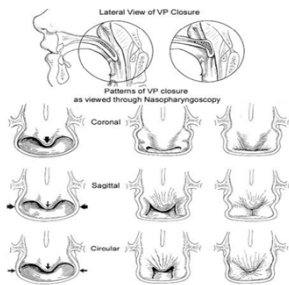
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Physiology

• Several closure patterns

• **Contact on:**

- Posterior Pharyngeal Wall
- Passavant's ridge
- Adenoid pads to create closure



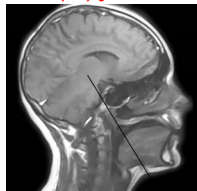
(Croft, Sherintan, & Rakoff, 1981; Kummer, 2020)

70

Velo-Adenoid Closure



Velopharyngeal Closure



71

Passavant's Ridge



72

Adenoid Pad

May be...

Enlarged:

- Prevent airtight seal
- Cause small gaps=nasal air emission

Irregular:

- Cause obstruction: cul de sac resonance
- May interfere with LPW movement
- May prevent airtight seal

Adenoidectomy can cause VPI:

- Usually temporary (resolves in 6 mo)
- May persist especially in submucous cleft

Resources by Dr. Aron Katsman

73

Variations in VP Anatomy & Function

Age

- Children (closure at age of the child matters and should inform the clinical decision)
- Adults show velar height

Gender

- Most VP structures show pubertal effect
- Adult males have greater velar height and stretch

Take-away

Age: when considering placement of pharyngeal flap, the age of the child matters and should inform the clinical decision

Gender: Anatomic data from males and females, especially post-pubescent, is not comparable

74

Variations in VP Anatomy & Function

Race

- Velar length
- Black men do
- In children, r
- levator m
- velar leng
- velar thic
- adenoid s
- velar kne

Take-away

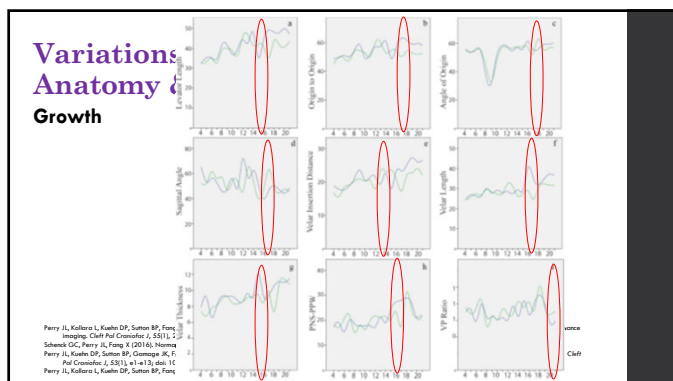
Race: Anatomic data from different racial groups, regardless of the age, is not comparable

References: Perry J, Hader S (2016) Examining Age, Sex, and Race Characteristics of Velopharyngeal Structure in 4- to 9-Year Old Children Using Magnetic Resonance Imaging. *Child Palate-Craniofacial Journal*. 55(1):21-34.

Kobler L, Perry JL, Hader S (2016) Racial variation in velopharyngeal and craniofacial morphology in children: An imaging study. *J Speech Lang Hear Res*. 59(1):27-38.

Perry J, Kuo DL, Sabin BP, Ganga JK, Pang K (2016) Anthropometric Analysis of the Velopharynx and Related Craniofacial Dimensions in Three Adult Populations Using MRI. *Child Palate-Craniofacial Journal*. 53(1):41-53.

75



76

Growth

Group 1 (4-10 years), Group 2 (11-17 years), Group 3 (18-21 years)

- Significant sex effects were evident for levator length ($p = .011$), origin to origin ($p = .018$), and velopharyngeal length ($p = .011$). Significant effects became increasingly apparent between male and female populations.
- Boys, in general, showed a decrease in levator length (Perry et al., 2014).
- The sagittal angle values (inverse of the sagittal angle) showed a decrease in boys compared to girls.

Take-away

Growth: Sexual dimorphism apparent primarily post-pubertal; values from males/females should not be compared. Values such as placement of the velum against PPW also vary by age, sex, and race. **Be careful in making comparisons across factors of age, race, sex.**

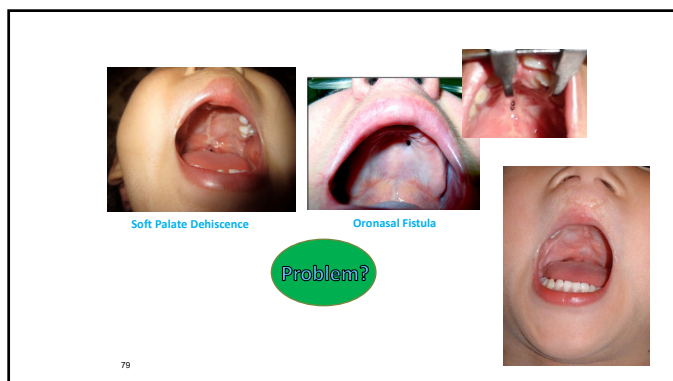
77

Review of anatomy

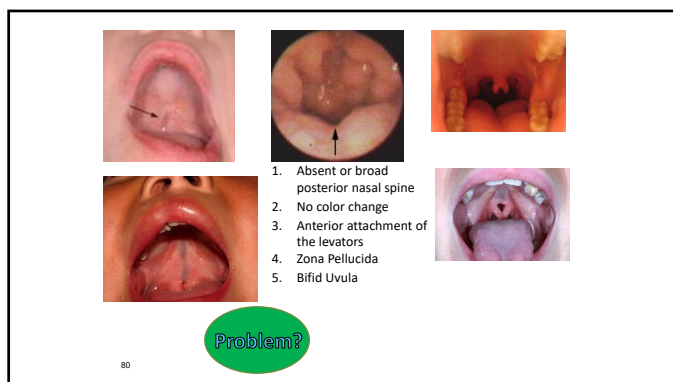
What do you see?
 What do you conclude?

78

78



79

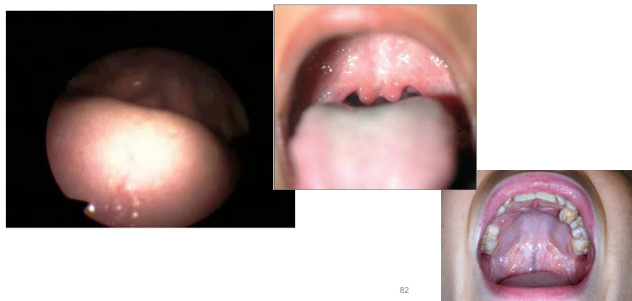


80



81

Oral Exam Findings...



82

High Arched Palate

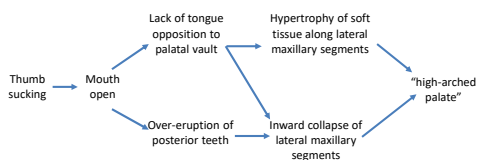


Problem?

83

83

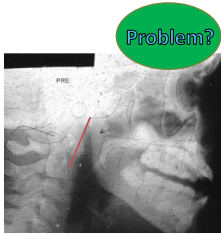
Note on High Arched Palate



Sequence of events cascading from thumb sucking and leading to subjective impression of high arched palate. The high arched palate often mistakenly assumed to be a cause of speech problems.

84

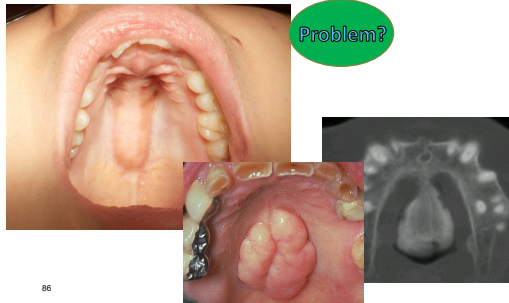
Deep Nasopharynx



85

85

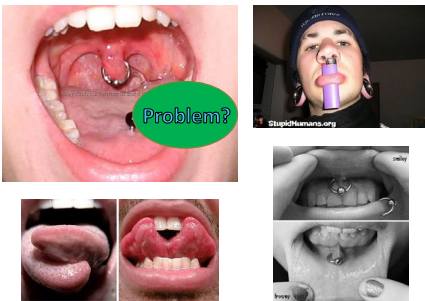
Oral Exam Findings...



86

86

Piercings and Other weird stuff



87

Ankyloglossia

Problem?

88

Tongue/Oral Cavity Size

Problem?

89



Nasopharyngeal Airway Obstruction

<p>Nasal</p> <ul style="list-style-type: none"> ▪ Nasal Cleft Deformities ▪ Allergic Rhinitis ▪ Vasomotor Rhinitis ▪ Bacterial URI ▪ Choanal Atresia ▪ Nasal Cavity Mass ▪ Septal Deviation ▪ Turbinate Enlargement ▪ Nasal Hygiene ▪ Maxillary Retrusion (seen in Down, Apert, Crouzon Syndromes) 	<p>Pharyngeal</p> <ul style="list-style-type: none"> • Hypertrophied Tonsils • Hypertrophied Adenoids • Complications of Cleft Palate/Craniofacial and Airway surgery • Pharyngoplasty: Pharyngeal Flap/Sphincter • Stenosis following T&A • Mandibular retrusion (Pierre Robin Sequence)
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90

90

Enlarged Tonsils

Problem?

91

91

International Journal of Pediatric Otorhinolaryngology, 14 (1987) 57-63
Elsevier
PDR 00464

Velopharyngeal insufficiency due to hypertrophic tonsils. A report of two cases

Karen MacKenzie-Stepner¹, Mary Anne Witzel^{1,2}, David A. Stringer^{2,3}
and Randy Laskin¹

Departments of ¹ Speech Pathology and ² Radiology, The Craniofacial Treatment and Research Centre, The Hospital for Sick Children, Toronto, Ont. (Canada) and ³ Faculty of Medicine, University of Toronto, Toronto, Ont. (Canada)

(Received 27 May 1987)
(Accepted 1 September 1987)


Key words: Velopharyngeal insufficiency; Hypernasality; Fluoroscopy; Radiography; Hypertrophic tonsils

Summary

Two children in whom idiopathic hypernasality was diagnosed were referred for investigation of velopharyngeal function. Multiview videofluoroscopic assessments showed the tonsils prolapsing posteriorly during speech, preventing the palate from fully approximating the posterior pharyngeal wall. Tonsillectomy was recommended. Postoperative evaluations found that the hypernasal resonance was eliminated in both children.

92

Enlarged Adenoids



Problem?

93

Oral Exam Findings...



Severe Class III Malocclusion


Problem?

94

This slide illustrates severe Class III malocclusion. It includes a profile photograph of a man with a prominent lower jaw, a frontal photograph of the same man, a close-up of the teeth showing a significant overbite of the lower teeth, and two sets of lateral cephalometric radiographs showing the skeletal relationship between the upper and lower jaws.

94

Lip abnormalities



May indicate?

95

This slide shows various lip abnormalities. It includes a photograph of a young girl with a unilateral cleft lip, an intraoral photograph of a child with a cleft palate (indicated by an arrow), and two close-up photographs of lips with other abnormalities, such as a lip tie and a lip that is slightly curled or distorted.

95

Oral Exam Findings...



May indicate?

"U" shaped cleft palate

96

This slide shows a "U" shaped cleft palate. It includes an intraoral photograph of the palate showing a U-shaped gap in the tissue and a profile photograph of a baby's face showing the cleft.

96

Eye Abnormalities

Epicantal Folds

An epicanthic fold is a lateral extension of skin of the nasal bridge over the mesocanthion landmark. Epicanthic folds may be unilateral or bilateral.

While epicanthic folds may be more common in individuals with greater ethnic diversity than in individuals with a typical ethnic appearance, epicanthic folds are not a diagnostic feature of FAS.

Some individuals with FAS have epicanthic folds.

Some individuals with FAS do not have epicanthic folds.

It is important to note that epicanthic folds are independent to nose shape and are seen more frequently in very young children of all races due to the normal depression of their nasal bridge.

At left is a 5-point Liberty pictorial scale of epicanthic folds ranging from the epicanthic folds of 1) to an extreme expression of epicanthic folds of 5).

■ Feature associated with Down syndrome

97

Outer Ear Pathologies

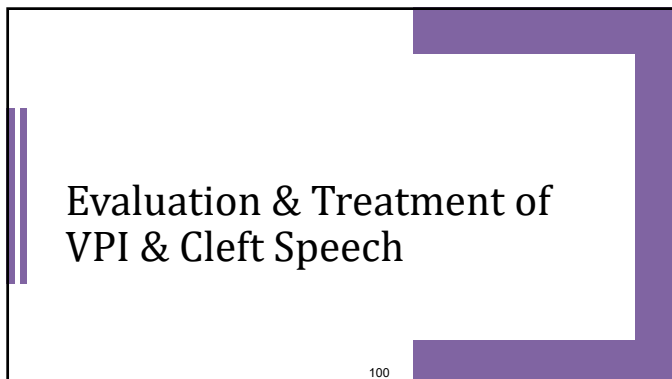
Microtia: deformation of pinna
 - More common in males
 - Right ear more often than left

Anotia (rare)
 Atresia: closed external ear
 - Can have membranous or osseous covering

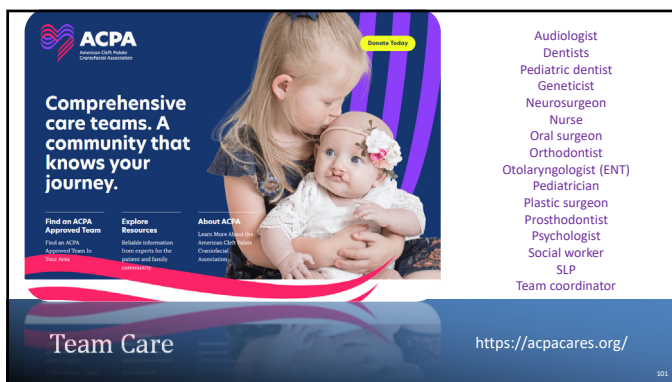
#ADAM

98

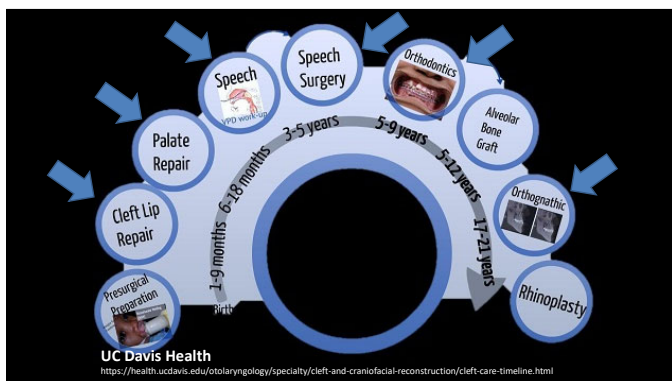
99



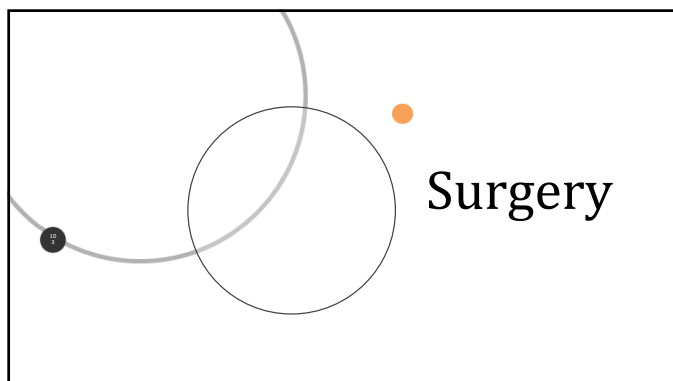
100



101



102



103

Lip Repair

Primary (first) lip surgery (8-10 weeks)

- Rule of 10's
 - Hemoglobin 10 g/dl
 - Weight - 10 lbs (4.5 kg)
 - Age - 10 weeks old

Goals:

- Accurate membrane union
- Symmetrical nasal floor
- Minimal scar
- Normal philtrum
- No alar collapse

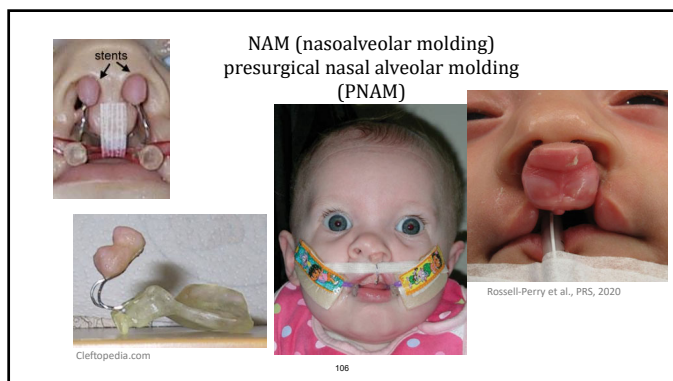
Image from: Phoenix children's hospital

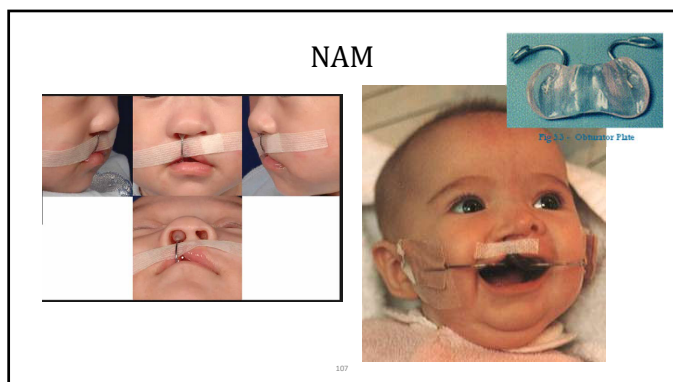
104

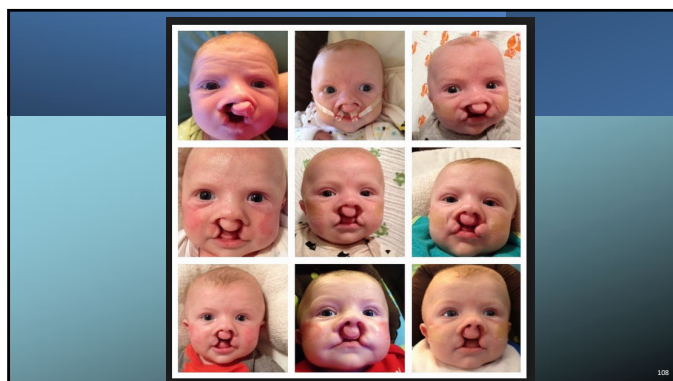
Presurgical orthopedics

- Goal:
 - Minimize width of defect
 - Improve alignment for surgery
 - Improvement often for lip and nasal position

105







Challenges with Feeding

Cleft lip only

- May have difficulty forming lip seal
- Excessive air ingestion
- Rarely see problems

Cleft palate

- Alveolar ridge compromised
- Inability to achieve negative pressure
- Nasal penetration/regurgitation
- Excessive air ingestion
- More difficulty with breastfeed



109

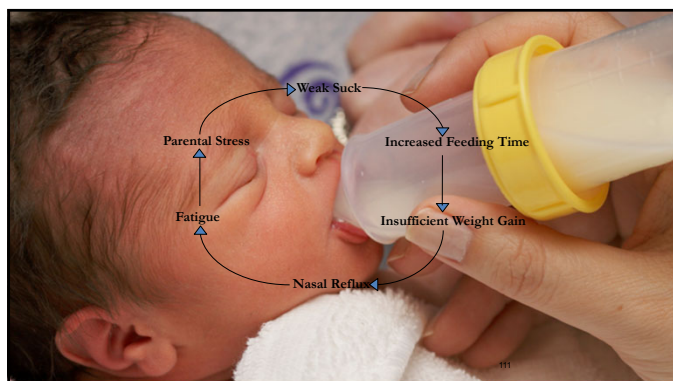
SLP and Feeding Support



- **Avoiding nasal reflux & optimizing feeding experience:**
 - Selection of most appropriate bottle and nipple
 - Positioning of nipple
 - Positioning of infant (feed baby upright)
 - Follow feeding schedule
 - Frequent burping

110

110



111

Feeding Therapy Schedule

- If mom wants to breast feed, encourage her to try
 - Consider nursing during non-feeding times for 5 minutes to have parent/baby bonding
- Limit feeding to 30 minutes (feeding every 2½-3hrs)
- Follow baby's lead
- Keep diary
- Weigh baby weekly
- Counsel parents through the process

Signs to watch for:

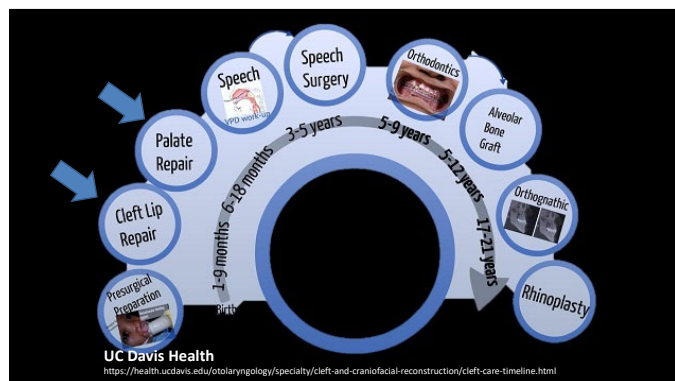
112

112

Feeding Progression

- Children with clefts should transition to solids at the same age as typical toddlers (4-6 months)
- It is safe to offer purees and age-appropriate solids before cleft is repaired
- Some children with clefts have difficulty transitioning to solids due to nasal regurgitation
- Post-surgically (9-12 months for palate) they will have some restrictions right after surgery to avoid fistula

113



114


Palate Repair

Goals:

- Closure (normal growth and speech)
- Remove levator from hard palate and create muscular sling
- Add bulk to velum body
- Normal food intake
- Decrease URI's
- Improved status of middle ear

Timing:

- 9-18 mo.
- Early vs. Late issue?

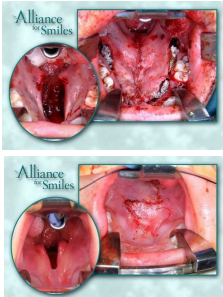


115

Palate Repair

Procedures:

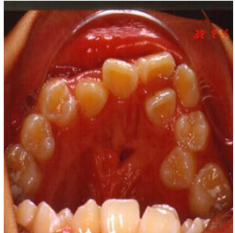
- Von Langenbeck
 - Bipedicle; elevation of mucoperiostium
- V-Y Repositioning/pushback (Wardill-Kilner)
 - Unipedicle; repositioning
- Buccal Flap
- Intravelar veloplasty
- Furlow Palatoplasty
 - Double opposing Z-plasty (lengthens velum)



116

116

Palatal (oronasal) Fistula

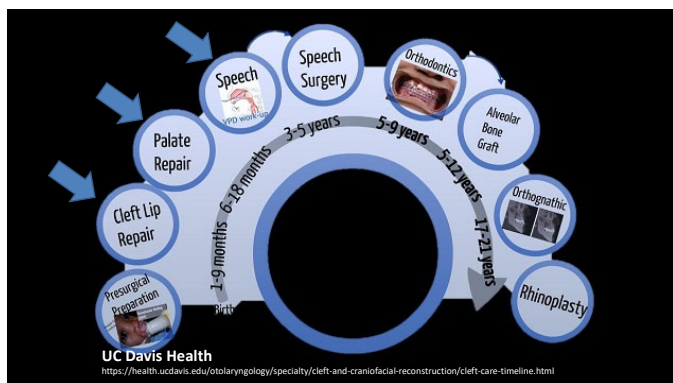


Can Cause:

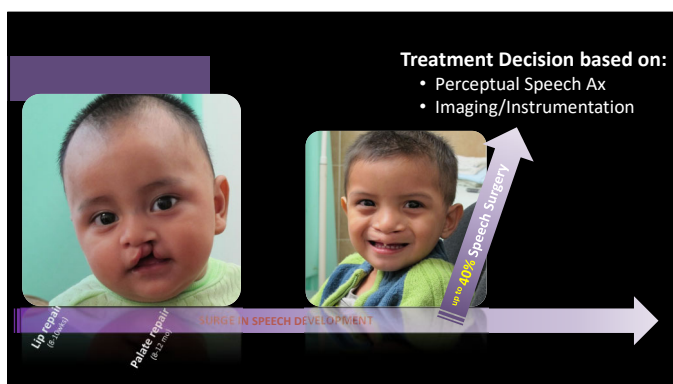
- Nasal emission (if small to medium)
- Hypernasality (if large)
- Compensatory articulation

117

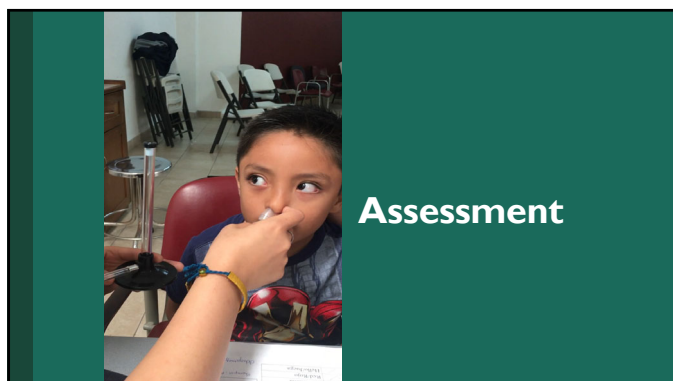
117



118



119



120

Purpose of Evaluation

121

Clinical Paradigm

1. Listener Judgment/Perceptual analysis
2. Perceptual leads to assumptions about anatomy and physiology
3. Instrumental analysis should confirm perceptual judgment

122

Evaluation

- Determine velopharyngeal function by assessing:
1. Resonance (hyper, hypo, mixed, cul de sac)
 2. Nasal Air Emission (obligatory or phone-specific)
 3. Articulation (note omissions, distortions, substitutions)
 4. Oral Exam
 5. Instrumental Evaluation

123

1. Resonance

Assessing **hypernasality**:

• **Definition:** Excessive nasal resonance particularly noted on vocalic sounds; but perceived in connected speech

• P, B → M; T, D → N

• Test with **oral sentences loaded with plosives or sibilants**

“Put the baby in the buggy”
“do it for daddy”
“I eat cake and ice cream”

Cause: VPD, Fistula (STRUCTURAL)

Kummer, 2019

124

1. Resonance

Assessing **hyponasality**:

• **Definition:** lack of nasal resonance

• M → B; N → D

• Test nasal patency for nasal obstruction

• Test with **nasal-loaded sentences**

“Mom’s name is Nancy”
“My mom made lemonade”
Count from 90-99

Cause: obstruction, hypertrophic adenoids/tonsils (STRUCTURAL)

Kummer, 2019

125

1. Resonance

Assessing **Mixed Resonance**:

• **Definition:** Hyper or NAE + Hypo

• **Cause:** Neurological or Structural

Assessing **cul de sac**:

• **Definition:** Sound resonates in pharynx or oral cavity due to obstruction

• Muffled speech and low volume

Kummer, 2019

Cause: STRUCTURAL

126

2. Nasal Air Emission

Nasal air emission (NAE)

- Inappropriate release of air pressure through nasal cavity
- During consonants, especially p, b
- Weak pressure consonants
- May see nasal grimace
- Cause: STRUCTURAL

Phone specific distortions—nasal rustle, nasal turbulence, nasal snort

- Produce in substitution for specific phonemes (often s, sh, f, or j)
- Velum is lowered and port creates an audible friction sound
- Cause: Due to faulty articulation not due to structure or function
- SPEECH THERAPY WARRENTED

127

2. Nasal Air Emission

Is hypernasality due to Fistula, Velopharyngeal system, or BOTH?



Compressive cleft care, Losee & Kirschner 2018

128

See Scape

Fistula vs NAE/hypernasality?

- Temporarily close off fistula
- Anterior sounds (t,d) vs. posterior sounds (k,g);
 - no difference = NAE due to VPD
 - If more nasal emission on anterior sound than posterior sound = fistula is cause
 - Use see scape to visibly see air flow

If fistula is symptomatic = surgery often necessary



129

3. Articulation

Test articulation at the conversational speech, sentence, word and imitation level

Note compensatory errors:

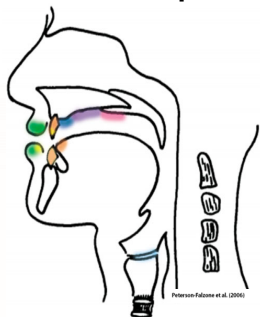
- Glottal Stop
- Pharyngeal Stop
- Mid-dorsal palatal stop
- Pharyngeal fricative
- Velar fricative
- Posterior nasal fricative/nasal snorting/rustle at port

130

Normal Place Map

Place Map for High Pressure Consonants

- | | | |
|-------------|---|----------------|
| p, b | | Bilabial |
| f, v | | Labio-dental |
| θ, ð | | Lingual-dental |
| t, d, s, z | | Alveolar |
| ʃ, tʃ, ʒ, ʒ | | Palatal |
| k, g | | Velar |
| h | | Glottal |

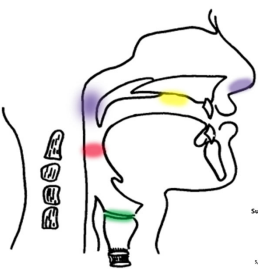


131

Compensatory Place Map

Place Map for Compensatory Articulation Errors

- | Substituted for: | Type of Error: |
|-----------------------------|---|
| p, h, t, d, k, g, h | Glottal Stops |
| s, z, ʃ, tʃ, dʒ, f, v | Nasal Fricatives |
| ʃ, z, ʒ, tʃ, dʒ, t, c, k, g | Pharyngeal Fricatives & Stops |
| t, d, k, g, s, z | Mid-dorsum Palatal Stops & Fricatives |



132

Which errors did you hear?



Note compensatory errors:

- Glottal Stop Pharyngeal fricative
- Pharyngeal Stop Velar fricative
- Mid-dorsal palatal stop Nasal Fricative
- Nasal Substitution

Trost-Cardamone, 1987

133

Which errors did you hear?



Note compensatory errors:

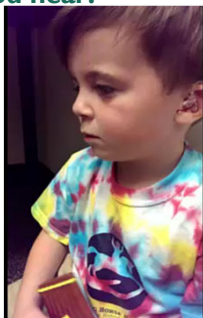
- Glottal Stop Pharyngeal fricative
- Pharyngeal Stop Velar fricative
- Mid-dorsal palatal stop Nasal Fricative
- Nasal Substitution

134

Which errors did you hear?

Note compensatory errors:

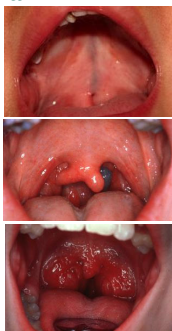
- Glottal Stop
- Pharyngeal Stop
- Mid-dorsal palatal stop
- Pharyngeal fricative
- Velar fricative
- Nasal Fricative



135

4. Oral Mechanism Exam

Structure:	Assess for:
Hard Palate	fistula, devices, midline ridge, color change in hard palate, zona pellucida
Velum/Uvula	bifid uvula, zona pellucida, length, mobility
Pharynx	movement, passavant's ridge
Tonsils	Size, location
Facial features	Eyes, lips, ears, face
Nose/Airway	patency for breathing of each nostril
Maxilla	micro/macrogathia, micro/macrostomia
Dentition	anything causing mis-articulations
Tongue	ankyloglossia



136

4. Instrumental Assessment

Indirect Methods: Nasometer

- Provides acoustic data regarding velopharyngeal function
- Indirect measure



137

4. Instrumental Assessment



Direct Methods:

- **Radiography (Lateral Cephalometric)**
 - Advantage: Easily available, obtain VP dimension measurements
 - Disadvantage: x-ray radiation, must sit still, sustained phonation
- **Videofluoroscopy**
 - Advantage: during real-time speech, movement, less invasive than nasoendoscopy
 - Disadvantage: x-ray radiation
 - Age: 4-7



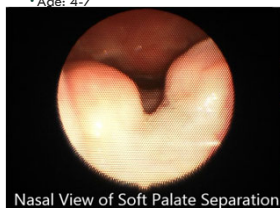
138

4. Instrumental Assessment

Direct Methods: Flexible nasopharyngoscopy

- Advantage: view closure pattern, no radiation
- Disadvantage: Requires nasal anesthesia, invasive, compliance, cannot obtain VP dimension measurements

• Age: 4-7



Nasal View of Soft Palate Separation

Posterior Pharyngeal Wall
Lateral Pharyngeal Wall
Velum

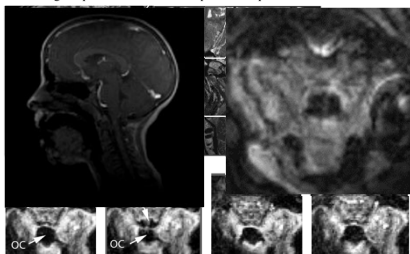
139

4. Instrumental Assessment

Direct Methods: MRI

Midsagittal plane

Oblique coronal plane

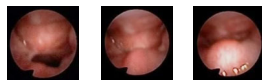


/a/ /n/ /s/ /a/

140

Comparing Direct Imaging Methods

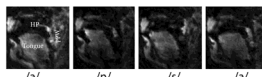
Nasoendoscopy



Videofluoroscopy (lateral view)



MRI (sagittal)



(oblique coronal)



141

Speech Therapy

Special Thanks to:
 Lynn Marty Grames, MS CCC-SLP
 St. Louis Children's Hospital
 John E. Riski, PhD CCC-SLP, F-ASHA
 Children's Healthcare of Atlanta

142

When & What to work on:

143

Birth – 3 years
 Think "Quantity"

- Feeding
- Parent education/counseling
- Provide oral experiences (nasal pinching)
- **Increase:**
 - Non-speech sounds
 - Speech sound inventory
 - Vocabulary
 - MLU

144

3-4 years of Age

Think "Quality"

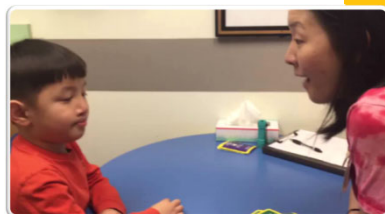
- Evaluate articulation
- Evaluate velopharyngeal function and resonance
- Start speech therapy or consider surgery if needed
- Make appropriate referrals



145

Speech Therapy used for:

- Monitoring language/development
- Compensatory articulation productions
- Phone specific NAE
- Phone specific hypernasality due to misarticulations
- Hypernasality due to oral-motor dysfunction (dysarthria or apraxia of speech)



146

MOST IMPORTANT SLIDE

Speech Therapy


- **CANNOT** fix structural problems
 - NAE, hypernasality, hyponasality
 - Fistula, SMCP
 - **Refer to cleft team!**
- **CAN** fix mislearning problems
 - Posterior nasal fricative (cleft or non-cleft)
 - Compensatory articulation errors

• Blowing/sucking/whistle **NEVER WORKS IN ISOLATION;**
MUST quickly transition to speech!

147

Note on Oral Motor Exercises


- These are not backed by evidence-based practice
 - Oral Motor Exercises isolate oral structures and do not incorporate coordination of Respiration, Laryngeal and Velopharyngeal Movements
 - DIFFERENT motor plan!
- DO NOT target blowing/oral motor exercises to improve resonance or "strengthen" the palate.
 - Need to target speech to improve speech



148

Reinforcing Oral Airflow

Using blowing to elicit "TH"

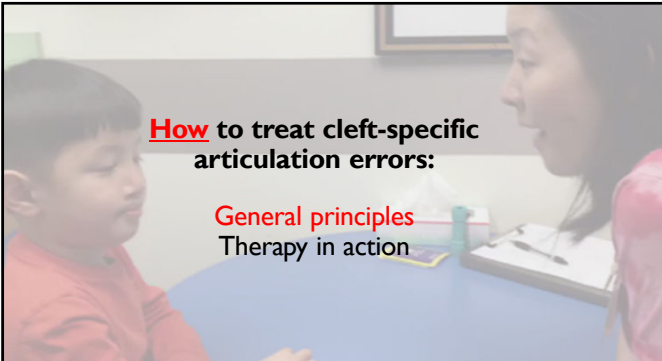


1. Fun activity to (1) target placement
2. Get the kid to do what you want him to do with articulators
3. Transition immediately to paired activity + SPEECH
4. Target sounds with correct placement using activity

149

How to treat cleft-specific articulation errors:

General principles
Therapy in action



150

General Guidelines for Therapy

Articulation (motor-phonetic) Therapy

1. Teaching articulatory placement + airflow direction & pressure build up
2. High intensity
3. High repetition
4. High accuracy (100%)
5. Use feedback & limit visual/cognitive load

151

General Guidelines for Therapy

Articulatory Placement: Work from the front of mouth to the back

Teach visual phonemes first

Do not be afraid to teach sounds out of developmental order

Remember: Establishing a **NEW MOTOR PLAN**

Defer [k,g] until late in therapy

152

General Guidelines for Therapy

Articulatory Placement: Teach from similar place of articulation

- For [p,b] → use [m], plug the nose
- For [t,d] → use [n,l], plug the nose
- For [s,z] → use [t,d] prolonged
- For [k,g] → use "ng" plug the nose

153

General Guidelines for Therapy

Standard Articulation Hierarchy

Isolation
 Syllable Imitation
 Word Imitation
 Phrase Imitation
 Picture Naming
 Question Response
 Simple Sentence
 Complex Sentence

154

Teaching Oral Pressure
 Using a whistle tube

Kummer, 2019

155

General Guidelines for Therapy

Intrinsic Feedback

- Auditory: Toobaloo/straw
- Visual: See-Scape
- Tactile: Hand on throat
- Touch cues: Tap on cheeks for "p"
- Oral pressure: Holding the nose
- Oral airflow: Whispering

Extrinsic Feedback

- Knowledge of results
- Knowledge of practice

Motor learning variables

- Error detection
- Home practice

Kummer, 2019

156

General Guidelines for Therapy
(see handout)

**Decrease Cognitive Load:
Give the sound a new name!**

- "Lip poppers" → P, B
- "Tongue tappers" → T, D
- "Hissy, Smiling, Spider sound" → S
- "Quiet sound" → SH

157

Give the sound a new name!

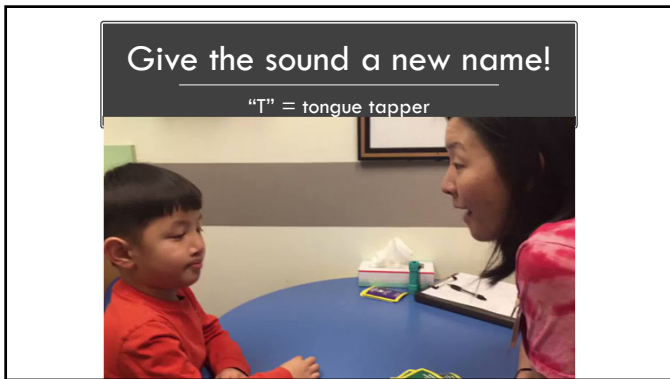
"P" = lip popper



158



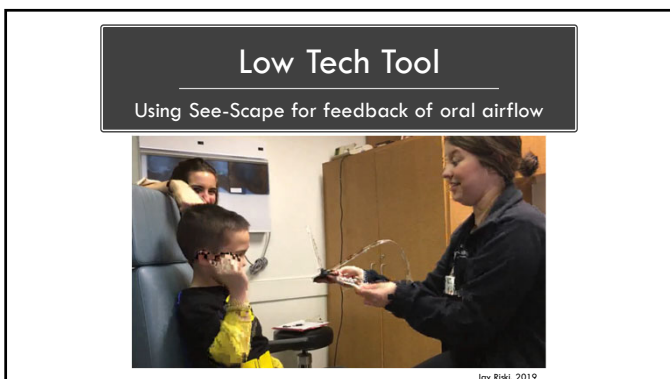
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160



161

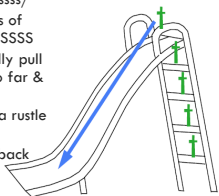


162

Therapy Techniques

To eliminate pharyngeal fricative, pharyngeal affricates, and posterior nasal fricatives:

- Use straw or nasal pinching
- For /s/:
 - Long-t strategy: /t-t-t-tsssss/
 - Use /t/ sustained at ends of words: Cat becomes CATSSSS
 - Start with "th" & gradually pull tongue back (may go too far & be producing "sh")
 - May occlude the nose if a rustle appears during /s/
 - Use straw/tube for feedback



163

Sound Shaping

Eliciting "S" from "T" using long-t strategy



164

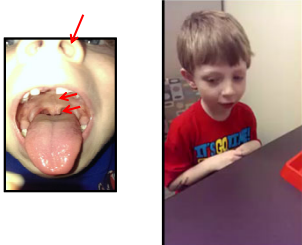
Therapy Techniques

To eliminate pharyngeal fricative, pharyngeal affricates, and posterior nasal fricatives:

- For "sh", "ch", "dg"
 - Start with "s", move tongue back and pucker to produce "sh"
 - Start with "sh" and "make it short" = "ch"
 - Start with "ch" and "make it buzzy" = "dg"
 - Straw for feedback

165

Sound Shaping
Eliciting "SH" from "S"



166

Therapy Techniques

To eliminate *Mid-dorsum palatal stops*:

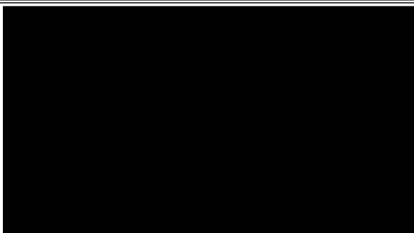
- Substituted for /t, d, n, or l/ &/OR /k, g, ng/
- Is often a result of anterior crossbite and class III malocclusion

Teaching Correct Placement of Lingual-Alveolars/Velars

- Tongue blade between canine and molar teeth and practice /t,d,n/ in front of blade and /k, g, ng/ in back; start with /l/ placement
- Work from sound they have to new sound
 - ng (nose plugged) to k
 - n and l (nose plugged) to t and d

167

Sound Shaping
Eliciting "K" from "NG" + nasal occlusion



168

When do I wean from nose-plugging?

After the syllable level...but
...reuse as complexity
advances,
to check for coarticulation, or
with new consonant targets

169

Weaning Nasal Occlusion



170

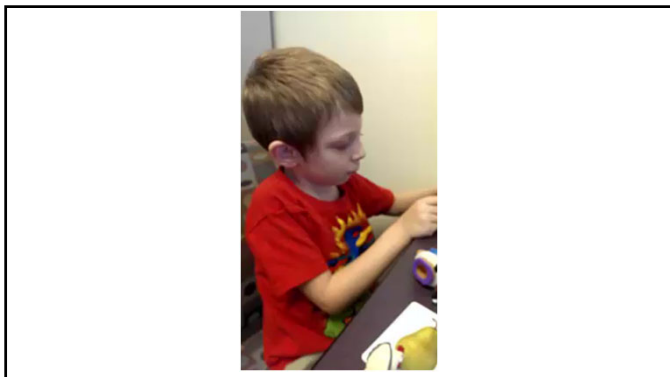
Therapy Techniques

To eliminate glottal stop substitutions:

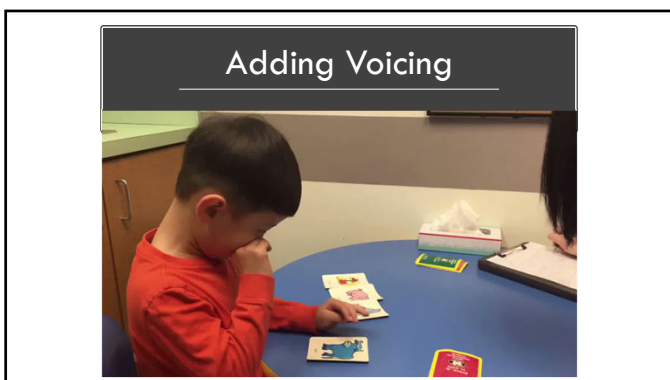
- Tactile cues (hand on neck)
- Continuous airflow /h/
 - Sustain /h/ paired with front vowel then move to /h/ with back vowel
- Easy onset "p_hoo" "po"
 - Start with whisper: phhhhaaay
 - Start voicing phhhhaaay
 - Decrease hhhh & keep voicing of aaay
 - Normal production

This can also be used to elicit the p sound

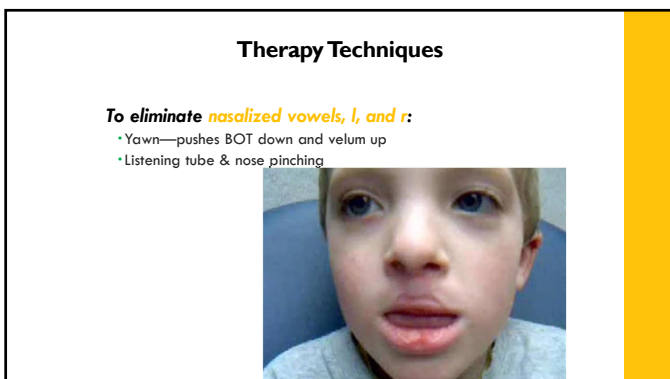
171



172



173



174

Summary of Therapy Strategies:

- Repetition and Intensity!! (Principles of Motor Learning)
- Again, **NO** blowing, whistling, or sucking in isolation
- **DO** use articulation therapy
- Counsel parents (increase quantity & quality)
- If abnormal resonance and nasal emission persist, **Refer** to Cleft Palate Team

175

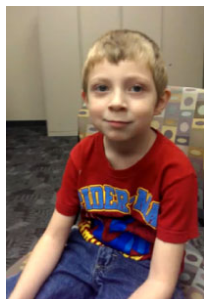
Case Examples

176

Case History- A.S.

Background/Family Hx:

- "trouble with pronunciation and /l/"
- Age 4;8
- Born full term, 6lb,9oz
- Early developmental milestones met in typical timeframe *per parent report*
- Enrolled in infant toddler program for physical therapy
- Father has asymptomatic bifid uvula
- Mother is homeschooling for pre-school year



177

Case History- A.S.

Medical Hx:

- Symptomatic bifid uvula
- No history of feeding issues as infant
- No previous surgical history
- Mild head trauma in 2013 which required ER visit
- No history of speech or language therapy
- Genetic testing = normal



178

Case History- A.S.

Report from School:

- School district evaluation classified child as "autistic"
 - ✦ Primary reason: "lack of eye contact"
- IEP speech evaluation noted normal oral mechanism
- Speech classified as "delayed" with no resonance issues.
 - ✦ Articulation difficulties categorized as "primarily vowel productions & omission of medial sounds"



179

Initial Resonance Evaluation

Articulation:

Developmental sound substitutions included: w/l, s/sh, s/ch, d/ig, dg, ik
Phonological errors: fronting & cluster reduction
Compensatory Errors

Compensatory Articulation:

Glottal stops and laryngealization

Oral-Nasal Resonance:

Mixed.

Mild-moderate hyponasality at the conversational level
Slightly enlarged turbinates in the left nasal cavity lead to perception of hyponasality

Oral Pressure:

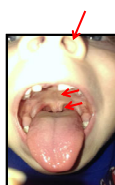
Fair

Intelligibility:

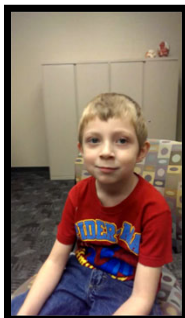
Moderate to severely reduced at conversational level when the context is unknown.

Audible Nasal Air Emission:

Present inconsistently



Enlarged turbinates may be masking some hypernasality & contributing to perception of mild hyponasality resulting in mixed resonance)



Age 4:8

180

Therapeutic Management

Current Issues

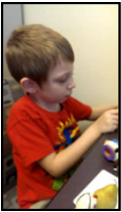
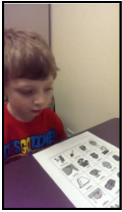
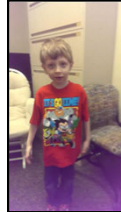
- Nasal air escape
- Glottal stops
- Reduced oral pressure
- Marginal VP competence
- Developmental articulation errors
- Potential for adenoid involution

General Therapy Goals

- Eliminate glottal stops in conversational speech
- Increase oral air pressure
- Improve intelligibility by eliminating inappropriate developmental sound substitutions and phonological processes

181

Video clips from 7th therapy session

Therapy Activities

- Whispering Technique
- Puffs for biofeedback /TH/productions
- Contrasts feedback for /fss vs sh/

Initial techniques:

- Nasal occlusion to establish oral airflow on sibilant sounds in isolation
- Tactile feedback

182

Complete Management Plan

Initial Resonance Evaluation

Recommended Speech Therapy Recommended genetics evaluation	Follow-up with Craniofacial team Complete Imaging Evaluation
---	---

Begin Therapeutic Intervention

Motor based speech therapy approach Targeting placement of articulation	Reduction of compensatory misarticulations 2 times per week with intensive home program
--	--

Additional Evaluation & Management

MRI evaluation when compliant	Continued evaluation with craniofacial team Continued speech therapy & home practice
-------------------------------	---

183

Resonance Evaluation

Articulation:
Fricative & sibilant sounds affected by posterior nasal fricative (PNF)

Compensatory Articulation:
PNF secondary to bilateral conductive hearing loss

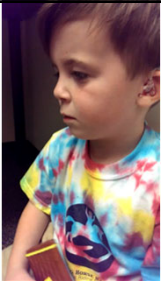
Oral-Nasal Resonance: Within normal limits.

Oral Pressure: Adequate

Intelligibility:
Mild-moderately reduced, especially when phonetic complexity increases

Audible Nasal Air Emission:
Present in the form of a PNF

Other: Bilateral conductive hearing loss. Wears bilateral hearing aids



Screening sentence level

History/Past Treatment:
Followed by audiologist for conductive hearing loss. ENT at practice recommended removal of adenoids to "improve speech".
Previous speech therapy in school district for 2 years with no improvement

184

Therapeutic Management

Current Issues/Key Findings

- Posterior Nasal Fricative
- Bilateral conductive hearing loss

Key Findings

- Normal Resonance
- Sibilants Involved
- Stop-Plosives Normal
- Can Learn "s"
- Has complete VP Closure

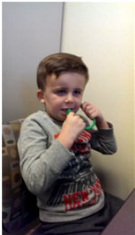
General Therapy Goals

- Eliminate use of PNF
- Provide tactile, visual and auditory feedback
- Utilize motor-based therapy approach
 - High frequency, multiple production repetitions, intense home practice

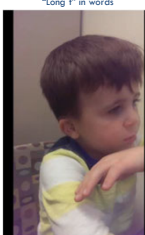
185

Therapeutic Management


Beginning Therapy
"Long f" Technique in isolation



Session Three
"Long f" in words



Post Therapy- Session 10

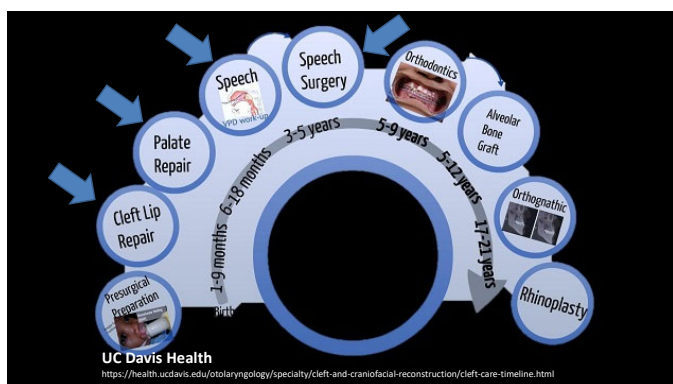


- Posterior nasal fricative eliminated on /s, sh, f, ch, th/ at the conversational level.
- Excellent parental involvement and guided home practice

186



187



188

Speech Surgery

- Revisional surgery
 - Palate re-repair
 - Buccal myomucosal
- Pharyngeal reconstructions
 - Sphincterpharyngoplasty
 - Pharyngeal flap

30-40%

Plastic surgery key: <https://plasticsurgerykey.com/12-pharyngeal-flap-surgery/>

189

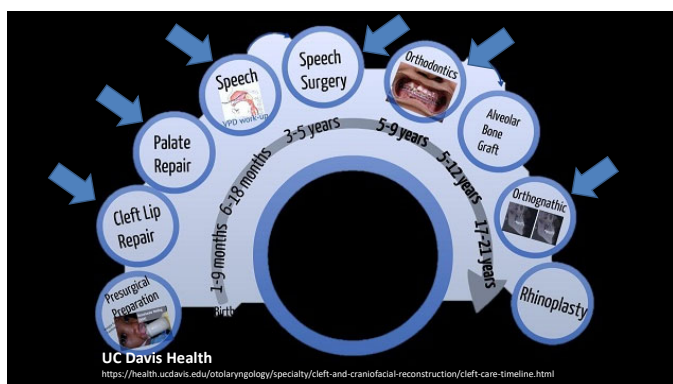
Speech Surgery

- **Goal**
 - Eliminate VPI
 - Avoid complications
 - OSA
- **SLP Role/Involvement**
 - Supports evaluation (as already described)
 - Speech therapy continues as needed
 - Supports post-surgery evaluation
 - Often done at particular timepoints

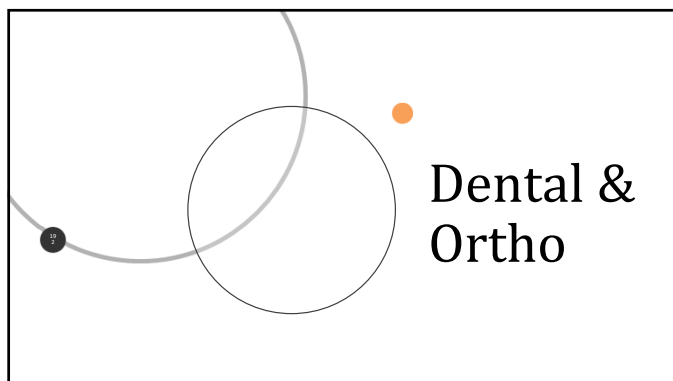
30-40%

Plastic surgery key: <https://plasticsurgerykey.com/12-pharyngeal-flap-surgery/>

190



191



192

Dental issues in Cleft

- Dental eruption is delayed (> boys UCLP)
- Missing teeth (how common?)
 - CPO (no involvement of alveolus) have high incidence of missing permanent lateral incisors.
 - 15% CL
 - 59% CL + alveolus
 - 78% CLP
 - Which teeth most impacted?



Jordan et al., 1966; Solis et al., 1998; Ross, 1975; Hansen & Mehdiria, 2003

193

Primary Dentition (1-6yr)

- Several dental abnormalities
 - Missing teeth
 - Supernumerary (typically on cleft site and may appear palatally or labially)
 - Malformation of teeth
 - Crossbites become more evident and very common in this population
 - Narrowing of maxillary segment significant in this population



194

194

What sounds are affected by missing teeth?

THE INTERNATIONAL PHONETIC ALPHABET (revised to 1993)

CONSONANTS (PULMONIC)

	Bilabial	Labiodental	Dental	Alveolar	Postalveolar	Retroflex	Palatal	Velar	Uvular	Pharyngeal	Glottal
Plosive	p b		t d	t̪ d̪	c ɟ	k g	q ɢ	ʔ			
Nasal	m	ɱ	n	ɳ	ɲ	ɳ	ɲ	ŋ	ɴ		
Trill			ʀ						ʁ		
Tap or Flap			ɾ								
Fricative	ɸ β	f v	θ ð	s z	ʃ ʒ	ʂ ʐ	ç ʝ	x ɣ	χ ʁ	ħ ʕ	h ɦ
Lateral fricative			ɬ ɮ	ɬ̺ ɮ̺							
Approximant			ɹ	ɻ			j	ɰ			
Lateral approximant			l	ɭ			ʎ	ʟ			

When symbols appear in more than one cell, they represent a sound contrast. Shaded areas denote articulations judged impossible.

195

Appliances



Paley et al., 2016 found (fixed labial orthodontic appliance)

- 44% unaffected with appliance
- 39% affected but adapted in 2 mo
- 17% persistent errors

Error resolution 8 mo post-appliance removal
 Most common error: /s/

196

196

Appliances



Can interfere with tongue tip movement = effecting lingual-alveolar (t, d, n, l) sounds while in place.

Typically, doesn't impact speech and in some cases can be helpful for speech therapists in teaching correct palatal-dorsal productions.

197

197

Palatal Lift

- To raise velum when there is poor velar movement (i.e. dysarthria; stroke pt.)

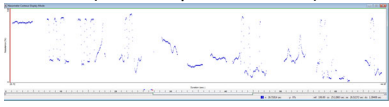


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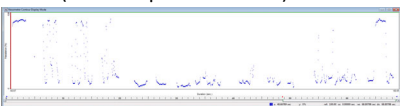
198

12-year-old repaired BCLP with post-sphincter pharyngoplasty

- Without Palatal Lift (Oral Sample Score: 29%)



- With Palatal Lift (Oral Sample Score: 10%)




199

199

Palatal Obturator

- Occlude an open cleft or fistula

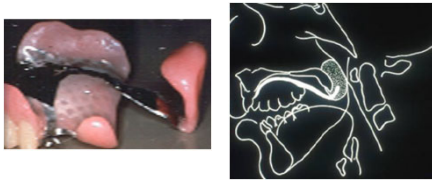


200

200

Speech Bulb

- To occlude nasopharynx

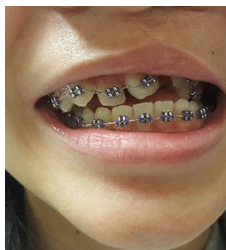


201

201

Collaboration

- Collaborate between dentist, orthodontist, and Speech on:
 - Differentiating speech errors that are needing therapy vs. physical management—making the right referral.
 - Coordination of timing of braces with speech therapy & planned alveolar bone grafts—management of any fistulae that might be impacting function.



(Schleif, Mason, & Perry, 2021)
202

202

Early Mixed Dentition (6-9yr)

- Major issues in patients with cleft in this stage:
 - Continued issues with crossbite
 - Mandibular growth spurt, creating apparent jaw discrepancy
 - Possibly alveolar bone grafting started here

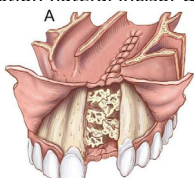


203

203

Alveolar Bone Graft

- Typically, during early mixed dentition
 - Best to do when lateral incisor is beginning to reach 1/2 to 2/3 normal root length (De Riu et al., 2004)
- Provide bony support for tooth eruption (lateral incisor & later canine)
- Bone from iliac crest



204

204

Late mixed dentition (9-12yr)

- Maxillary expansion needed often for alveolar bone grafting (if done at this stage)
- Attempts should be made to combine treatments (if possible) to avoid fatigue (Kapp-Simon, 2004)



(Schleif, Mason, & Perry, 2021)

205

205

Adolescent Dentition (12-18yr)

- Maxilla is often hypoplastic in all dimensions (Gaggi et al., 1999)
- At this age, ~80% of adolescents with cleft can now be treated successfully with orthodontics alone.
 - Remaining 20% will need orthognathic surgery + ortho

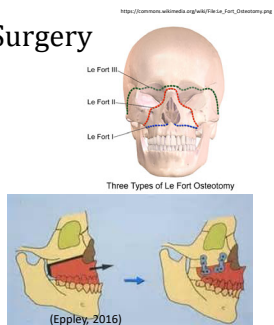


206

206

Orthognathic Surgery

- Le Fort Osteotomy
 - Recommended adv in cleft: <u>5-6 mm</u> (Combs & Harshbarger, 2014)
 - Maximum adv in noncleft: 10 mm
 - Often combined with mandibular setback
 - Horizontal relapse in 22-40% of cleft patients, most significant at 3 months post-op (Rachmiel, 2007; Posnick & Dagens, 1994)

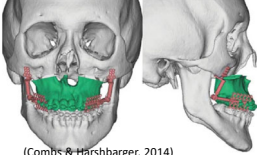


207

207

Orthognathic Surgery

- Distraction Osteogenesis
 - Use of internal or external distractors
 - Management of severe maxillary hypoplasia
 - > 10 mm in noncleft
 - > 6 mm in cleft (Combs & Harshbarger, 2014)
 - Horizontal Relapse in 5.5-23%, mostly in the first 6 months post-op (Cho & Kyung, 2006; Kanno et al., 2008; Wittfang et al., 2002; Aksu et al., 2010)



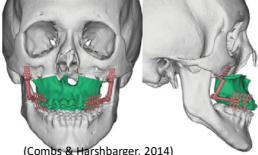
(Combs & Harshbarger, 2014)

208

208

Orthognathic Surgery

- Effects on speech
 - Resonance (Sales et al., 2019)
 - Hyponasal → Normal
 - Normal → Hypernasal
 - Hypernasal → More hypernasal
 - Velopharyngeal Function
 - Results are inconclusive
 - Possible predictors of velopharyngeal insufficiency: LVP activity & pre-operative velar length (Nohara, Tachimura, & Wada, 2006; Implieri et al., 2018; McComb et al., 2011)



(Combs & Harshbarger, 2014)

209

209

Decision for SLP to make

Therapy

Wait

(for improved dental/occlusal situation via surgery, orthodontia, or prosthetics)

Combination

210

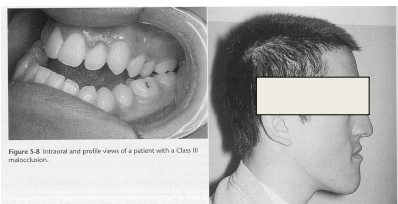
Is it all related to the structure? What sounds will it affect? How do we determine when and if therapy will be helpful?



211

Class III Malocclusion

What sounds will this impact? Is therapy needed? If so, when?



Some errors in placement are acceptable with class III & some are not

212

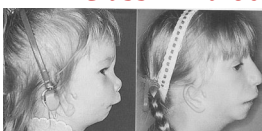
Class III Malocclusion

What errors are common?

- Labiodentals (f, v)—use bilabial pattern or upper lip to mandibular incisors
 - Teach reverse labiodental
- Lingual-alveolars (t, d, l, n, s, and z)—instead of tongue tip to alveolar they tongue to maxillary incisors (called dentalization)
 - /t, d, n, l/ may be produced off incisal edges

213

Class II Malocclusion



Common in:
 - Pierre Robin
 - Sticker's
 - VCFS

Typical Errors??

- Bilabials /p, b, m/
- ✓ Bilabial fricatives
- May also have difficulty with /th/ and /s/
- May sound like they are mumbling (lack of oral opening)



Figure 3-22 Profiles of two children with hyper-orbitals, particularly demonstrating the mandibular hypoplasia.

214

Anterior Open Bite

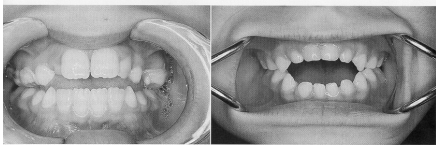


Figure 5-9 Two patients with anterior open bites, one far more severe than the other.

Common with? Treacher Collins, Apert's, Crouzons

Types of Errors??

- Sounds at risk: /th, f, v/ and bilabials (p, b, m)

215



Types of Errors??

- Lateral emission of oral air stream
- Protrusion of tongue through space


Who might we see this in?

216


Other Dental Related Speech Issues

<https://vcortho.com/crossbite/>


- Overjet
- Overbite
- Crossbite
- Missing teeth
- Rotated teeth
- Supernumerary




Anterior Crossbite




Posterior Crossbite



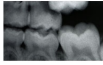
Crowding




Open Bite




Protrusion




Ectopic Eruption



Complete Class III



Diastema



Oral Habits

Malocclusions, like those illustrated above, may benefit from early diagnosis and referral to an orthodontic specialist for a full evaluation.

217

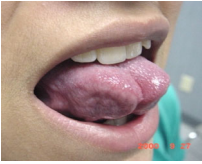
Ankyloglossia (tongue-tie)

“short lingual frenulum” results in reduced mobility of tongue for speech/swallow

- Difficulty protruding tongue beyond lower incisal edges
- Check both attachments
- Inadequate elevation to maxillary alveolar ridge
 - Alveolar /t, d, V/, require minimal elevation
 - Usually retroflexive /r/ most affected
- Should not prevent acquisition of speech

Assess tongue movement during speech and swallow

Trial of speech therapy vs frenectomy?



218

Take home on Ankyloglossia

- Incidence is rare
- Seldom impacts speech (more often feeding and hygiene are concerns)
- SLPs should be ones to determine if it is impacting speech and swallowing

219

Take aways:

- Cleft is heavily based in anatomy and physiology—SLP needs to review this often!
- SLP is involved across the lifespan for children born with cleft lip/palate and/or VPI
- Collaborative Team care is gold standard

UC Davis Health
<https://health.ucdavis.edu/otolaryngology/specialty/cleft-and-craniofacial-reconstruction/cleft-care-timeline.html>

220

Resources & Tools for Clinical Practice

Resources for Families & Clinical Competencies can be located on the American Cleft Palate/Craniofacial Associations website: <http://acpacares.org/>

221

ACPA
 American Cleft Palate/Craniofacial Association

Comprehensive care teams. A community that knows your journey.

Find an ACPA Approved Team
 Find an ACPA Approved Team in Your Area

Explore Resources
 Browse information from experts for the patient and family experience

About ACPA
 Learn More About the American Cleft Palate/Craniofacial Association

Specialty Teams:

- Audiologist
- Pediatric dentist
- Geneticist
- Neurosurgeon
- Nurse
- Oral surgeon
- Orthodontist
- Otolaryngologist (ENT)
- Pediatrician
- Plastic surgeon
- Prosthodontist
- Psychologist
- Social worker
- SLP
- Team coordinator

Team Care

<https://acpacares.org/>

222

The Cleft Palate Craniofacial Journal



Impact Factor: 1.915 / 5-Year Impact Factor: 2.164





The Cleft Palate Craniofacial Journal (CPCJ) is the premiere peer-reviewed, interdisciplinary, international journal dedicated to current research on etiology, prevention, diagnosis, and treatment in all areas pertaining to craniofacial anomalies. CPCJ reports on basic science and clinical research aimed at better elucidating the pathogenesis, pathology, and ... | [View full journal description](#)

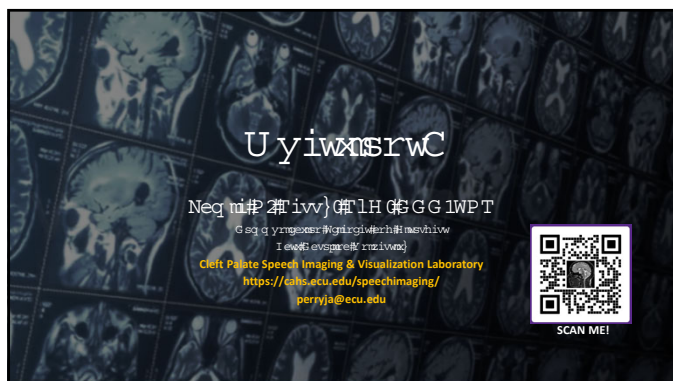
This journal is a member of the [Committee on Publication Ethics \(COPE\)](#).

223

<https://cahs.ecu.edu/speechimaging/>

224




UyiwrsrC

Neq ni# 2# iw} (H LH GGG IWP T

Gsg q yingexar #gtrglwrbh# nsvhiw
I ewsf evsme#K nzi iwed

Cleft Palate Speech Imaging & Visualization Laboratory
<https://cahs.ecu.edu/speechimaging/>
perryja@ecu.edu



SCAN ME!

225
