Benign Vocal Fold Lesions

Steven Smith, MD
Mentor: Michael Underbrink, MD
The University of Texas Medical Branch (UTMB Health)
Department of Otolaryngology – Head & Neck Surgery
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Outline

- Introduction
- Prevalence
- Anatomy
- Common benign vocal cord lesions
Introduction

- Normal voice requires laryngeal function to be coordinated, efficient, and physiologically stable.
- Imbalances in this delicate system can affect voice quality.
- Benign lesions of the vocal folds can cause imbalances in this system.
- The exact prevalence of benign vocal cord lesions has been hard to determine and there has been a lack of data.
Prevalence

- Cohen et al 2011
  - Large retrospective study looking at the US claims database, MarketScan
  - January 2004 - December 2008 (55 million)
  - 537,000 had an ICD-9 diagnosis of dysphonia
    - Point prevalence rate 1%
    - Females 1.2% and Males 0.74%
- Benign vocal pathology (11%)
  - Limitations
    - PCP diagnosed acute laryngitis 67% of the time
    - Otolaryngologist – vocal cord pathology
Anatomy

- Laryngeal skeleton consist of nine cartilages
  - Main laryngeal structure formed by 3 unpaired cartilages
    - Thyroid, cricoid, and epiglottic
  - Remainder of the framework consist of paired cartilages
    - Arytenoid, corniculate, and cuneiform

http://education-portal.com/cimages/multimages/16/Larynx_rear_view.png
Anatomy

- Arytenoid
  - Articulates with the cricoid to form the cricoarytenoid joint
  - Multiaxial joint (sliding, rocking, twisting)
  - Vocal process (medially) and muscular process (laterally)
  - Actions of the intrinsic muscles change position and shape of vocal cord

Anatomy

- Intrinsic muscles
  - Responsible for vocal fold motion
  - 3 types
    - Abductor, adductors, and tensor
- Abductor
  - Posterior cricoarytenoid
    - Sole abductor
    - Responsible for glottic airway
Anatomy

- **Adductors**
  - **Thyroarytenoid**
    - Two muscular bellies
      - Lateral – shortens and adducts
      - Medial – shortens and thickens
  - **Lateral cricoarytenoid**
    - Lengthening and adduction
  - **Interarytenoids (oblique and transverse)**
    - Only unpaired intrinsic muscles
    - Closure of posterior glottis
Anatomy

- Tensor
  - Cricothyroid
    - Two muscle bellies
      - Vertical oriented
      - Oblique oriented
    - Tightening and lengthening

http://muscular-system.blogspot.com/2012/05/cricothyroid-muscle.html
Anatomy

- Blood supply
  - Superior laryngeal artery
  - Inferior laryngeal artery
Anatomy

- Nerve supply
  - Superior laryngeal nerve (inferior vagal ganglion)
    - Two branches
      - Internal branch - sensory
      - External branch – motor (cricothyroid)
  - Recurrent laryngeal nerve
    - Branch of the vagus nerve
      - Left side
      - Right side
    - Provides sensory innervation to the infraglottis and motor innervation to all intrinsic muscles except cricothyroid

https://web.duke.edu/anatomy/Lab21/Lab21_clip_image002_0019.jpg

http://www.drmkotb.com/myimages/Recurrent%20Laryngeal%20nerves.jpg
Anatomy

- **Histology**
  - Superficial layer – stratified squamous epithelium
  - Lamina propria
    - Superficial (Reinke’s space)
      - Loose fibrous matrix (few fibroblast)
    - Intermediate
      - Elastin
    - Deep
      - Fibroblast and collagen (dense)
  - Muscle – vocalis muscle (medial portion of the thyroarytenoid muscle)
Anatomy

- Mucosa and vocal ligament extend over the vocal process
  - Cartilaginous (aphonatory)
    - Posterior one-third
  - Membranous (phonatory)
    - Anterior two-thirds
- Important anatomical feature
  - Most benign lesions affect the membranous portion
Larynx

- Major functions
  - Airway protection
    - Most important
  - Respiration
    - Gateway to airflow
  - Phonation
    - Most complex and highly specialized

http://www.nature.com/gimo/contents/pt1/images/gimo39-f2.jpg
Mucosal Wave

- **Body-cover theory**
  - Wavelike motion of mucosa (normal speech)
  - Cover – mucosa
  - Body – ligament and muscle

- **Videostroboscopy**
  - Gold-standard
  - Magnified
  - Mucosal vibratory patterns

http://origin-ars.els-cdn.com/content/image/1-s2.0-S0030666505702383-f069902.jpg
Normal Videostroboscopy
Benign Vocal Cord Lesions

- Can be divided into two categories
  - Non-neoplastic
    - Vocal nodules
    - Vocal Polyp
    - Vocal Cyst
    - Reinke’s edema
    - Granuloma
    - Leukoplakia
    - Intracordal scars
  - Neoplastic
    - Papilloma

Table 61.1 Benign tumours of larynx

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Benign Non-neoplastic Vocal Cord Lesions

- Majority of vocal fold lesions
- Vibratory injury
- Multifactorial
  - Extroverts, talkativeness
  - Occupation
  - Smoking, acid reflux, allergy, and infection
Vocal Cord Nodules

- Children and adult females

- Presentation
  - Hoarseness of variable duration, can have varying degrees of breathiness and vocal breaks
  - Voice misuse or abuse (professional singers, teachers, other occupations with high voice demands)

www.britishvoiceassociation.org.uk/voice_information/nodulesDM.jpg
Vocal Cord Nodules

- Bilateral
  - Junction of the anterior to middle membranous portion of vocal fold

- Vary in size, symmetry, contour, and color

- Pathological sequence
  - Forceful or prolonged vibration at the membranous (vibratory) vocal cord
    - Edema and congestion
  - Long-term vocal abuse leads to hyalinization of the SLP
Vocal Cord Nodules

- Videostroboscopy
  - Hourglass appearance
  - Relatively symmetrical mucosal wave
Vocal Cord Nodules

- Management
  - Voice therapy
    - Primary treatment
    - Optimize laryngeal environment
    - Phonotraumatic behaviors, guidelines for voice use, optimizing hydration
  - Medical
    - Reflux, smoking
  - Surgical
    - Botox, Steroids
Vocal Polyps

- Unilateral lesions
  - Broad based or pedunculated
- Red, white, or translucent lesions at anterior/middle third along the free edge
- Vocal abuse, anticoagulant use
- Two types
  - Hemorrhagic – abrupt onset – extreme vocal effort
  - Nonhemorrhagic (pseudocyst) – outpouchings of inflamed SLP
Vocal Polyps

- Pathophysiology
  - Shearing forces
  - Capillary rupture and focal accumulation of blood or hematoma
  - Inflammatory cells infiltrate
  - New matrix

http://mmd.sagepub.com/content/2/2/95/F3.large.jpg
Vocal Polyps

- Videostroboscopy
  - Usually have intact mucosal waves
  - Phase asymmetry with impaired glottic closure

http://www.youtube.com/watch?feature=player_detailpage&v=gXeR__rbrl4
Vocal Polyps

- Management different based on polyp size
  - Conservative management for small polyps

- Management
  - Medical
    - Discontinue anticoagulants, reflux
  - Voice therapy
    - Small polyps
  - Surgical
    - Office based pulse dye laser (585nm)
      - Small hemorrhagic polyps
Vocal Cord Cyst

- Unilateral but can be bilateral
- Sac like structure within the lamina propria, yellow or white in color, distinct and defined border

Two subtypes
- Epidermoid
  - Stratified squamous epithelium
  - Vocal abuse or congenital
- Mucous retention
  - Cylindrical epithelium
  - Spontaneously
Vocal Cord Cyst

- **Pathogenesis**
  - Epidermoid vocal cord cyst
    - Epithelial cells buried congenitally
  - Healing mucosa – vocal abuse
  - Mucous retention cyst
    - Plugging of mucous gland
    - Upper respiratory infection, voice overuse, and acid reflux

Vocal Cord Cyst

- Videostrobe
  - Asymmetrical mucosal wave
  - Decreased on side of lesion
  - Glottic closure depends on the size of the cyst

https://www.youtube.com/watch?feature=player_detailpage&v=byEc85zMHPY
Vocal Cord Cyst

- Management
  - Surgical – mainstay of treatment
  - Supportive measures (hydration, reflux)
  - Voice therapy
    - Limited role
    - Epidermoid type
Reactive Lesions

- Response to unilateral vocal cord lesion
- Reactive callus with vocal cord hyperplasia
- Can be confused with vocal nodules
Reactive Lesions

- Videostroboscopy
  - Hourglass appearance
  - Wave asymmetry unlike vocal nodules

https://www.youtube.com/watch?feature=player_detailpage&v=IWV9D-2F6Ac
Reactive Lesions

- Management
  - Treat primary lesion
  - Conservative management
Reinke’s Edema

- Polypoid corditis, reinke’s edema, or smoker’s polyps
  - Bilateral diffuse polyposis
- Chronic irritant exposure
- Middle aged, talkative women with a long-term history of smoking
- Lower pitch (masculine range)
- Outpouchings of the membranous vocal cord
  - Water balloon appearance

http://www.susansienko.com/media/photo/mucosal/reinke.html
Reinke’s Edema

- Videostroboscopy
  - Decreased mucosal wave
  - Phase asymmetry due to ball-valving and asymmetric edema
Reinke’s Edema

- Management
  - Medical - smoking cessation
  - Voice therapy
    - may help introduce optimal vocal behavior
    - reduce size of the polyp and improve vocal functioning
  - Surgery necessary when the voice remains unacceptable to patient
Vocal Granuloma

- Primarily in men
- Posterior one-third or cartilaginous glottis
- Speech may be normal
- Vocal cord trauma
  - Associated with acid reflux, chronic cough, throat clearing, and intubation
- Pathophysiology
  - Forceful closure of the arytenoids or direct abrasion of the mucosa over the arytenoid perichondrium from pressure necrosis or coughing on an ET tube

http://voiceproblem.org/disorders/granuloma/granuloma_slide1.html

Vocal Granuloma

- Videostroboscopy
  - Mucosal wave present
  - Location in cartilaginous posterior vocal cord
  - Large lesions can effect closure
Vocal Granuloma

- **Management**
  - Treat underlying cause of irritation
  - Medical
    - Anti-reflux regimen
      - Spontaneously resolve over 3-6 months
  - Voice therapy
  - Surgical
    - Recurrence is common
    - Reserved for lesions
      - Enlarging
      - Affecting the voice
      - Suspicion for malignancy
Capillary Ectasia

- Female singers
  - Hoarseness after short periods of singing
- Abnormal dilation of capillaries, can also present as clusters
- Pathophysiology
  - Vibratory microtrauma lead to capillary angiogenesis
- Predisposes
  - Increased vulnerability to mucosal swelling
  - Vocal fold hemorrhage
  - Hemorrhagic polyp formation

http://www.casa.org/sites/default/files/photos/image_65/Fig%20Vocal%20fold%20hemorrhage.jpg

http://emedicine.medscape.com/article/866318-overview
Capillary Ectasia

- Management
  - Medical
    - Discontinue anticoagulants
    - Acid reflux
  - Voice therapy – behavioral changes for voice abusers
- Surgical
  - Patients who fail conservative management
  - Spot coagulation is an excellent option
    - CO2 laser - scarring
    - KTP (532nm) laser
      - Angiolytic
      - Selectively ablate vessels
Intracordal Scarring

- Aphonia to relatively normal speaking voice
- Scarred, stiff vocal fold cover
- Inflammation, vocal trauma, vocal cord hemorrhage
  - Scarring of the SLP or Reinke’s space
- Surgery involving lamina propria and repeated epithelial procedure
- Pathophysiology
  - Scaring adheres the mucosa to the underlying vocal ligament, disrupting the ability of the mucosa to oscillate freely

http://www.entandallergy.com/vas/gallerydetails/Scarring
Intracordal Scarring

- Videostroboscopy
  - Markedly reduced or absent mucosal wave usually asymmetric
  - Often effects phase closure

http://www.youtube.com/watch?feature=player_embedded&v=le9PegXRRvA
Intracordal Scarring

- Management
  - Medical
    - General medical issues that affect voice should be optimized
  - Voice therapy
    - Voice building approach
      - Strengthen the muscles involved in phonation
      - “Phonatory massage”
  - Surgical
    - Incision with elevation of mucosa above scar with early voice therapy
- Prevention
  - Precise surgical technique
  - Early treatment of vocal trauma
Leukoplakia

- White hyperkeratotic plaque represents change in epithelium
  - 10.2 per 100,000 (Males)
  - 2.1 per 100,000 (Females)
- Pathophysiology unknown
  - Chronic irritation – smoking
- 3 stages
  - No dysplasia -> mild to moderate dysplasia
  - severe dysplasia
- 8-14% chance of malignant transformation

http://dc357.4shared.com/img/njWXqcC/s3/13bfe2250c0/leukoplakia_left_vocal_cord.jpg
Leukoplakia

- Videostroboscopy
  - Normal to sluggish mucosal wave
Leukoplakia

- Videostroboscopy
- Can vary in severity but a mucosal wave should be present
Leukoplakia

- Tissue diagnosis is necessary to rule out malignancy
- Surgical
  - Excision or laser
  - Stage
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Vocal Cord Papilloma

- Most common benign neoplasm (84%)
- Prevalence Rate
  - 4.3 per 100,000 children
  - 1.8 per 100,000 adults
- HPV (strains 6 and 11 most common)
  - Type 11 associated with more aggressive disease
- HPV types 16 and 18 higher risk of malignant transformation
- 200 fold increased risk of acquiring RRP if the mother is infected with genital HPV at birth

http://voicehealth101.com/content-images/Papilloma1.png
Papilloma

- Two types
  - Juvenile
    - More aggressive and bulky, exuberant tissues resembling “clusters of grapes”
  - Adult-onset
    - More localized, usually less aggressive, less exophytic with a velvety appearance and little projection from the surface of the vocal cord
Papilloma

- Videostroboscopy
  - Mass effect with decreased mucosal wave

https://www.youtube.com/watch?feature=player_detailpage&v=t4YbV6enzOs
Papilloma

- Management
  - Surgery
    - CO2 laser
      - Most widely accepted
      - Risk – scarring
    - Pulse Dye and KTP
    - Microdebrider
      - Bulky lesions
  - Adjuvant treatment
    - Interferon, Indole-3-carbinol
    - Cidofovir (antiviral)
    - Bevacizumab (trials)
  - Vaccine (Gardasil)
    - Incidence of RRP
Cidofovir

- Prodrug (1995) not approved for intralesional vocal cord injection
- Used as an adjunct to RRP refractory to surgery
- Only approved for IV treatment of CMV retinitis in acquired immunodeficiency patients
  - Side effects
    - Nephrotoxicity, hepatic dysfunction, and ocular toxicity
Cidofovir

- Concern raised about cidofovir increasing malignant potential
  - Studies have shown that 2-3% of patient with RRP have malignant transformation
  - Equivalent to patients with and without cidofovir exposure

- Gilead general warning letter (2011)
  - Warning against off-label use of cidofovir
  - Nephrotoxicity, neutropenia, oncogenicity, and fatalities
Cidofovir

2012

- International multicenter retrospective study
  - Evaluate the safety of cidofovir for intralesional laryngeal injections
  - 635 RRP and 275 treated with cidofovir
  - No statistical difference in occurrence of neutropenia or renal dysfunction before or after cidofovir treatment
  - No statistical difference in upper airway and tracheal malignancies between the cidofovir group and non cidofovir group
Bevacizumab

- Monoclonal antibody inhibits VEGF (antiangiogenic activity)
- Hypothesized - synergistic affect with KTP laser (photoangiolyis)
- Zeitals et al 2011
  - Prospective study of 20 adult patients with bilateral disease
  - Treated with 532nm pulsed KTP laser 4 times at 6 week intervals
  - Bevacizumab injected in the vocal cord with the greater volume of disease at presentation
  - Contralateral vocal cord was injected with saline
Bevacizumab

• Findings
  • No local or systemic complications
  • 3 subjects, no noticeable disease in either cord
  • 16 subjects had less disease in the Bevacizumab treated cord
  • 1 had more disease in the Bevacizumab treated cord

• Conclusion
  • Injection with antiangiogenic medications shows potential to improve KTP laser treatment and may decrease the frequency of treatments
Conclusion

- Benign vocal cord lesions are common pathologies that will be seen in clinic
- Recognizing and correctly diagnosing the lesions are important in treatment outcomes
- Videostroboscopy
- Understanding the goals of the patient are important in deciding the best treatment options
- Preservation of the normal anatomy is important to optimize vocal outcomes


