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

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PART 1:

▪ What is VPD?
▪ VPD Clinic
  ▪ Team members
  ▪ Our patients
▪ Typical Visit
VPD: Velopharyngeal Dysfunction

PART 1 (continued)

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

PART #1
VELOPHARYNGEAL DYSFUNCTION
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?
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 Insufficiency

- 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
VPD CLINIC
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)
Who we DON’T see?

- Patients with cleft lip and palate
  - Followed by the Cleft Lip and Palate Clinic at Children’s Mercy
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
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
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
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
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
• 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
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
• Discuss findings with parents
  • Provide education re: the velopharyngeal mechanism
  • Provide easy to understand information
    • Straw technique is very helpful
  • If velopharyngeal insufficiency or incompetency is suspected and impacting speech intelligibility, a scope is recommended
NASOENDOSCOPY
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
Traditional flexible scope training is to pass along the floor of the nasal cavity. This does NOT allow a good view of the velopharynx.
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.
Interpreting Scope Exam

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

- Nasal Obstruction
  - Hyponasal?
  - Turbinate hypertrophy?

- Adenoids
  - Enlarged? Absent?
  - Contributing to closure?
Interpreting Scope Exam

- Palate structure
  - Evidence of SMC?
Submucous Cleft Palate
Interpreting Scope Exam

- Closure Pattern

- Coronal

- Sagittal

- Circular

- Circular with Passavant
Interpreting Scope Exam

- Closure Pattern
Closure Pattern
Interpreting Scope Exam

- 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
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
Medialized Vasculature
Interpreting Scope Exam

- Turbinate hypertrophy?
- Adenoids?
- Palate- SMC?
- Closure pattern?
- Gap size?
- Medialized vasculature?
I’m learning so much about VPD!
RECOMMENDATIONS
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
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
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
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 associated with just a few sounds?
    - Usually s, z, f, v and/or th
  – With nasal occlusion does the child appear 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
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
Furlow Palatoplasty

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

Chim H, et al
Furlow Palatoplasty
Furlow Palatoplasty
Surgery for VPD

- SMC is not present
- VPI present after Furlow
- Large gap
  - Posterior pharyngeal flap
  - Sphincter pharyngoplasty
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 before definitive surgery)
Sphincter Pharyngoplasty

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
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 before definitive surgery
Posterior Pharyngeal Flap

Pre-op
Posterior Pharyngeal Flap

Post-op
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
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
CASE STUDIES
• Cleftline
  – www.cleftline.org
  – Education materials

• Books
  – Cleft Palate and Craniofacial Anomalies: Effects on Speech and Resonance, 2nd Edition (Kummer, 2008)
QUESTIONS?
THANK YOU!

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