Clinical Evaluation of Velopharyngeal Function : Perceptual Assessment

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Background Context

- Ideally, diagnosis of VPI should be made on the basis of direct examination of the velopharyngeal port during speech.
  - e.g. using nasendoscopy, videofluoroscopy
- But (a) sometimes such an examination is not possible; and (b) it is not necessary to conduct such examinations for all patients with CP.

Aim

- What are the perceptual indicators for referral for direct imaging of the VP port?
- If direct examination is not possible, what are the perceptual indicators of VPI?

☑ VPI cannot be diagnosed definitively on the basis of perceptual information, such information can be a strong indicator of VPI.

Possible perceptual indicators of VPI

- Hypernasality
- Articulation errors (a particular pattern)
- Nasal emission
- Grimace
- Nasal regurgitation

Nasal regurgitation

- Definition: leakage of liquids or solids from the nose during eating or drinking
- A strong indicator of VPI
- Rule out oral-nasal fistula (oral examination)
- Information usually obtained by case history
- Determine:
  (1) frequency of problem (every meal? once a month?)
  (2) consistency (liquids, solids, semi-solids)
- Some regurgitation may be WNL, especially in children

Grimace

- Also a good indicator of VPI
- Rarely associated with fistula
- 'Unconscious' attempt to block nasal air escape by occluding nares?
- Can be subtle (e.g. slight pinch of nostrils) or more dramatic (e.g. affecting whole face)
- Usually classified as 'present' or 'absent'

Nasal Emission

- Definition: nasal escape of air during speech
- Can be audible or inaudible ('visible')
- Can be consistent or inconsistent
  - ☑ determine which phonemes
  - ☑ usually pressure consonants (plosives, fricatives, affricates)
- Can be associated with fistula as well as VPI

Testing for nasal emission

- Perceptual evaluation (phonetic transcription)
  e.g., /pen/ => [p^{NE}en], [p*p*en]
- "Mirror test"
  - place small mirror under nares during production of speech sounds
  - test left and right nares separately
  - be aware of "normal" nasal escape (e.g. for nasal consonants or vowels in nasal context)
    - ↑ try sustained phonation of fricatives (e.g. /s/)

Modified tongue anchor technique

☑ ask patient to "puff up cheeks", while the tongue tip is protruded through the lips

(avoids patient retracting tongue to aid VP closure)

- may require some practice
- speakers with normal VP closure should be able to sustain this posture with no nasal escape

Caution: non-speech movement (generalizable to speech?)

Phoneme specific nasal emission

- Patient has nasal emission for some phonemes but not for all high-pressure consonants
- Maybe only in some contexts
- No existing physiological cause (fistula, VPI)
- This is a learned pattern
- Treat as articulation disorder, not resonance disorder

Hypernasality

- Definition: excessive nasal resonance during speech (oral-nasal balance; perceptual quality)
- Possibly the most important indicator of VPI
- Hypernasality is "carried" primarily on vowels, not consonants
- Best evaluated during connected speech (reading aloud sentences or paragraph; conversational speech), not during production of single words or phonemes

- Hypernasality is usually evaluated using an interval scale (4 point, 7 point)
  e.g. 1 = normal, 2 = mild, 3 = moderate, 4 = severe
- Determine consistency
  (single words versus connected speech; worsen over time?)
- Making perceptual judgement of hypernasality requires training and experience
  (even experienced judges/clinicians may require 'recalibration' with standardized materials)
- Ideally (especially in research), use panel of judges
  - determine inter-judge and intra-judge reliability

Articulation Errors Associated with VPI

- Weak pressure consonants
  e.g. /bin/ => [bfiin]
- Deleted (omitted) pressure consonants
  e.g. /bin/ => [Øin]
- 'Compensatory articulation'
  - More posterior place of articulation
  - Manner often maintained
    e.g. /sit/ => [ˌit], /kup/ => [÷up]

Hoarseness as predictor of VPI?

- Controversial
- VPI may lead to voice disorder (hoarseness)
- Because of excessive demands on an inefficient system
- Probably only in cases of severe VPI
- Prevalence of voice disorders approximately 6% in non-cleft population (higher in children?)

Case Profiles

- Case 1: Baba (18 m), Case 2: Mei Mei (5 y)
  - unrepaired cleft palate = VPI
- Case 3: Li Bing
  - Severe hypernasality, some compensatory articulation errors
  - Need further information (nasal emission? nasal regurgitation?) but probable VPI
  - Rule out O-N fistula
  - Refer for direct examination; probable surgical or prosthetic management of VPI

"Pinch test"

- Ask patient to repeat a sentence with no nasal consonants
- Then repeat, with nostrils occluded ("pinched")
- Compare occluded and unoccluded
- If significant change, suggests hypernasality

Caution: some SLPs find this difficult to use/interpret, some children may show change when not hypernasal

Hypernasality vs Hyponasality

- Hypernasality = excessive nasal resonance
  Hyponasality = insufficient nasal resonance
- Hyponasality - related to nasal blockage
  - Cold, allergy, polyp, etc.
- Treatment: ENT
- Important to distinguish perceptually

Articulation

- Articulation errors are common in speakers with cleft palate, even after surgical repair
- May be related to several physiological problems including: malocclusion, hearing impairment, fistula, VPI
- Why associated with VPI?
  - many speech sounds require intraoral air pressure (especially 'pressure consonants')
  - VPI leads to 'leakage' of air through the velopharyngeal port and nose, and difficulty achieving/maintaining intraoral air pressure

- Case 4: Ting Ting
  - mild hypernasality, mild nasal emission, numerous articulation errors
  - small fistula, Class III malocclusion
  - need further information (grimace? nasal regurgitation? consistency of hypernasality and nasal emission)
  - Possible VPI
  - needs differential diagnosis (fistula, malocclusion)
  - Refer for direct examination; possible surgical or prosthetic management of VPI

Conclusions

- Ideally, a diagnosis of VPI is made on the basis of direct examination
- Perceptual evaluation may provide strong indications of the presence of VPI
- Perceptual indicators include: hypernasality, nasal emission, a specific pattern of articulation errors, nasal grimace, and nasal leakage while eating/drinking.
- Perceptual judgements require training and experience; we must ensure the validity and reliability of our judgements,, and document systematically.