Hoarseness and Benign Vocal Fold Mucosal Disorders

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Definition of Hoarseness

- the perceived breathiness quality of the voice (Bailey)
- a rough or noisy quality of voice (Dorland)
- a rough, harsh voice quality (Stedman)
Symptom –vs- Diagnosis

- Hoarseness is a symptom of a disease process
- Although hoarseness appears on the ICD9 as a diagnosis (784.49):
  - it is really a symptom resulting from the underlying disease process
  - the underlying disease process is your diagnosis (ex. vocal nodules)
Anatomy: Laryngeal Cartilage
Anatomy: Laryngeal Cartilage
Anatomy: Laryngeal Muscles

Right lateral view

- Foramen for superior laryngeal vessels and internal branch of superior laryngeal nerve
- Oblique and transverse arytenoid muscles
- Posterior cricoarytenoid muscle
- Vertical part
- Oblique part
- Cricothyroid muscle

Posterior view

- Epiglottis
- Aryepiglottic fold
- Cuneiform tubercle
- Corniculate tubercle
- Aryepiglottic muscle
- Oblique arytenoid muscle
- Transverse arytenoid muscle
- Posterior cricoarytenoid muscle
- Cricoid cartilage
Anatomy: Laryngeal Muscles
Anatomy: Laryngeal Innervation
Anatomy: Laryngeal Motion

- Tension of vocal ligament
Anatomy: Laryngeal Motion

- Adduction of vocal ligament
Anatomy: Laryngeal Motion

- Abduction of vocal ligament
Histology

- Mucosal layer
  - Pseudostratified squamous epithelium superiorly and inferiorly
  - Nonkeratinizing squamous epithelium at contact surface of medial cord
Histology

- Subepithelial tissues: three layered lamina propria
  - Superficial Layer (Reinke’s space)
  - Intermediate layer
  - Deep layer
    - the intermediate and deep layers make up the vocal ligament
- Vocalis and thyroarytenoid muscle
Histology
Physiologic Function

- Prevents aspiration (sphincter)
- Respiratory gateway
- Phonation
- Valsalva Maneuver
  - allows for transmission of pressure to abdominal cavity
  - stabilizes thorax during heavy lifting
Phonation

- Physical act of sound production by means of passive vocal fold interaction with the exhaled airstream
Phonation

- Larynx recognized as critical organ for sound production for centuries
- Husson presented the neurochronaxic hypothesis in 1950
  - Each vibratory cycle caused by separate neural impulse
Phonation

- Currently accepted mechanism
  - Interaction of aerodynamic forces and mechanical properties of laryngeal tissues generate vocal sound
Requirements for Phonation

- Adequate breath support
- Approximation of vocal folds
- Favorable vibratory properties
- Favorable vocal fold shape
- Control of length and tension
Mechanism of Phonation

- Inhalation of air
- Glottic closure
Mechanism of Phonation

- Exhalation increases subglottic pressure until vocal folds displace laterally.
Mechanism of Phonation

- Vocal folds return to midline
  - Decrease in subglottic pressure
  - Elastic forces in vocal fold
  - Bernoulli effect of airflow
Body-Cover Concept

- Vibration of the mucosa does not correspond directly to the vocal fold
  - wave is propagated along mucosa
  - made possible by Reinke’s space which is a gelatin-like layer made of loose connected fibers of collagen and elastin
  - vocal ligament does not undergo mucosal wave
History

- Onset and duration of vocal symptoms
- Potential causes or exacerbating influences
- Talkativeness
- Other risk factors
  - Tobacco
  - Alcohol
  - LPR
  - Dehydration
  - Medications
  - Allergies
Physical Examination

- Laryngeal mirror
  - **Advantages**: fast, inexpensive, minimal equipment
  - **Disadvantages**: gag, nonphysiologic, no permanent image capability
Physical Examination

- **Rigid Laryngoscopy (70 or 90-degree telescope)**
  - **Advantages**: best optic image, magnifies, video documentation
  - **Disadvantages**: gag, nonphysiologic, expensive
Physical Examination

- **Flexible fiberoptic nasolaryngoscope**
  - **Advantages**: well tolerated, physiologic, video documentation
  - **Disadvantages**: time consuming, expensive, resolution limited by fiberoptics
Physical Examination

- Videostroboscopy
  - Advantages: allows apparent “slow motion” assessment of mucosal vibratory dynamics, video documentation
  - Disadvantages: time consuming, expensive
Physical Examination

- Direct laryngoscopy
  - Available for use with treatment
Surgical Treatment

Benign Lesions

Cold instruments

- <3 mm: Nodules, Hemorrhagic polyp, Web, Cyst, Granuloma
- 3–6 mm: Nodules, Hemorrhagic polyp, Cyst, Granuloma, Sulcus vocalis
- >6 mm: Web, Granuloma, Polypoid corditis

CO₂ laser

- 3–6 mm: Hemorrhagic polyp, Granuloma
- >6 mm: Hemorrhagic polyp, Granuloma, Polypoid corditis
Surgical Technique

- Cold instruments
Surgical Technique

Cold instruments

- Subepithelial injection of saline and epinephrine
  - exaggerates difference of normal SLP from polyp tissue
  - hemostasis
Surgical Treatment

- Lateral Microflap Technique
  - Laterally based incision
    - Surgical scar on superior/lateral aspect of vocal fold
    - Free edge of vocal fold intact
  - Identifies vocal ligament lateral to primary pathology
  - Lesions adherent to vocal fold epithelium medial to incision may require additional incision
Surgical Treatment

- Medial Microflap Technique
  - Incision made adjacent to lesion
  - Avoids extensive dissection of SLP
Surgical Treatment

- Medial –vs- Lateral
  - Medial microflap is method of choice for most benign laryngeal lesions
  - Lateral microflap chosen when vocal ligament may be:
    - Difficult to identify
    - At significant risk of injury
Surgical Technique

Cold instruments

- Epithelial cordotomy
Surgical Technique

Cold instruments

- Mucosal flap elevated from medial to lateral, off the lesion and over the superior surface of the vocal fold
Surgical Technique

Cold instruments

- Lesion separated from the vocal ligament
Surgical Technique

Cold instruments

- Lesion separated from inferior mucosal flap
Surgical Technique

Cold instruments

- Up angled scissors used to incise mucosal membrane to be sacrificed with lesion
Surgical Technique

Cold instruments

- Lesion removed and flaps are situated
Surgical Technique

- Microspot CO2 Laser
  - CO2 laser energy is absorbed by water allowing Reinke’s space to act as a natural barrier to protect the vocal ligament
  - Provides excellent hemostasis
  - Thermal trauma can be detrimental
Benign Vocal Fold Lesions

- Polyps
- Nodules
- Varices and Ectasias
- Cysts
- Granulomas
- Polypoid Corditis/Reinke’s Edema
- Papillomatosis
Polyps

- Typically the result of trauma to the SLP and microvasculature
- Size, shape and tissue composition is variable
  - Sessile or pedunculated
  - Vascular, fibrotic, or mixoid
- Commonly found in the middle portion of the musculo-membranous region
Polyps

- Not uncommon to find a smaller traumatic fibrovascular lesion on contralateral vocal fold
- Overlying epithelium is usually normal and can be preserved to some extent
Polyps

- Sessile
  - epithelial microflap
  - Subepithelial resection of polyp contents

- Pedunculated
  - Retraction and amputation
Polyps

- **Size**
  - Small: 0-3mm
  - Medium: 3-6mm
  - Large: >6mm

- **Excision**
  - Cold instruments for small and medium polyps
  - Microspot CO2 laser for large polyps
Polyps
Polyps
Polyps
Nodules

- Fibrovascular tissue secondary to vocal abuse or inappropriate vocal use
- Strobvideolaryngoscopy is essential in assessment
- SLP is thinned effecting mucosal wave
- Treatment
  - Vocal rehabilitation is primary
  - Surgery is secondary
Nodules
Nodules
Varices and Ectasias

- Result from microvascular trauma in SLP
- Most commonly found at middle musculo-membranous vocal fold
  - Situated at lateral extent of mucosal wave excursion- “striking zone”
  - Believed to result from deceleration force
Varices and Ectasias

- Treatment
  - Cold instruments: epithelial cordotomy followed by vascular lesion removal
    - No post-op deterioration of vocal function or mucosal wave flexibility
  - Microspot CO₂ laser ablation
    - Heals more slowly
    - Potential for epithelial stiffness
Varices and Ectasias
Cysts

- Arise in SLP
  - Attached to vocal ligament or epithelial basement membrane
  - Freely suspended within SLP

- Size is variable

- Asymmetric spheroid mass on medial surface of vocal fold

- Most arise from obstructed mucus ducts in SLP
Cysts

- **Treatment**
  - Cold instrument resection
    - Subepithelial infusion of saline and epinephrine is helpful
    - Must retrieve entire cyst wall to prevent recurrence
    - Preserve normal SLP
  - Microspot CO2 laser not as effective due to necessity of delicate tangential dissection
Cysts

- Results
  - Mucosal wave usually improves
  - Does not return to normal if cysts has replaced substantial amount of SLP
    - SLP does not regenerate
Cysts
Granulomas

- Results from hypertrophic inflammatory reaction due to traumatic mucosal disruption
- Majority found in arytenoid region
- Usually exophytic with narrow base
- Typically arise in patients with LPR
- Seen with endotracheal intubation
Granulomas

- Treatment
  - Vocal therapy including antireflux management
  - Surgical resection
    - conservative management has failed
    - concern of a neoplastic process
    - airway compromise
Granulomas
Granulomas
Granulomas
Granulomas
Polypoid Corditis (Reinke’s Edema)

- Extensive swelling of SLP
- Usually on superior surface of musculo-membranous vocal fold
- Typically bilateral but asymmetric volume
- Multifactorial cause
  - Smoking
  - LPR
  - Vocal hyperfunction
Polypoid Corditis (Reinke’s Edema)

- **Treatment**
  - Smoking cessation
  - Antireflux medication
  - Preoperative vocal therapy
  - Surgery
    - Epithelial microflap elevation with SLP contouring and reduction using either cold instruments, Microspot CO2 laser, or both
    - Vocal ligament should never be visualized
    - Both vocal folds can be treated in one procedure if flap is elevated on superior surface of vocal fold
Polypoid Corditis (Reinke’s Edema)
Papillomatosis

- Human papillomavirus 6 and 11
- Confined to epithelium
  - Excision should preserve SLP
- Most commonly found in musculo-membranous region, but may extend into arytenoid, ventricle, subglottis
Papillomatosis

- **Surgical treatment**
  - Cold instruments
  - Microdebrider
  - Microspot CO2 laser

- Resection of lesions inhibits recurrence in 30% of chronic patients
Papillomatosis