VPD Clinic: Using Nasopharyngoscopy to Evaluate Velopharyngeal Dysfunction… and so much more!

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VPD: Velopharyngeal Dysfunction

PART 1:

- What is VPD?
- VPD Clinic
  - Team members
  - Our patients
  - Typical Visit

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VPD: Velopharyngeal Dysfunction

PART 1 (continued)

- Typical Visit
  - History & Physical
  - Speech & Resonance Evaluation
  - Nasoendoscopy
    - Preparation & video samples
    - Interpreting the scope

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VPD: Velopharyngeal Dysfunction

PART 2

- Treatment Recommendations
  - Determining the type of VPD
  - Surgical Intervention
  - Speech therapy

I can’t wait to learn more about VPD!

VELOPHARYNGEAL DYSFUNCTION

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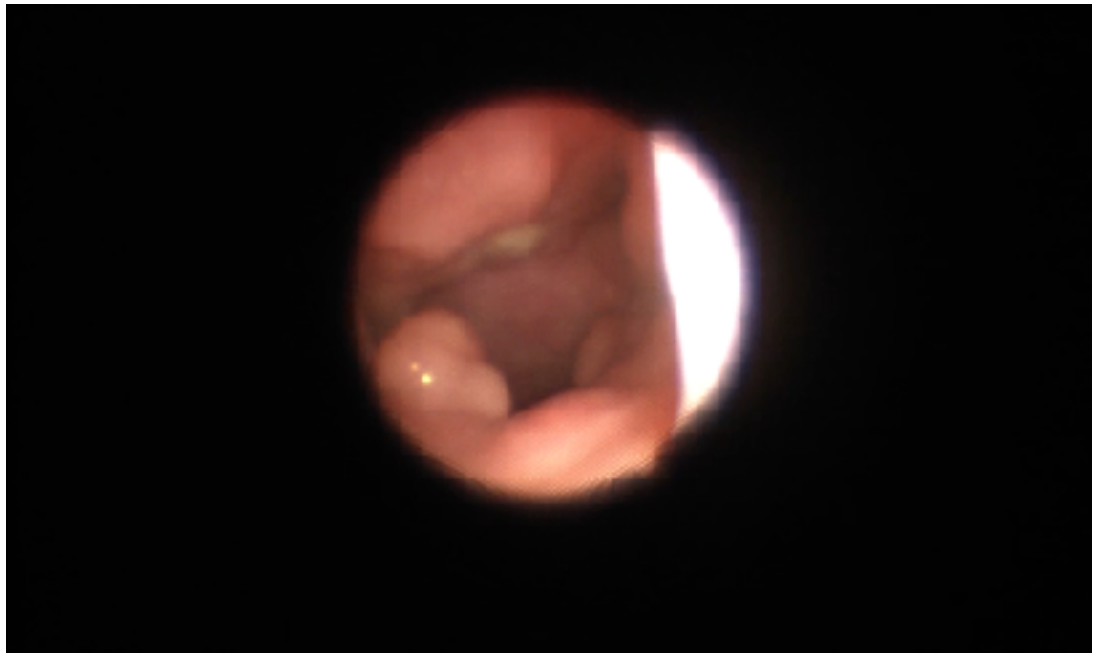
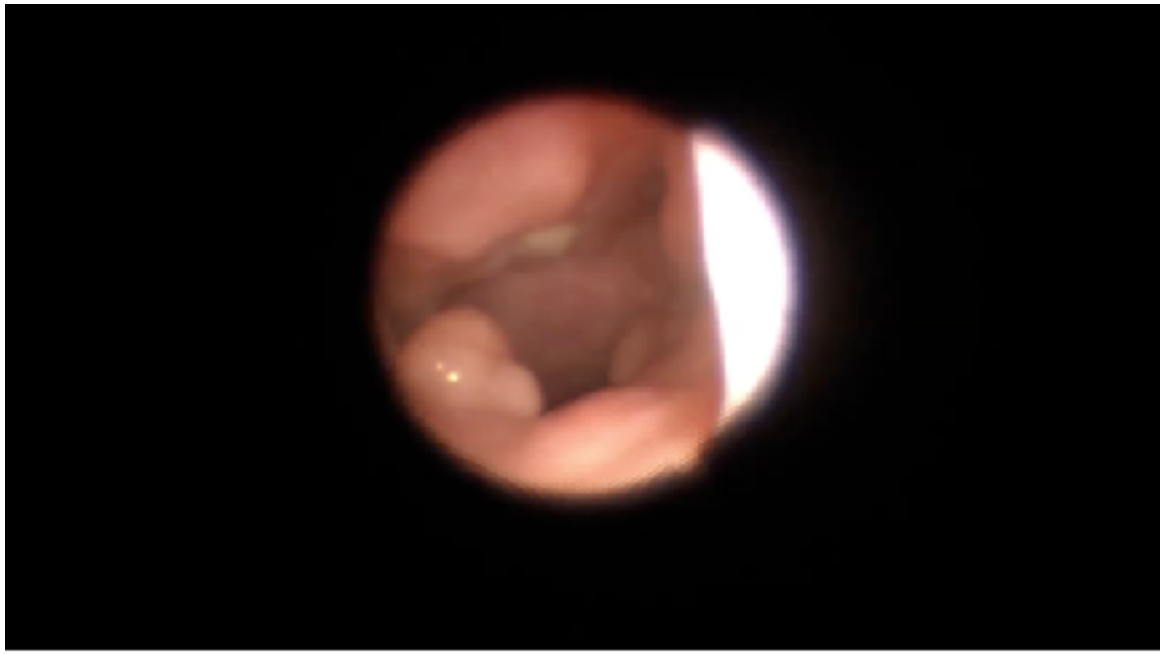
Types of Velopharyngeal Dysfunction

- VPD is a term used to describe a group of disorder involving the velopharyngeal valving mechanism.
- Who gets it?
  - Cleft palate (10-20% after repair have residual VPI)
  - Submucus cleft palate
  - 22q11.2 deletion syndrome
  - S/p adenoidectomy
    - 1:1,500-1:10,000
  - Motor speech disorder/neuromuscular disorder/cranial neuropathy
  - Tonsil hypertrophy- prevents palate from moving superiorly
  - Idiopathic

VPD from tonsillar hypertrophy?





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Types of Velopharyngeal Dysfunction

- 3 types:
  - Velopharyngeal Incompetence
  - Velopharyngeal Insufficiency (VPI)
  - Velopharyngeal Mislearning

Velopharyngeal Incompetence

- Incomplete closure of the velopharyngeal valve due to a neurological problem
- Often associated with asymmetrical palatal elevation when there is cranial nerve damage
- Common causes:
  - Posterior fossa tumors – damaged cranial nerve X (Vagus) during surgery, may or may not be permanent
  - NF 1 – also associated with surgical damage to the cranial nerve.
  - Apraxia of speech
- Require surgical intervention (may not be a candidate to due medical history) or a palatal lift

Velopharyngeal Insuffiency

- Occurs due to an anatomical or structural defect such as a short soft palate
- Common causes:
  - cleft palate
  - submucous cleft palate
  - Adenoids/adenoid atrophy
- Mild cases may improve with speech therapy but typically these children require surgical intervention (or palatal lift) to improve closure for speech
- Speech therapy may be recommended to improve oral airflow and correct compensatory errors

Velopharyngeal Mislearning

- The child has not learned how to use the velopharyngeal mechanism appropriately for select non-nasal sounds
- Velopharyngeal mechanism is intact
- The child is able to produce most sounds with adequate intraoral pressure
- Results in phoneme specific audible nasal emission of air (most common with s and z) or hypernasality on vowels (fairly rare)
- Requires speech therapy

Why do we care about VPD?

- **Impacts quality of life!!**
  - Made fun of at school, bullying
  - Embarrassed to read out loud/give presentations
  - Struggle at school
  - Self-conscious
  - Withdraw from social settings
- Research on-going for quality of life impact on pts with VPI
  - VELO questionnaire : VPI Effects on Life Outcomes

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VPD CLINIC

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VPD clinic

- Team Members
  - Jill Arganbright, MD
  - Brenda Sitzmann, MA, CCC-SLP
  - Clinic nurse
  - Child life

VPD clinic

- Our patients
  - Resonance or hypernasality concerns
    - Super Q Express Clinic
      - 22q11.2 deletion syndrome clinic at CMH
    - Internal referrals from speech, ENT, genetics, plastics
    - Referrals from outside providers
  - Ideally the patient is able to produce at least single word utterances with high pressure consonant sounds (ex. Puppy, daddy, go)
    - Some exceptions including extremely hypernasal patients who are unable to produce high pressure consonant sounds (lots of nasal substitutions)

VPD clinic

- Who we DON'T see?
  - Patients with cleft lip and palate
    - Followed by the Cleft Lip and Palate Clinic at Children's Mercy

VPD clinic

- Typical Clinic Visit
  - 60 minutes
  - Introduction and description of what will take place
    - History and physical (if not previously established)
    - Speech and resonance evaluation
    - If deemed necessary, scope evaluation
    - Discussion of results and recommendations

History and physical

- History
  - What are the speech concerns?
  - How long been going on?
  - Speech therapy
    - Goals
    - Progress

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History and physical

- History (continued)
  - Surgical history
    - Adenoidectomy
    - Previous palate surgery
  - Snoring/obstructive sleep apnea
  - Nasal regurgitation
    - During eating (not vomiting)
  - Speech intelligibility
    - Familiar and unfamiliar listeners

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Speech & Resonance Evaluation

- Oral Mechanism Exam
- Resonance Assessment
- Articulation Assessment
- Patient/Parent Education
- Recommendations
  - Would the patient benefit from endoscopy?

Oral Mechanism Exam

- Soft palate
  - elevation during phonation
    - symmetrical or asymmetrical
    - No/minimal elevation
    - “Tenting”
  - Palatal length
    - Difficult to assess from an oral view
    - Nasal endoscopy is the gold standard
  - Sphincter pharyngoplasty or pharyngeal flap observed?

Oral Mechanism Exam

- Feeding/swallowing difficulties
  - Patient/parent report of nasal loss of liquids or solids
  - Vomiting through the nose is not as concerning
    - Path of least resistance
  - REMINDER: Velopharyngeal port closure for speech is a completely separate neurocognitive pathway than for swallowing
    - May completely close with swallow and not with voluntary speech.

Resonance Assessment

- Evaluating for:
  - Hypernasality
  - Hyponasality
  - Cul-de-sac resonance
  - Mixed resonance
- Try to determine the cause of the resonance disorder
  - Velopharyngeal insufficiency
  - Velopharyngeal incompetence
  - Velopharyngeal mislearning
  - Nasal obstruction

Assessment Techniques

- Speech samples:
  - Sustained phonation
  - Resonance assessment phrases
    - See next slide
  - Reading passages
    - Grandfather passage
    - Zoo passage
  - Conversational speech sample

- No tech/low tech:
  - Nasal occlusion
  - Mirror under the nose
  - Straw as a “phone”

- Technology based:
  - Endoscopy

Resonance Assessment Phrases

- Pat the puppy
- Buy baby a bib
- Take Teddy to Town
- Did daddy do it?
- Kick the cake
- Go get the girl
- Forty four fish
- I love every view
- Sun in the sky
- Zebra at the zoo/Zippers are easy to close
- She wears blue shoes
- Father takes a bath
- That thumb hurts
- Jack wore a soldier's badge/Jack & Jill jumped over the bridge
- Stop the skate from sliding
- Where were you? Why were you away?
- Mama made muffins/Mama made lemonade
- Nine men came/no no no
- I like lollipops
- The red bird has a beard

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Nasal Occlusion

- Listening for changes in occluded and non-occluded productions
- I find this technique particularly useful with sustained phonation and for determining if distortions are due to placement or nasal air loss
- Pros:
  - Inexpensive and readily available
  - May provide an insight to what the child would sound like with a successful speech surgery
- Cons:
  - Creates a cul-de-sac resonance quality

Mirror Technique

- Place a small mirror under the nose – it will fog up if nasal air loss is present
  - No fogging with non-nasal sounds
  - Fogging with nasal consonant sounds
- Pros:
  - Very visual/easy for children to identify
  - Inexpensive, readily available
  - Easy to provide parent training/home carryover
- Cons:
  - Have to be quick – most people exhale through their nose at the end of an utterance

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Straw Technique

- This is my “go to” technique for evaluating resonance and teaching children and caregivers about resonance disorders
  - I learned this inexpensive, readily available technique from Ann Kummer, Ph.D., CCC-SLP
- Place one end of a “bendy” straw at the child’s nares. The other end is placed near the SLP’s ear
- The straw amplifies hypernasality and nasal air loss.
- It also confirms appropriate nasal resonance for nasal consonants

Technology Tools

- Nasal endoscopy
  - "Gold standard" because it provides a more complete view of velopharyngeal closure patterns
  - Pros:
    - Distinguishes between resonance concerns related to VPD vs. fistulas
    - Determine if therapy techniques are effective
    - Determine the type of speech surgery
      - direct assessment of closure pattern
  - Cons:
    - Can be challenging with young children

Hypernasality Assessment

- Severity
  - Mild
  - Moderate
  - Severe
- Consistency
  - Inconsistent
  - Consistent

- Associated Characteristics
  - Nasal emission of air
  - Nasal Rustle/Turbulence
  - Nasal grimace
  - Weak or omitted consonants
  - Short utterance length
  - Compensatory and obligatory speech errors

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Hypernasality Assessment

- The American Cleft Palate-Craniofacial Association has great speech samples
  - Children
  - Women
  - Men
- http://www.acpa-cpf.org/education/educational_resources/speech_samples/

Cul-de-sac Resonance

- Muffled speech quality that is often due to an obstruction (ex. limited oral opening, enlarged tonsils, nasal obstruction) paired with VPI
  - Sound resonates/gets stuck in a nearly closed off chamber in the pharynx or nasal cavity
  - Does resonance improve with increased oral opening?
- Can be challenging to discriminate between hyponasality and cul-de-sac resonance

Articulation Assessment

- With standardized testing, I focus on articulatory placement – not hypernasality, nasal rustle, etc. – when calculating raw scores.
- Types of errors:
  - Compensatory errors
    - Speech errors that are directly related to VPD. These errors are often attempts to adjust for nasal air loss.
  - Obligatory errors
    - A type of compensatory speech error that is directly related to structural issues such as a severe underbite.
  - Phoneme specific audible nasal emission of air
  - Motor speech & developmental errors

Articulation Assessment

Stimulability Testing

- Significant part of a speech and resonance evaluation
- Trial techniques to guide decision making
  - Is the child able to produce p with improved oral airflow?
  - Can the nasal snort be eliminated?
- If the child is success, may recommend therapy prior to endoscopy and/or surgery

Parent Education & Endoscopy

- Discuss findings with parents
  - Provide education re: the velopharyngeal mechanism
  - Provide easy to understand information
    - Straw technique is very helpful
  - If velopharygeal insufficiency or incompetency is suspected and impacting speech intelligibility, a scope is recommended

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NASOENDOSCOPY

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Preparation for Scope

- **CHILD LIFE**
- Numbing up the nose
  - Topical spray: afrin, 1% lidocaine
  - Topical 4% lidocaine jelly on q-tip placed into the nose for 1-2 minutes. Repeat.
    - Goal is to gently advance the q-tip posteriorly to rest between the middle turbinate and the septum (path of the scope)

Tips and Tricks

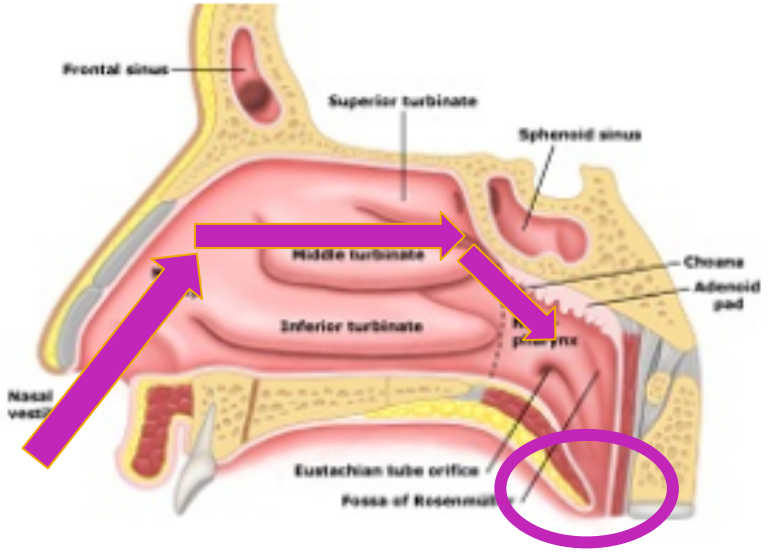
- **CHILD LIFE**
  - **Describe the procedure in kid-friendly language**
    - ‘Make a movie of the inside of your nose’
    - ‘Medications to make your nose go to sleep’
  - **Distraction while numbing,** having a prize to earn
- Let the child see the scope, touch it, let the scope touch the face, look in the ears and mouth with the scope

Tips and Tricks

- Positioning- sitting on mom/dad's lap for comfort
  - Parent places child's legs between his/her legs and give a bear hug
  - Clinic nurse holds the child's head
- Get the scope in quickly…may need to hold position for a while to let the child calm down
- If no luck…can try for a few short phrases- 'take it out'

Scope Evaluation

- Flexible laryngoscope
- Where to position the scope in the nasopharynx
  - Scope placed in the nose
  - Instead of traveling along the floor, want to advance the scope **high** in the nose to be adjacent to or above the middle turbinate
  - Look **down** onto the velopharynx



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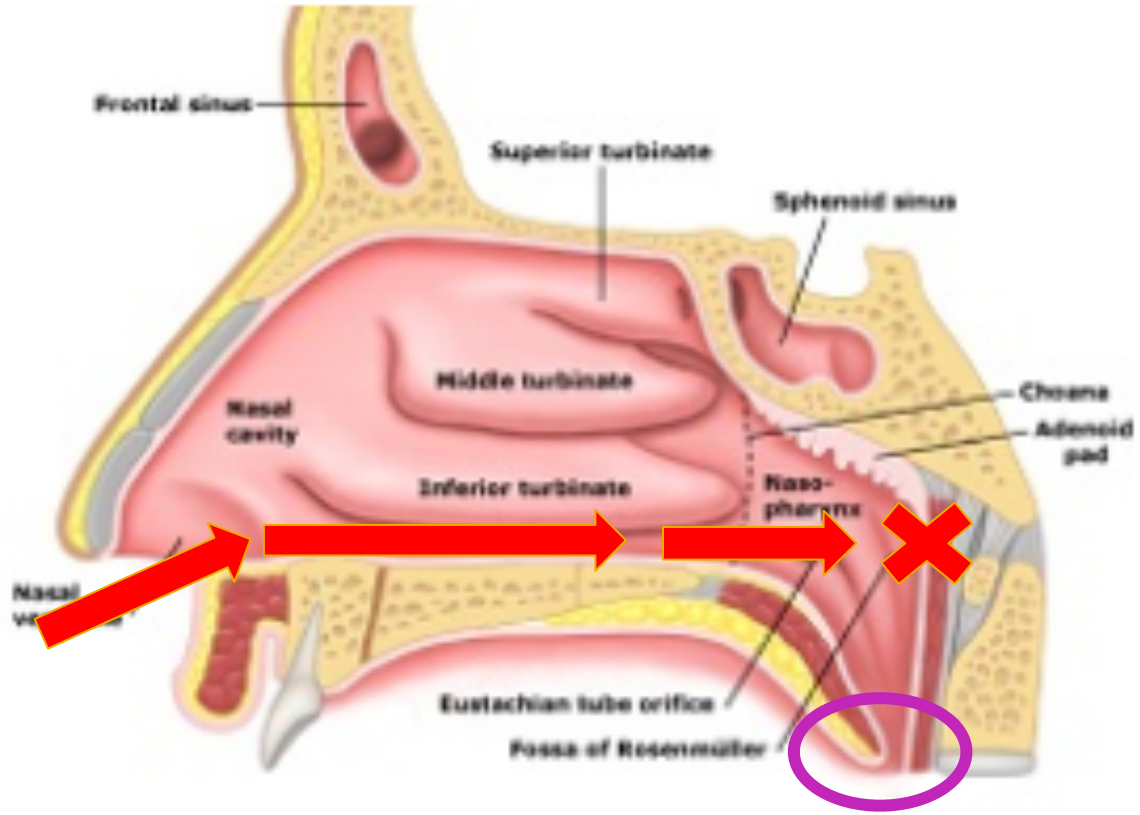
Scope Evaluation

Traditional flexible scope training is to pass along the floor of the nosal cavity. This does **NOT** allow a good view of the velopharynx



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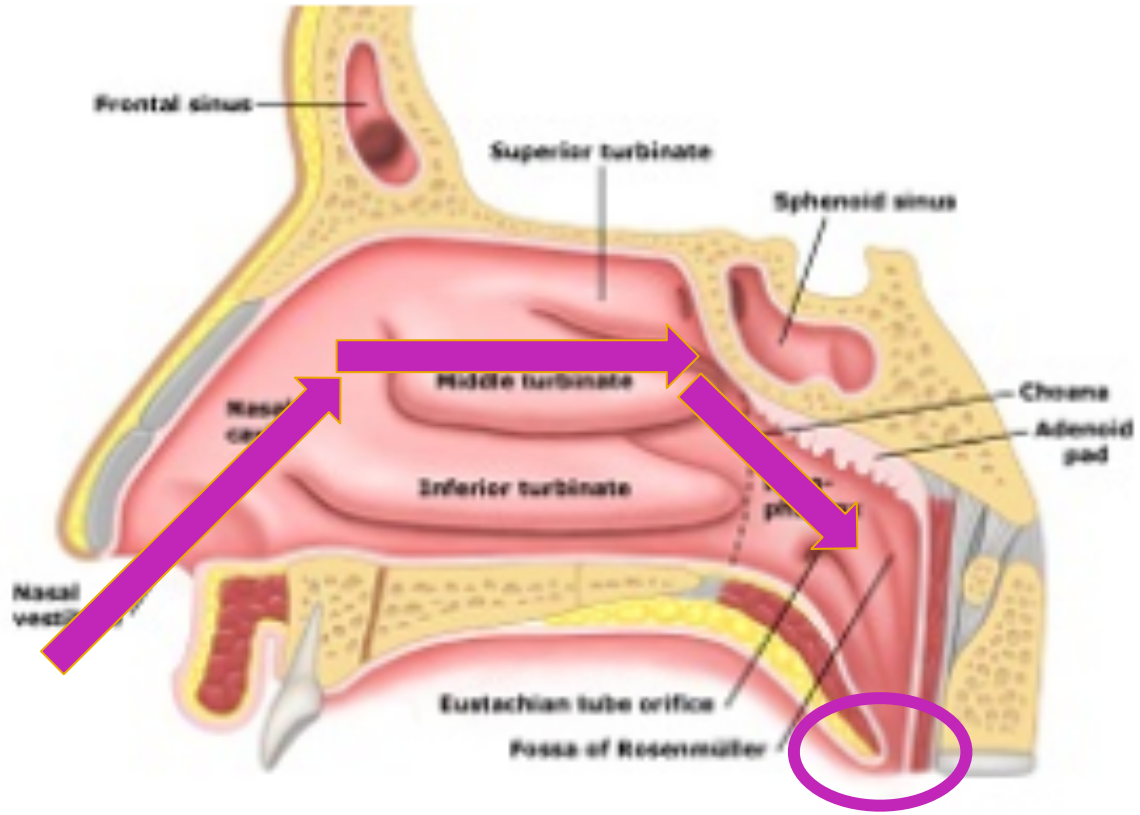
Scope Evaluation

By positioning the scope high in the nose, you can now look down on the velopharynx and allows for the examiner to have a much better view of velopharyngeal closure



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Interpreting Scope Exam

- What are we looking for?
  - Nasal obstruction
  - Adenoids
  - Palate structure
    - Seagull sign, evidence of submucus cleft palate (SMC)
  - Closure pattern
  - Gap present?
  - Size of gap?
  - Vocal cord motion
  - Midline pulsations

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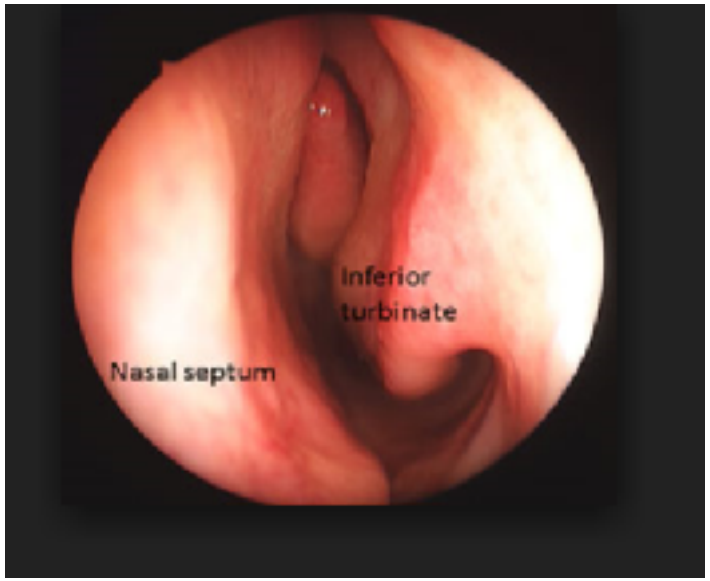
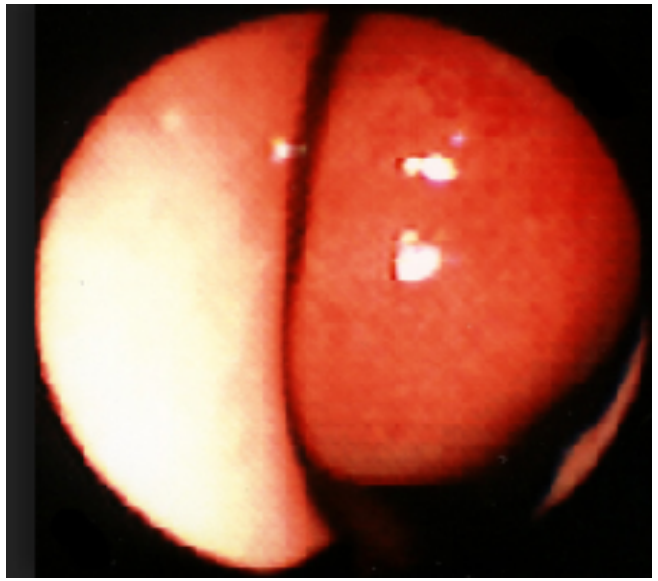
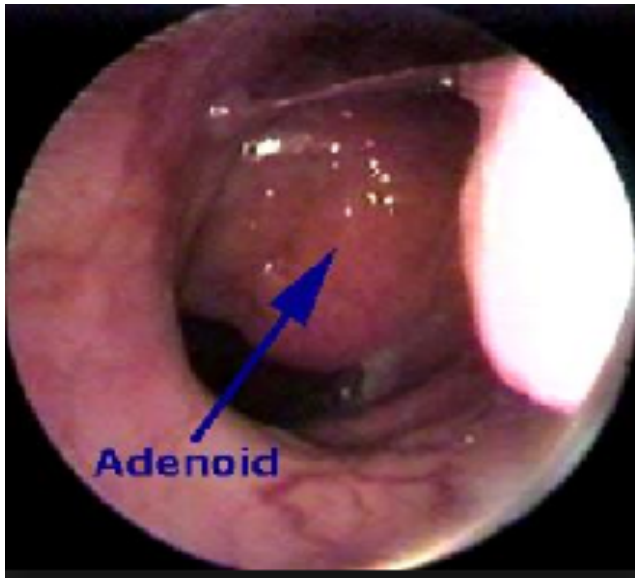
Interpreting Scope Exam

- Nasal Obstruction
  - Hyponasal?
  - Turbinate hypertrophy?
- Adenoids
  - Enlarged? Absent?
  - Contributing to closure?

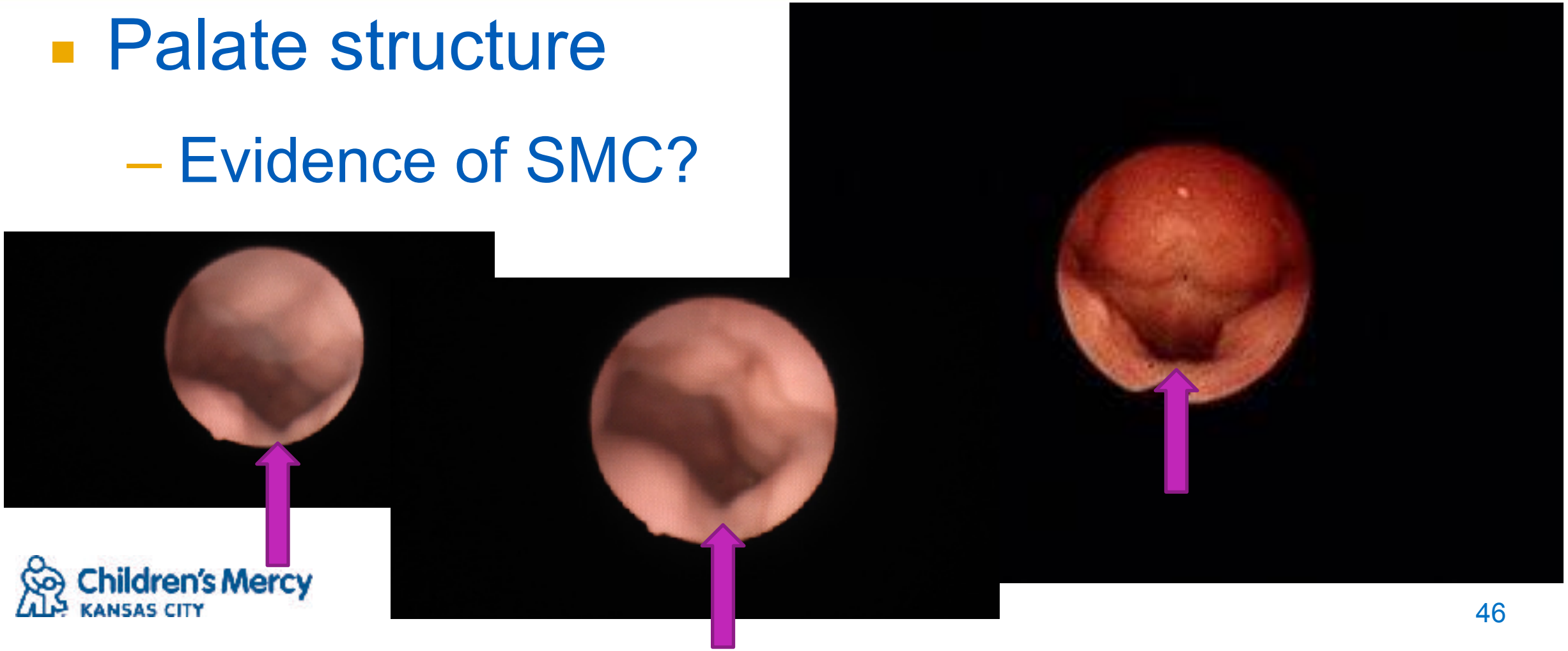






Interpreting Scope Exam

- Palate structure
  - Evidence of SMC?



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Submucus Cleft Palate

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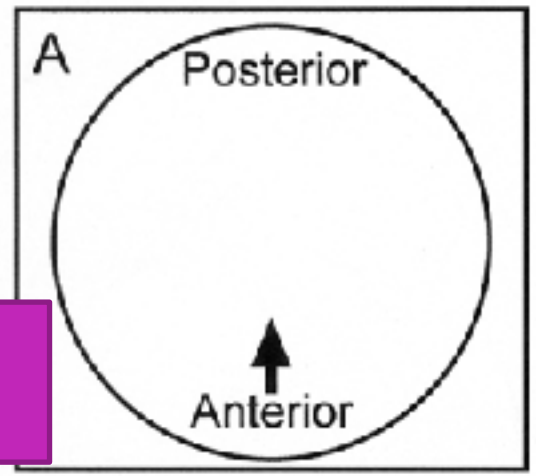
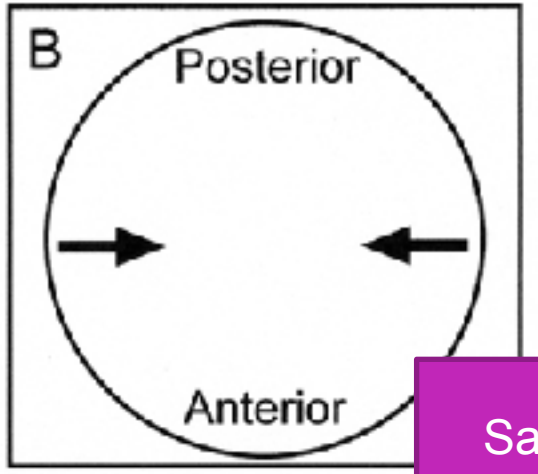
Interpreting Scope Exam

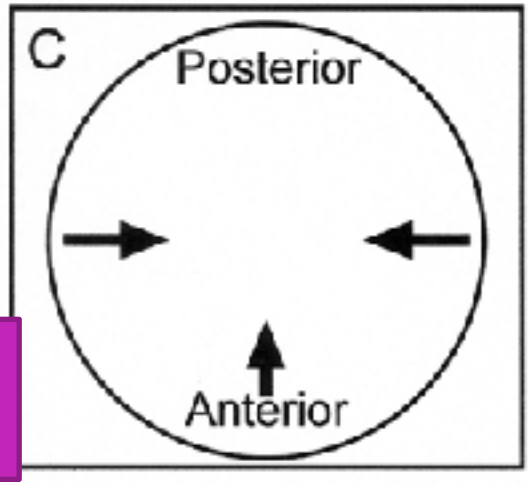
- Closure Pattern



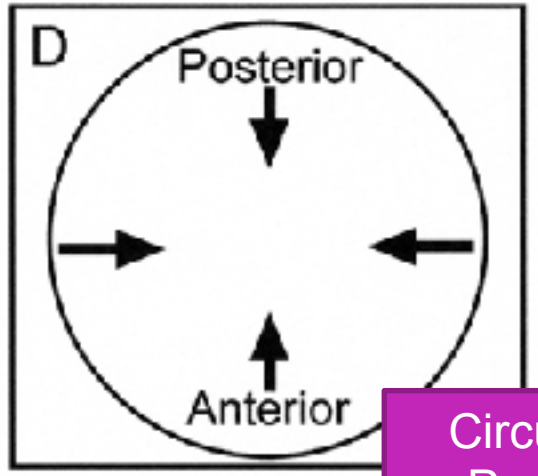
Coronal



Sagittal



Circular



Circular with Passavant

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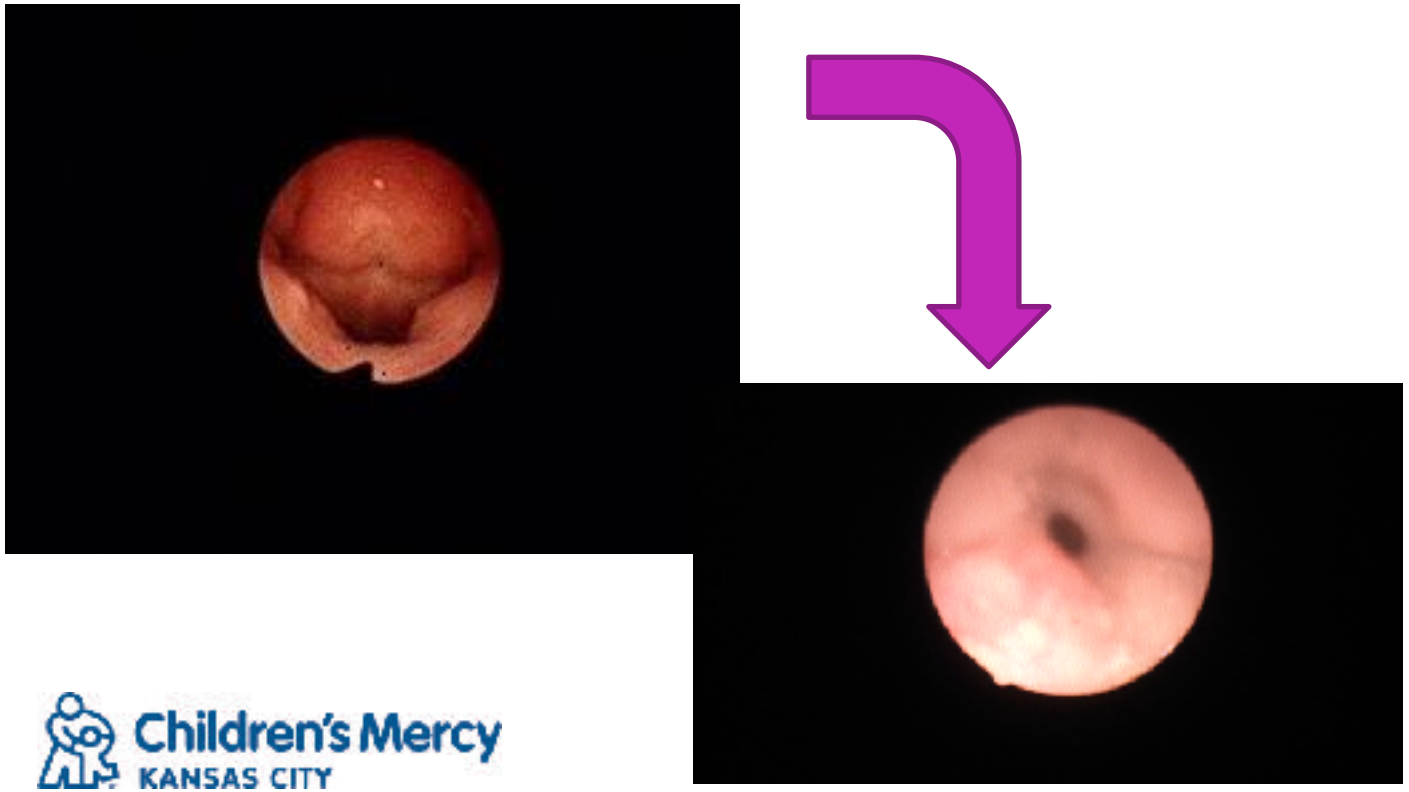
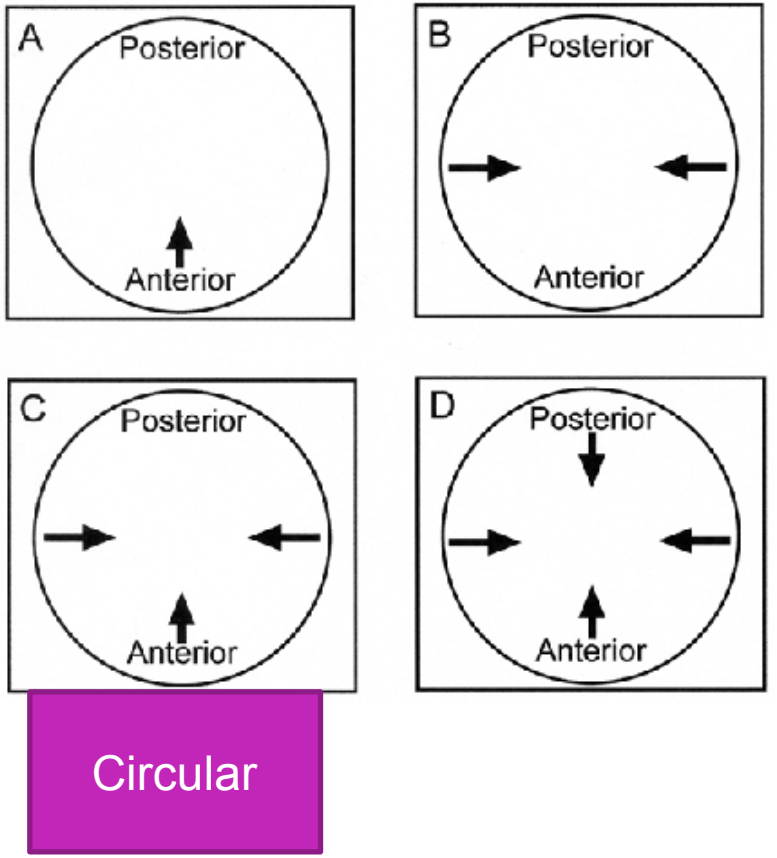
Interpreting Scope Exam

- Closure Pattern





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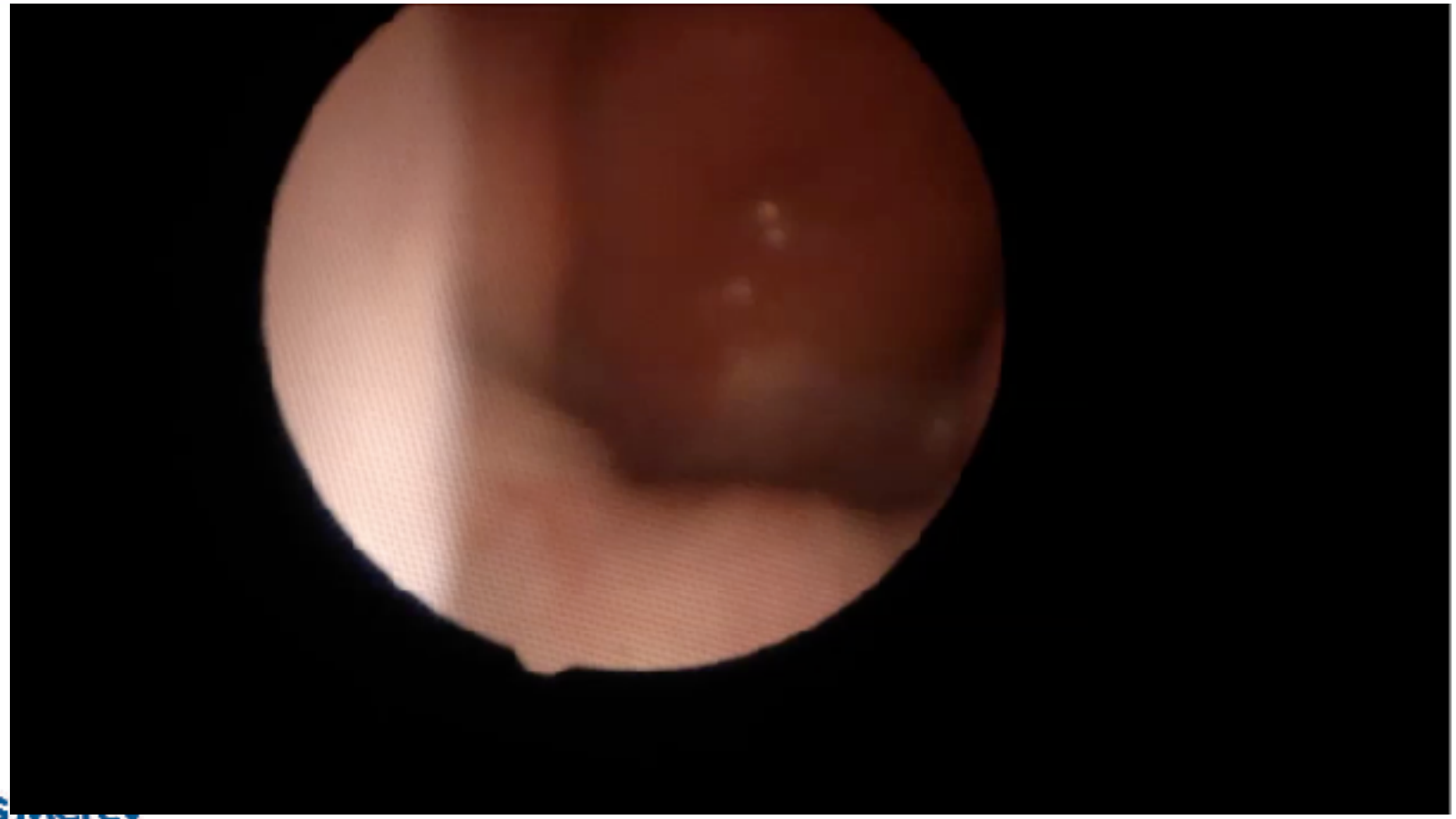
Closure Pattern



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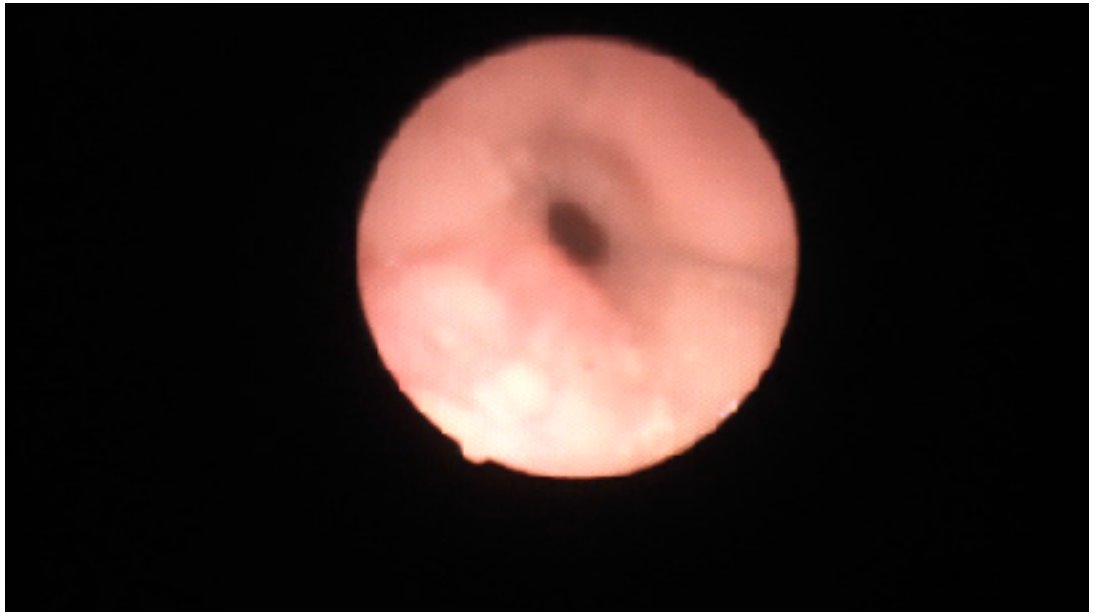
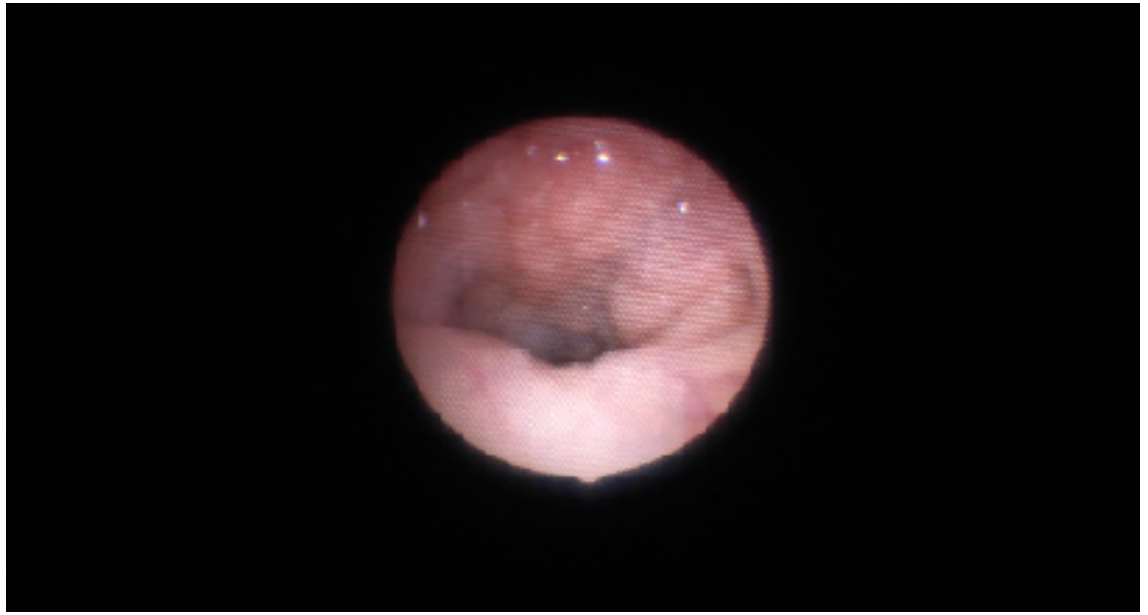
Interpreting Scope Eaxm

- Gap present? Gap size
  - With maximal closure, size of residual gap





Interpreting Scope Exam

- Why is this helpful?
- Closure pattern + gap size = surgical planning
- Assist in determining which speech surgery to recommend
- Assist in intra-op planning/flap design for speech surgery
  - How wide of a flap
  - Height of flap inset

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Interpreting Scope Exam

- Vocal fold motion
  - Bilateral vocal fold mobility

- Midline pulsations
  - 22q11.2 deletion syndrome
  - Pulsations do not always accurately predict location of vessels
    - Mitnick et al. 50% of pts with medially displaced carotid arteries on imaging actually had pulsations

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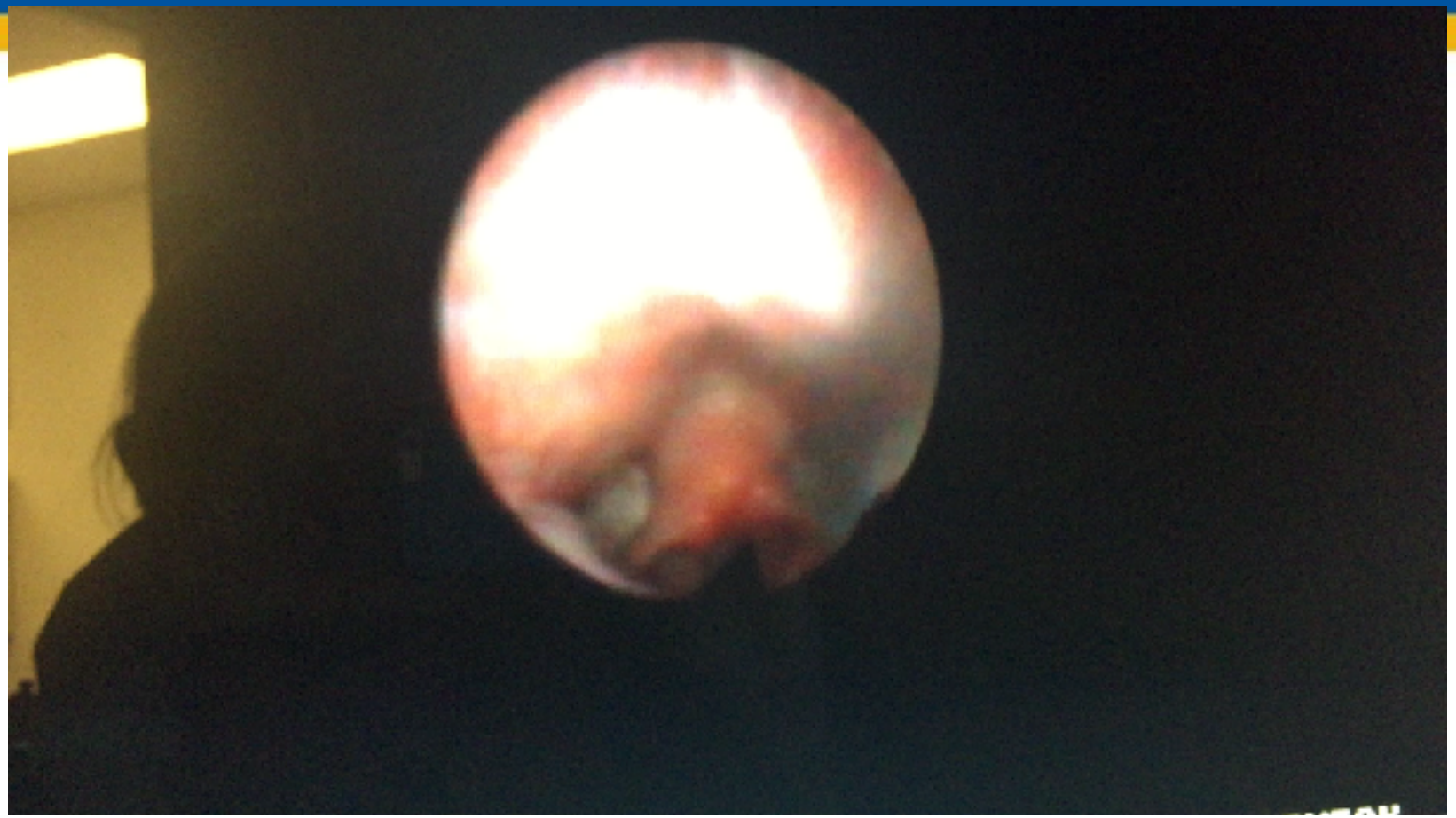
Medialized Vasculature



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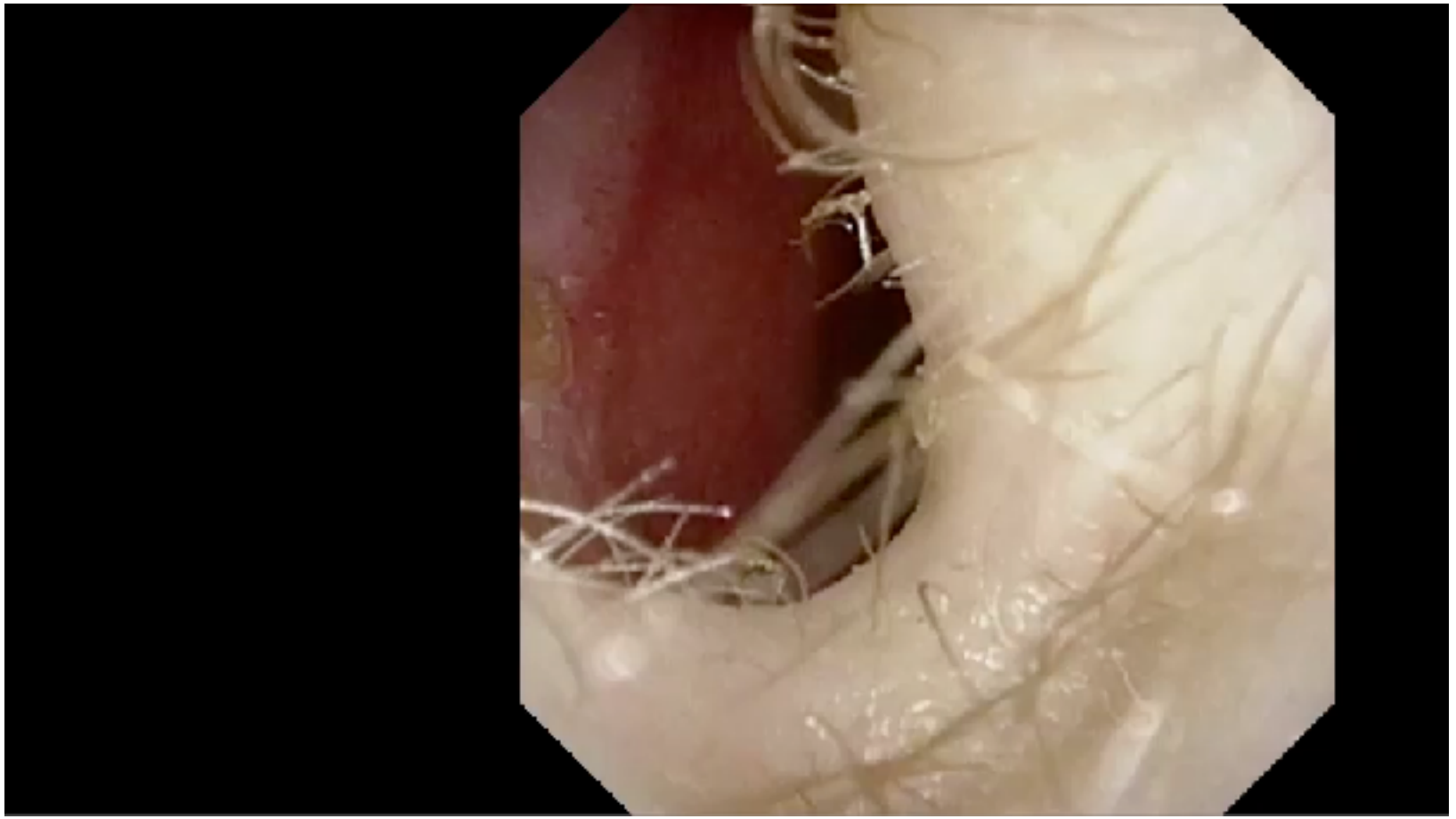
Interpreting Scope Exam

- Turbinate hypertrophy?
- Adenoids?
- Palate- SMC?
- Closure pattern?
- Gap size?
- Medialized vasculature?



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RECOMMENDATIONS

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Determining the Type of VPD

Determining the type of velopharyngeal dysfunction guides treatment recommendations

- Speech therapy
  - Outpatient and/or school based
  - Coordinate care with community SLPs
- Surgery
  - Furlow palatoplasty
  - Pharyngeal Flap
  - Sphincter Pharyngoplasty
  - Posterior wall augmentation (Deflux, Prolaryn, fat)
- Speech appliance/obturator
- Follow-up in VPD Clinic

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Determining the Type of VPD

- Is it **velopharyngeal incompetence (neurological)**?
  - Asymmetrical palatal elevation?
  - History of surgery that may have damaged cranial nerve X (Vagus)?
  - Sudden onset of hypernasality
  - Signs of apraxia of speech?
  - No history of cleft palate or submucous cleft palate
    - Rarely see velopharyngeal incompetence in cleft clinic but we see if frequently in VPD Clinic

Determining the Type of VPD

- **Velopharyngeal incompetence treatment options**
  - Typically requires surgical intervention if VPD is impacting communication success
  - May recommend speech therapy
    - Mild (no surgery recommended)
      - Compensatory strategies
      - Articulation
    - Before Surgery
      - Teach improved placement
      - Eliminate compensatory errors prior to surgery
    - After surgery
      - Teach correct oral airflow
      - Continue work on articulation

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Determining the Type of VPD

- Is it **velopharyngeal insufficiency** (VPI)?
  - History of cleft palate or repaired submucous cleft palate?
  - Is palatal length inadequate?
    - Reminder: it is difficult to assess the palatal length from an oral view
  - Does the palate appeared to be tethered/movement is limited?
  - Signs of a submucous cleft palate?
  - Does increased utterance length and/or fatigue increase resonance concerns?
- If yes, most likely VPI related hypernasality

Determining the Type of VPD

- **Velopharyngeal insufficiency (VPI) treatment options**
  - Typically requires surgical intervention
    - It is a structural issues
  - May recommend speech therapy
    - Mild (no surgery recommended)
      - Compensatory strategies
      - Articulation
    - Before Surgery
      - Teach improved placement
      - Eliminate compensatory errors prior to surgery
    - After surgery
      - Teach correct oral airflow
      - Continue work on articulation

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Straws & Whistles & Bubbles, Oh my!

- Research has shown that these activities do not improve velopharyngeal closure for speech
  - There is a separate velopharyngeal closure motor program for speech vs. non-speech tasks.
  - Many of our hypernasal patients are able to achieve adequate closure for swallowing, etc.
  - To improve speech, you have to work on speech.
  - I may use them to teach the difference between oral and nasal airflow

Determining the Type of VPD

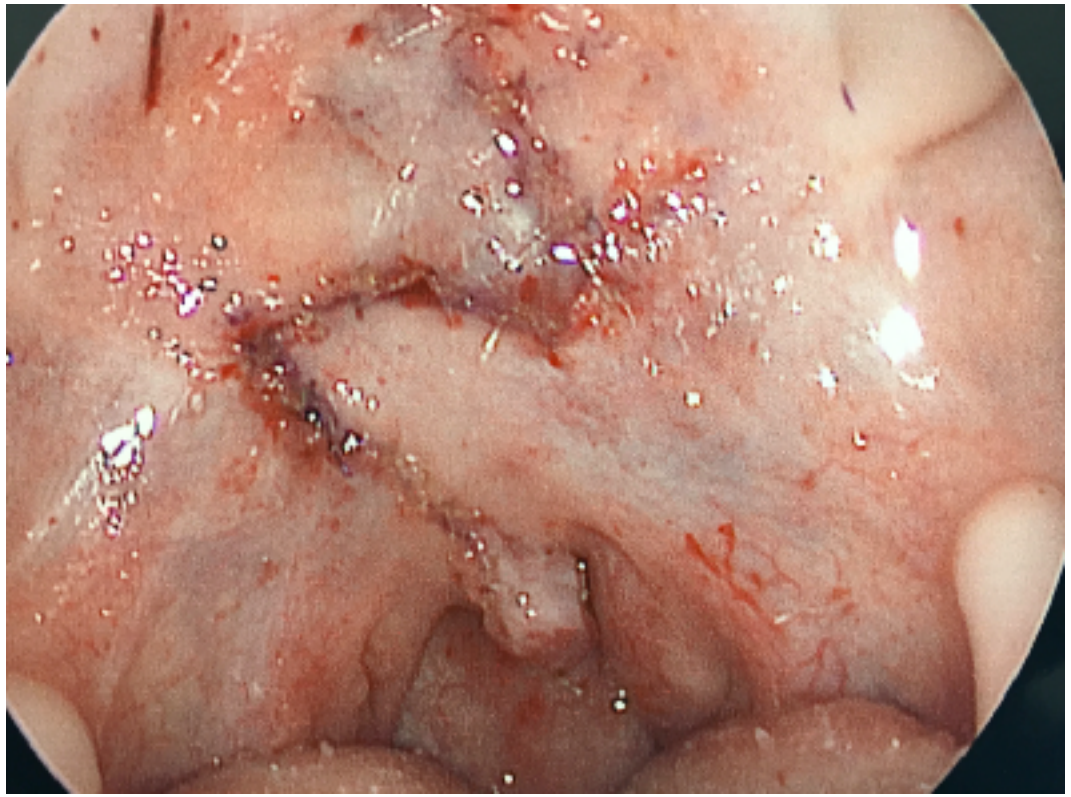
- Is it **velopharyngeal mislearning**?
  - Does the child have good oral air pressure for most non-nasal sounds?
  - Is nasal air loss is associated with just a few sounds?
    - Usually s, z, f, v and/or th
  - With nasal occlusion does the child appears to be forcing air into the nasal cavity and it gets “stuck”?
  - Can you elicit erred sounds with improved oral airflow (more to come on techniques)?
- If the answer to a majority of these questions is yes, it is most likely velopharyngeal mislearning.
- May see signs of velopharyngeal mislearning following primary palate repair and “speech surgery”

Determining the Type of VPD

- **Velopharyngeal mislearning treatment options**
  - Speech therapy
    - Typically a very short course of articulation treatment
    - Once improved oral airflow is achieved for 1-2 difficult sounds it is often transferred to other sounds with minimal difficulty
  - Not surgical candidates
    - The velopharyngeal closure mechanism is intact, the child is not using it correctly for all appropriate sounds

Surgery for VPD

- Speech surgery
  - **Furlow palatoplasty**
  - **Pharyngeal Flap**
  - **Sphincter Pharyngoplasty**



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Furlow Palatoplasty

- When **submucus cleft palate** is present
- If SMC and a larger gap, consider combining with a sphincter pharyngoplasty
- Genetic testing for 22q11.2 deletion syndrome recommended by ACPA

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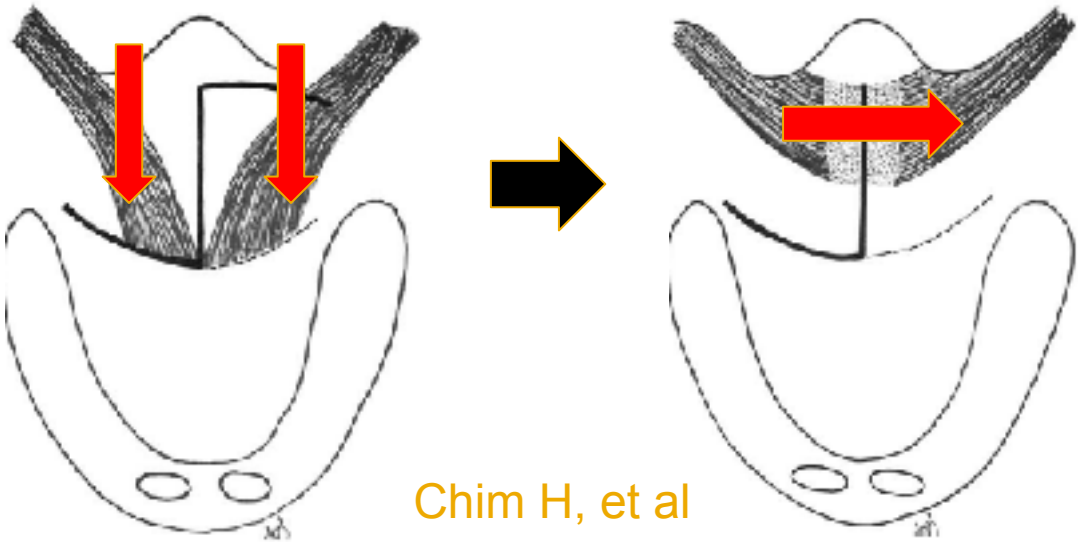
Furlow Palatoplasty

- Surgical repair of submucus cleft palate
- ‘Double opposing Z-plasty’
- Orients levator palatini muscle in proper direction
- Adds length to the palate



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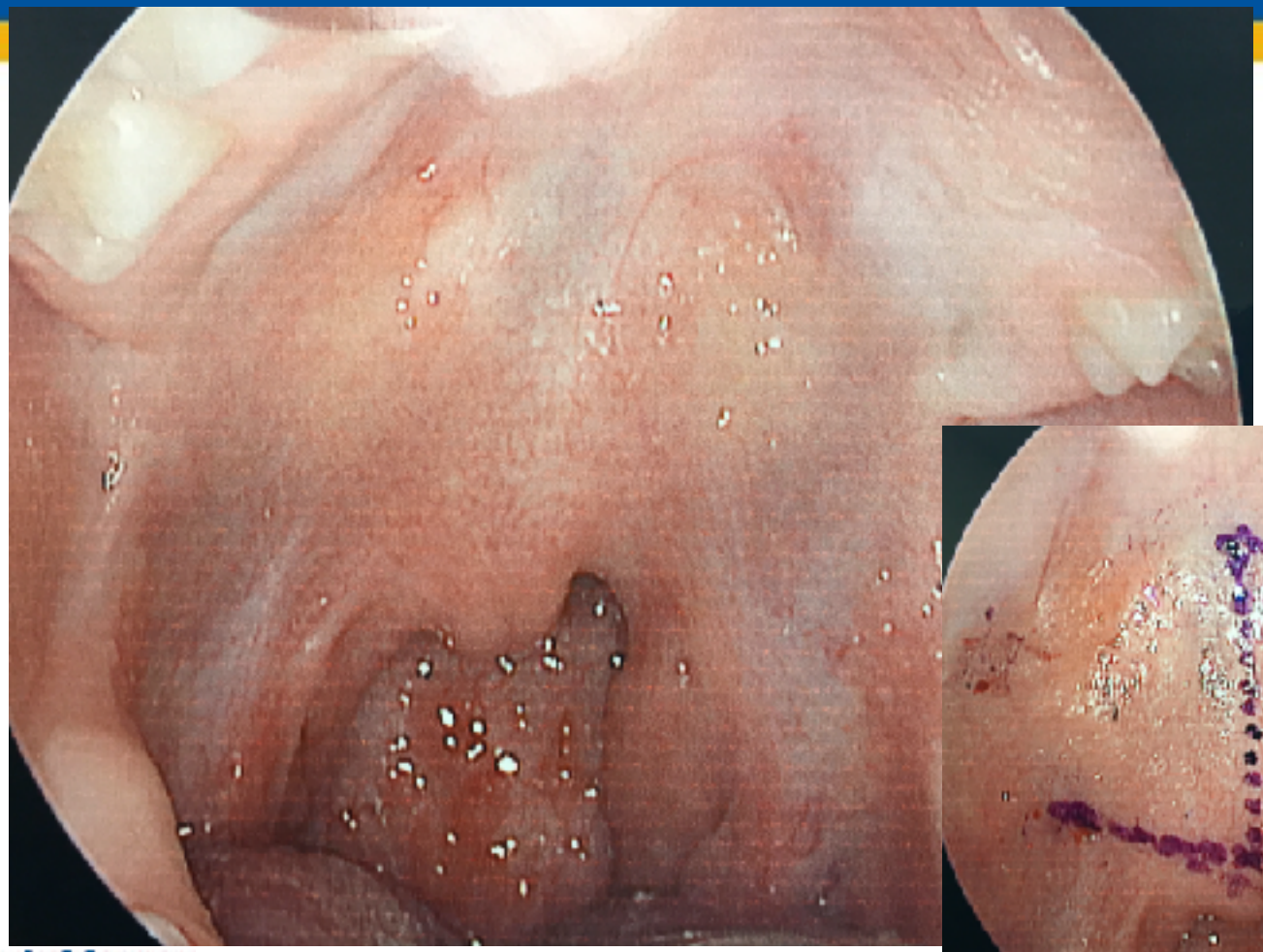
Furlow Palatoplasty



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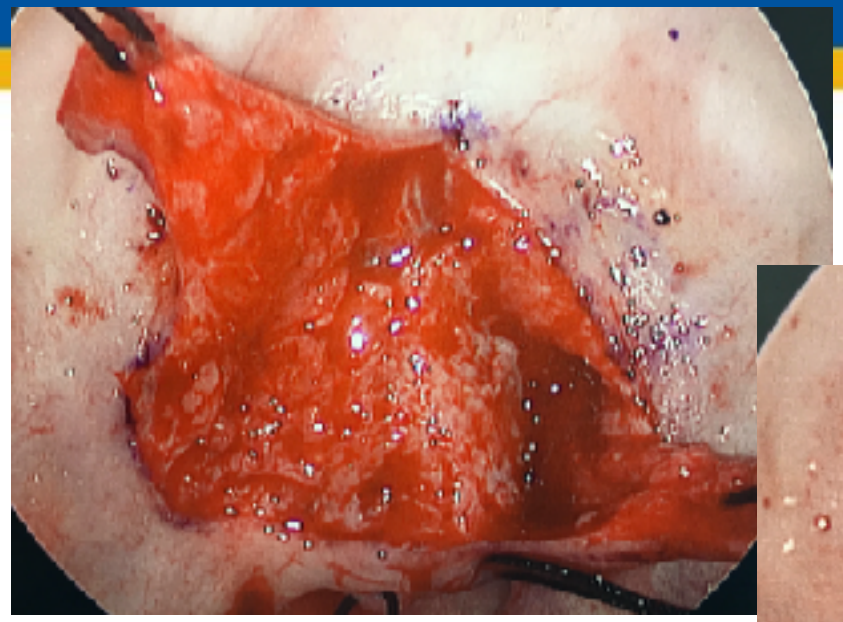
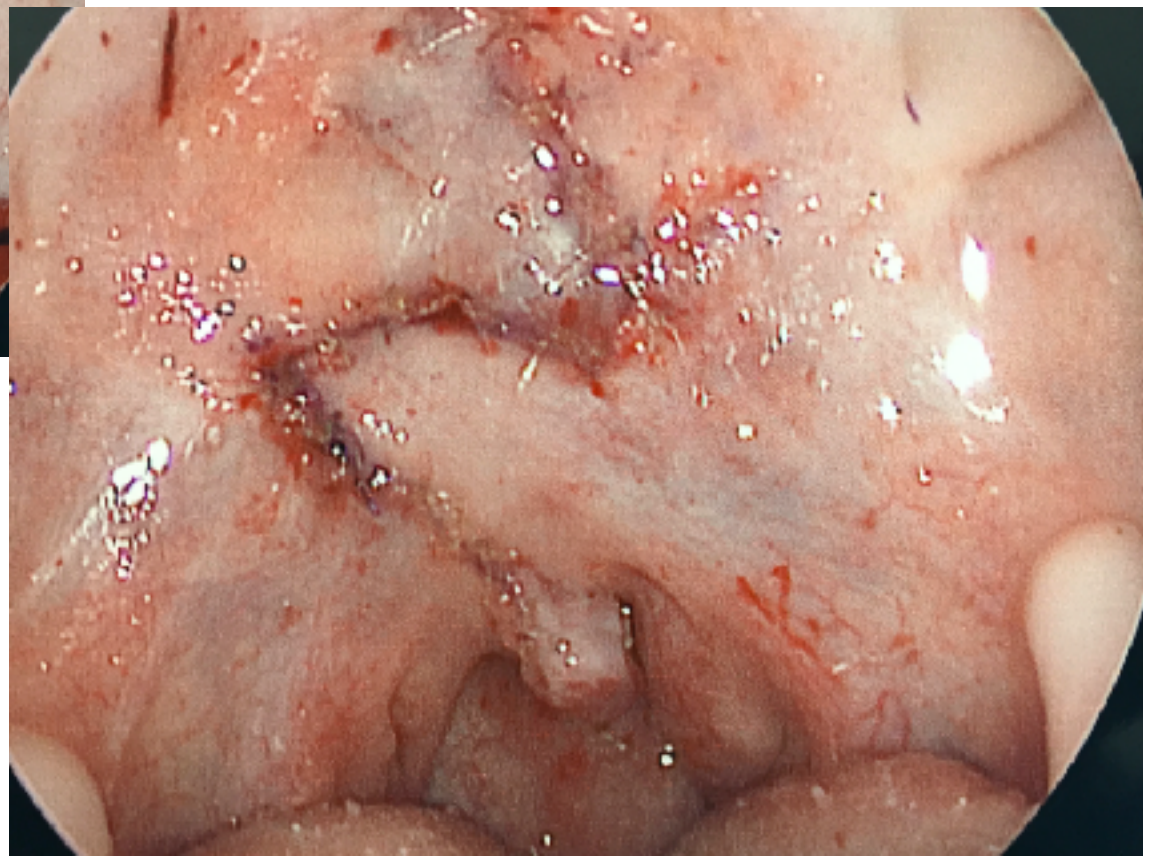
Furlow Palatoplasty





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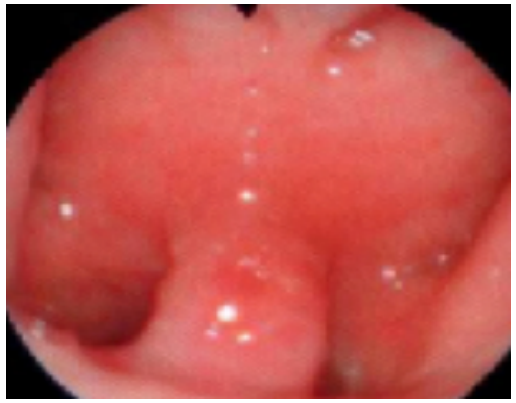
Surgery for VPD

- SMC is not present
- VPI present after Furlow
- Large gap

- Posterior pharyngeal flap
- Sphincter pharyngoplasty



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Surgery for VPD

- Which surgery?
  - Closure pattern (test answer)
    - Circular closure pattern- pharyngeal flap
    - Coronal closure pattern- sphincter pharyngoplasty
  - Surgeon preference

Sphincter Pharyngoplasty

- 2 lateral myomucosal flaps elevated and sewn into the posterior pharyngeal wall
- Creates a ‘speed bump’ along the posterior pharyngeal wall for the soft palate to close against
- Works well for coronal closure patterns
- Consideration for staged T/A (speech may worsen bf definitive surgery)

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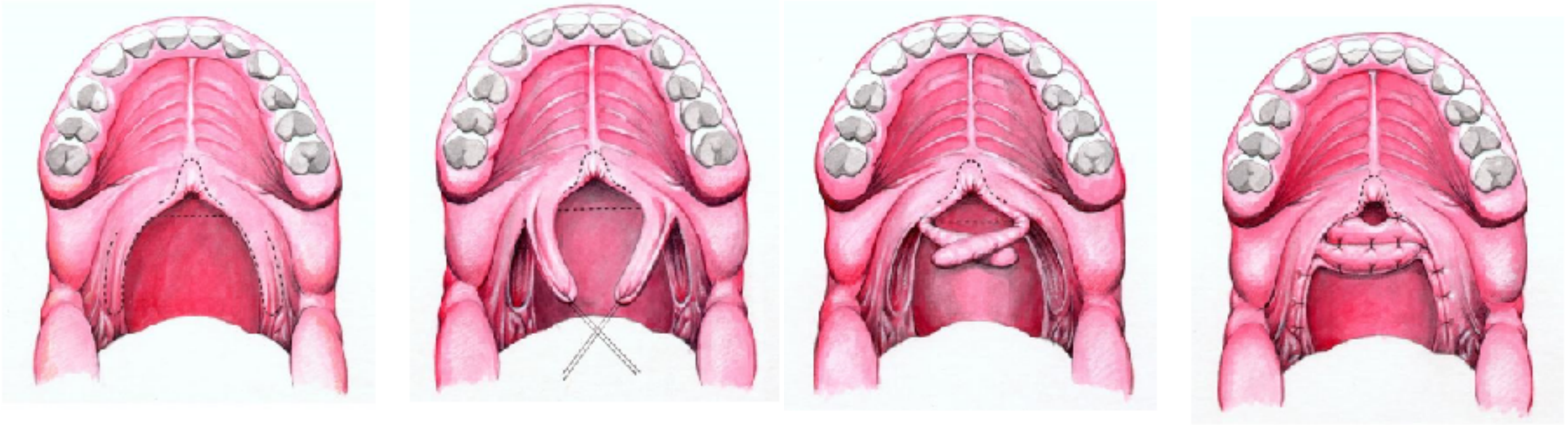
Sphincter Pharyngoplasty



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http://emedicine.medscape.com/article/1279928-overview

Posterior Pharyngeal Flap

- Superiorly based myomucosal flap from posterior pharyngeal wall elevated and inserted into the soft palate
- Builds a bridge between posterior pharyngeal wall and the soft palate

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Posterior Pharyngeal Flap

- Works well for central gaps, large gaps, neurogenic component
- Historic ‘work horse’ for children with 22q11.2 DS
- Highest risk of post-op OSA
- Consideration for staged T/A
  - speech may worsen bf definitive surgery

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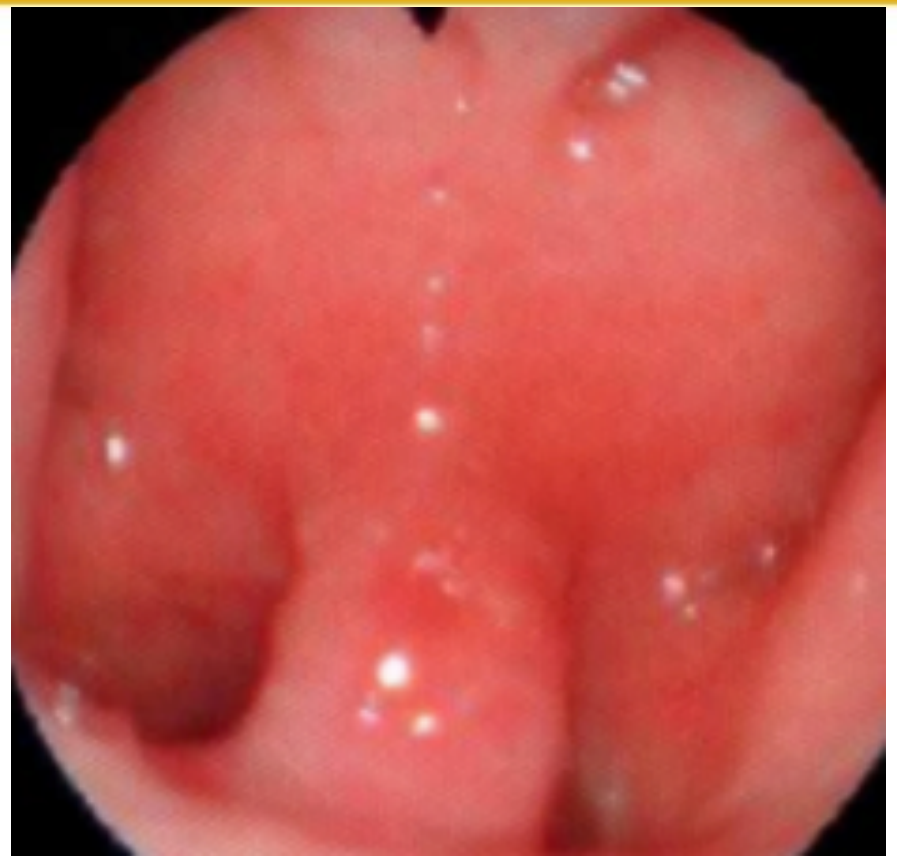
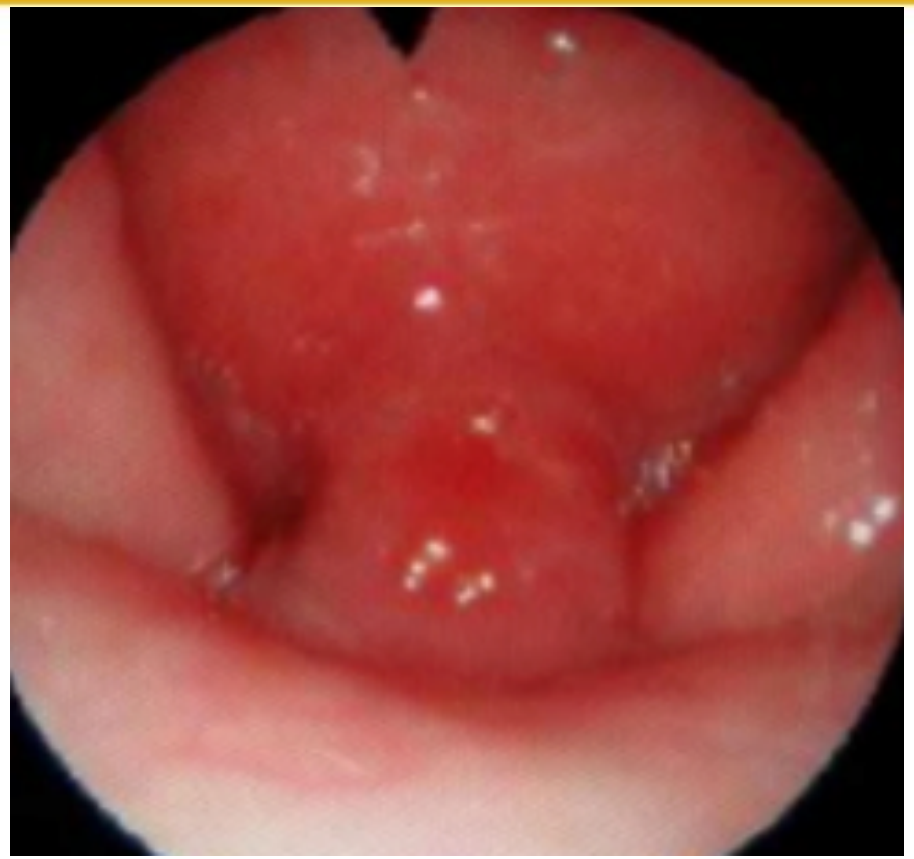
Posterior Pharyngeal Flap





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Posterior Pharyngeal Flap

Pre-op

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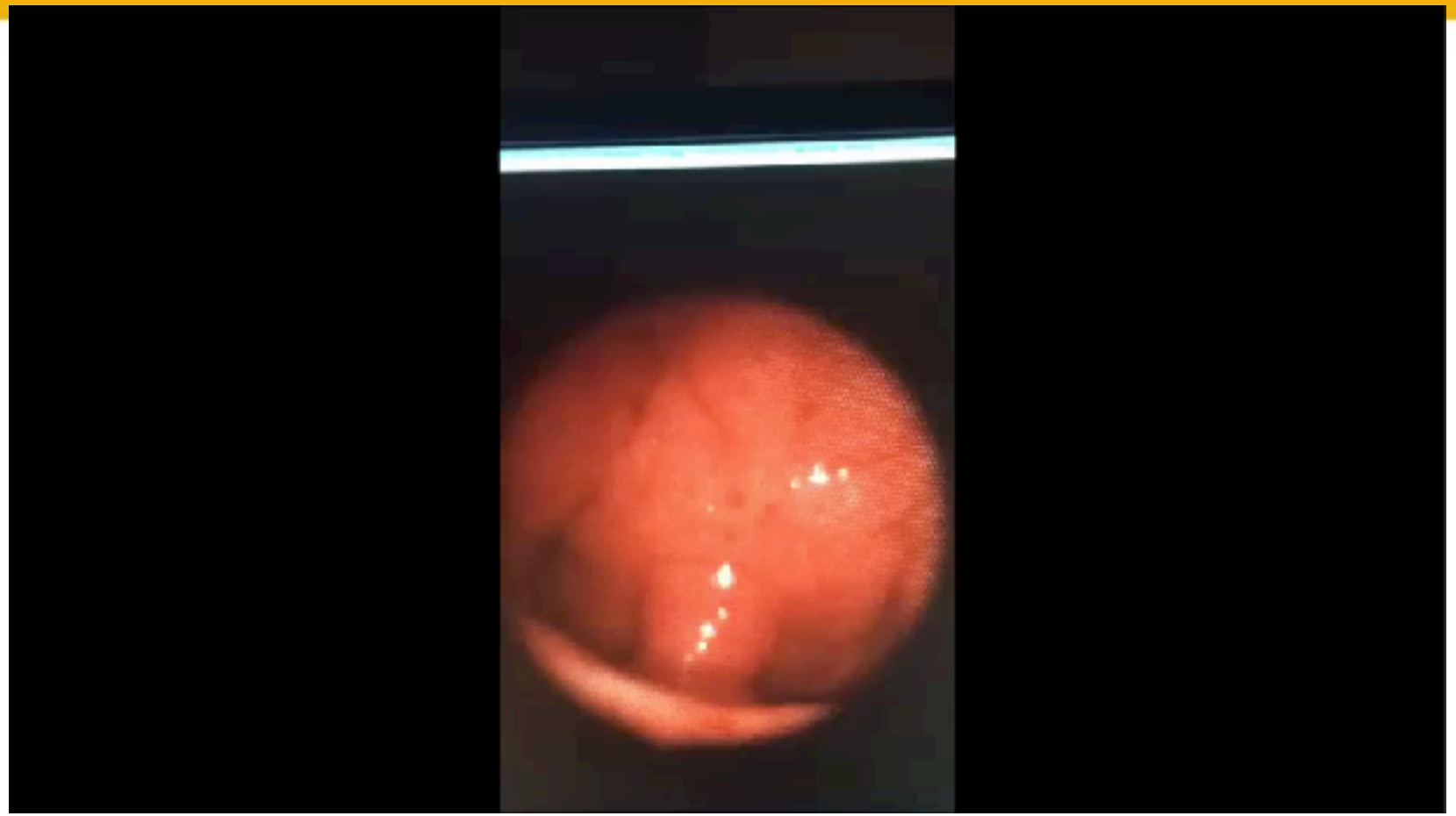
Posterior Pharyngeal Flap

Post-op



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Post-op VPD Surgery

- Pourable diet for 2 weeks post-op
- Resume speech therapy after 4-6 weeks rest
- If persistent snoring with concerns for sleep apnea, obtain sleep study (wait ~3 months)

Speech Therapy Following Surgery

- Important to let family know that post-op therapy is likely, particularly in children with articulation errors in addition to resonance concerns.
- Typically take a break from therapy services for 4-6 weeks following surgery
- Expect changes for up to six months following surgery
  - Healing, scarring
- Focus of therapy
  - Teaching oral vs. nasal airflow
  - Correcting articulation errors

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VPD Clinic Follow-Up

- Follow-up in VPD clinic 3-6 months following surgery
  - Re-scope if hypernasality is persistent
- Typically recommend follow-up in 6 months if we are monitoring resonance but not recommending surgery at the time of their initial visit
- Highly individualized process

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CASE STUDIES

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References/Resources

- **Cleftline**
  - www.cleftline.org
  - Education materials

- **Books**
  - Cleft Palate and Craniofacial Anomalies: Effects on Speech and Resonance, 2nd Edition (Kummer, 2008)
  - Cleft Palate Speech, 4th Edition, Peterson-Falzone, Hardin-Jones & Karnell, 2009)
  - Clinician's Guide to Treating Cleft Palate Speech (Peterson-Falzone, Trost-Cardamone, Karnell, Hardin-Jones, 2005)

QUESTIONS?

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THANK YOU!

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