Voice Disorders in Children

Peggy E. Kelley MD
Associate Professor of Otolaryngology
University of Colorado, Denver
The Children's Hospital
Outline

- Types and Etiologies of Voice problems
  - Resonance
  - Voice
- Evaluation of voice problems
  - History
  - Acoustic
  - Physical
  - Endoscopy
- Treatment of voice problems
  - Medical
  - Voice Therapy
  - Surgical
The voice outcome is dependent on the patient’s airway status and neurologic abilities which include swallowing and may be a clue to etiology and may guide treatment.
Pediatric Voice Disorders

- Problems of resonance
  - Submucous cleft palate
  - Velocardiofacial Syndrome (VCFS)
    - 22q11
  - Post adenoidectomy nasal emission
  - Palatal paresis/neuromotor dysfunction
  - Phoneme-specific VPI
Cleft palate is the fourth most common birth defect with an incidence of 1-500 births
- Approximately 26% are hypernasal after the primary palate closure

VCFS is one of the most common genetic disorders in humans
- Birth incidence (estimated) 1:1,800

Adenoidectomy may uncover VCFS, CPI
Resonance

- In English all sounds except m, n, ng require a closed velopharynx.
- If the nose is blocked the m, n, and ng sound like b, d, and g and the patient is *Hyponasal*.
- If the velum cannot close the b, d, and g and other sounds come through the nose and the patient is *Hypernasal*.
Anatomy of Resonance

Normal closure of palate

Velopharyngeal insufficiency

Hypernasal voice
Hyponasality
Diagnosis of Resonance Abnormality

- **History**
  - Any nasal reflux with feeding?
    - Suggests neurologic abnormality
  - Present since began talking?
    - VCFS, submucous cleft or other congenital syndrome
  - Previous surgery such as cleft palate repair (most common cause) or adenoidectomy
Diagnosis of Resonance Abnormality

- **Acoustic Evaluation**
  - Listen to single word or phrase repeated speech and spontaneous speech
    - Mild velopharyngeal insufficiency may only be evident on connected speech
    - May be present only for a few phonemes (most common is the “s”)
  - Use nasometer which records the amount of airflow through the nose and creates a computer graph for nasal and non-nasal sounds.
Nasometer

- KayPENTAX
  - Not scary
  - Do not have to be able to read
  - Data down to age 2
Diagnosis of Resonance Abnormality

- **Physical examination**
  - **Tonsil size**
    - If large in superior pole can prevent palate closure
  - **Palate elevation present or not**
    - Look for direction of muscle pull
    - Look for zona pellucida
    - Look for closure to posterior pharyngeal wall
  - **Fogging of a mirror during non-nasal phoneme production**
Diagnosis of Resonance Abnormality

- Nasendoscopy
  - Preparation of child
    - Let them know what to expect
  - To anesthetize or not…
    - Topical spray of lidocaine or ponticaine
    - Combined with a vasoconstrictor
  - Bribes often work
    - Give out toys from Donors to The Children’s Hospital
    - Can promise an ice cream to follow…
Nasendoscopy

- 2.8mm pediatric scope can easily evaluate velum movement.
  - Look for posterior pharyngeal movement, lateral wall movement, velar movement
  - Evaluate with repeated speech
  - Evaluate with connected speech
Nasendoscopy

- Submucous cleft
  - Zona pellucida
  - Notch in palate

- Velocardiofacial
  - No lateral or posterior movement
Pediatric Voice Disorders

- Problems of phonation
  - Vocal fold nodules
  - Vocal fold paresis
    - Congenital
    - Post-traumatic
  - Papilloma (Juvenile Recurrent Respiratory Papillomatosis JRRP)
  - Laryngeal trauma
  - Laryngeal edema/erythema (Laryngopharyngeal Reflux Disease LPRD)
Incidence of Voice Disorders

- 3% to 9% of the total population have voice disorders with vocal abuse being most prevalent
- Vocal nodules occur in 38-78% of chronic hoarseness in children
- Vocal nodules are more common in boys than girls with a ratio of 2 or 3 :1
Vocal Fold Nodules

- Present typically at junction of the anterior/mid 1/3rd of the vocal fold.
- May be associated with or without reflux disease.
Incidence of Voice Disorders

- Vocal fold paresis is the second most common congenital abnormality
  - Birth trauma 20%
  - Arnold-Chiari malformation - bilateral
  - cardiac surgery- left unilateral
  - associated anomalies
    - other cranial nerve palsies
    - cerebral dysgenesis
Incidence of Voice Disorders

- Respiratory Papillomatosis is most common benign neoplasm of the larynx.
  - 1500-2000 new cases diagnosed/year in U.S.
Incidence of Voice Disorders

- Intubation causes internal laryngeal trauma in 1-8% of infants/children intubated.
- External laryngeal trauma is less common in children than adults
  - Close line injury, strangulation from cords, direct trauma
Diagnosis of Phonation Abnormality

- History
  - Onset, duration, frequency, progression
  - Past Medical History
    - Allergy
    - Reflux
  - Prior intubation, trauma
  - Pattern of voice use/abuse
    - Yelling, noise making
  - Activities – drama, singing
Diagnosis of Phonation Abnormality

- History
  - Feeding, swallowing or respiratory symptoms
  - Hearing loss
  - Pediatric Voice Related Quality of Life survey
Pediatric Voice Outcomes Survey

☐ In general how would you say your child’s speaking voice is?

☐ To what extent does your child’s voice limit his or her ability to be understood in a noisy area?

☐ In the past 2 weeks, to what extent has your child’s voice interfered with his or her normal social activities or with his or her school?

☐ Do you find your child “straining” when he or she speaks because of his or her voice problem?
Diagnosis of Phonation Abnormality

- Acoustics
  - Visi-Pitch
  - Voice Recording/Perceptual Evaluation
Diagnosis of Phonation Abnormality

- Physical examination
  - Oral cavity
    - Pharyngeal erythema or edema
  - Neck
    - Tightness of laryngeal strap muscles
      - Sternohyoid, sternothyroid
    - Position of shoulders
  - Respiratory pattern
    - Diaphragmatic
    - Clavicular
Diagnosis of Phonation Abnormality

- Endoscopy
  - Flexible or rigid
    - Nasal for flexible
    - Rigid is oral with tongue retraction
  - Direct and stroboscopic when able
  - 2.8mm flexible scope can yield stroboscopic evaluation
Diagnosis of Phonation Abnormality

- Endoscopy looking for
  - Signs of allergy
    - Rhinorrhea, purple turbinates, edema, postnasal secretions
  - Masses or lesions
  - Signs of reflux
    - Erythema and edema of arytenoids, laryngeal side of epiglottis, post-cricoid area
Endoscopy

☐ Mobility.
☐ Adduction is necessary for voice
☐ Abduction is necessary for airway
  ■ Abduction is not to be confused with relaxation of adduction.
☐ Irregular fold edges; nodules, trauma = hoarseness
Treatment of Resonance and Voice Disorders

- Treat underlying medical conditions
  - Allergies
    - Nasal steroids
    - Antihistamines
  - Reflux disease
    - Gastroesophageal
    - Laryngopharyngeal
- Voice therapy
- Obturator
- Surgery
Surgical augmentation for resonance abnormality

- Pharyngeal flap
  - Best for good lateral wall movement
- Spincteroplasty
  - Good for palate that moves but is too short
- Injection
  - Useful as a trial so see how much difference posterior wall augmentation can make
  - Cymetra longer lasting than collagen. Teflon migrates.
Surgical treatment for resonance abnormality

- For submucous cleft of palate
  - Furlow palatoplasty
  - Opposing Z-plasties
  - Bring muscle to muscle contact
  - Also lengthens palate a little
Surgical Treatment for Voice Disorders

- Papilloma
  - Lasers, microdebridement
  - Cidofovir injection

- Nodules
  - Pediatric larynx only 2 layers vs 3 layer fold of the adult. There is no lamina propria.
  - Need to be able to have total voice rest for 2 weeks.

- Vocal cysts
  - Are amenable to microflap surgery
  - May need to see in operative field before can tell the difference.
Surgical Treatment for Voice Disorders

- Vocal fold paresis
  - Vocal fold injection
    - Gelfoam – very short term 6 weeks - 3 months
    - Fat - 3-6 month duration
    - Cymetra (micronized acellular dermis)
    - Radiesse (calcium hydroxylapatite) 2-3 years
  - Medialization thyroplasty
    - May add adduction arytenoidopexy
  - Reinnervation procedure
    - Ansa cervicalis nerve to recurrent laryngeal nerve anastomosis
    - Be sure with laryngeal EMG that nerve is out
Conclusion

- Pediatric resonance and voice disorders have great variety and call for many diagnostic and treatment options.
- Common things are common
  - VF nodules, reflux disease
- The care of the voice is a multidisciplinary problem requiring great therapy support.
- The field is changing and expanding with new techniques as we better understand the pediatric voice.