Diagnosis and Management of Bilateral Vocal Fold Immobility

Katherine C. Yung, MD
Assistant Professor, Division of Laryngology
Dept. of Otolaryngology-Head and Neck Surgery

Introduction: Nomenclature

- A vocal fold is *immobile* if it does not actively adduct or abduct on clinical examination.
- A *hypomobile* vocal fold has reduced range and/or speed of motion.
- Terms describe the subjective exam finding and make no assumption of the etiology for the impaired motion.
- Vast majority of vocal fold motion impairment cases are neurogenic, with the remainder mechanical in origin.
Differential Diagnosis

- Bilateral Vocal Fold Paralysis
- Posterior Glottic Stenosis
- Bilateral Crico-arytenoid Joint Fixation or Dislocation
- Infiltrative Lesion

Bilateral Vocal Fold Paralysis

- Definition of Paralysis
  Akinesia, palsy; loss of power of voluntary movement in a muscle through injury or disease of its nerve supply
  (Stedman’s medical dictionary, 22nd ed.)

- Injury to nerve supply to both vocal folds resulting in gross immobility
  - Motor cortex, brain stem, vagus nerves or recurrent laryngeal nerves
Etiology of Bilateral Vocal Fold Immobility

Breakdown of Surgical Causes
Clinical Presentation

- Respiratory symptoms
  - Shortness of breath
  - Stridor
- Voice changes
- Swallowing difficulties
  - Dysphagia
  - Aspiration

Timing of symptom onset
- Acute presentation → stridor
- Late presentation → dysphonia (asthenia, loss of projection)
History

- **Paralysis** - Neurologic etiology
  - Prior neck or chest surgery
- **Posterior Glottic Stenosis** - Structural etiology
  - Neck trauma
  - Prolonged intubation
  - Rheumatoid arthritis
  - Granulomatous diseases

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Physical Exam

- General appearance
  - Jaw thrust
- Stridor
- Dyspnea
- Supraclavicular retractions
- Perceptual Voice Evaluation
Endoscopic Exam

- Laryngoscopy/Hypopharyngoscopy
  - Decreased adduction/abduction
  - Pooling of secretions
  - Pharyngeal wall motion
  - Masses, lesions, mucosal abnormalities

- Videostroboscopy
  - Glottic Closure
  - Vibratory Parameters

Bilateral Vocal Fold Paralysis
Posterior Glottic Stenosis

Carcinoma
Laryngeal EMG

- Used to differentiate between structural and neuromuscular causes of vocal fold immobility
- Paralysis
  - EMG shows nerve injury
  - Prognostic information on recovery
- Posterior Glottic Stenosis or Joint Fixation/Dislocation
  - EMG shows normal neuromuscular activity

Imaging

- To evaluate course of recurrent laryngeal nerve
- Base of skull to A-P window
- CT
- MRI
Pulmonary Function Test

- If PIF < 1.5 L/sec consider acute treatment

Direct Laryngoscopy

- Palpation of cricoarytenoid joint
  - If immobile → suggestion of structural involvement resulting in immobility
Posterior Glottic Stenosis – Classification

- **Type 1** 25% of patient
  - Scarring between the vocal process of the arytenoid

- **Type 2** - 25% of patient
  - Scarring between the upper bodies of the arytenoid
Posterior Glottic Stenosis - Classification

- **Type 1**
  - Scaring between the vocal process of the arytenoid

- **Type 2**
  - Scaring between the upper bodies of the arytenoid

- **Type 3 – 50% of patients**
  - Scaring in the plane of the CA joint

Management Considerations

- Airway
- Swallow
- Voice

- Intervention depends on
  - Balance of functional needs
  - Patient preferences
Treatment Options

- Tracheotomy
  - Maximum inspiratory flow
  - Preserves voice quality
  - Can be temporary or permanent
  - Cons: stigma, trach care

- Glottis enlarging procedure – “the great compromise”
  - Temporary vs. definitive
  - Endoscopic vs. Open
BVFP - Management Options

- Laser cordotomy - Kashima
- Partial arytenoidectomy – Crumley & Tucker
- Total arytenoidectomy - Ossoff
- Suture lateralization – Woodson and Lichtenberger

PGS – Management Options

- Incision/Posterior micro-trapdoor flap with
  - Mitomycin c application
  - Suture lateralization
- Cordotomy or partial arytenoidectomy
- Open resection
  - Mucosal grafting
  - Cartilage grafting into cricoid
Laser Cordotomy - Schematic

CO₂ Laser Cordotomy
Cordotomy with CO$_2$ Laser

- **Advantages**
  - Relatively simple to perform
  - Does not result in excessive exposure of cartilage
  - Can be performed bilaterally
  - Minimal effect on swallowing
    - A-E fold remains intact
    - Interarytenoidius function not interrupted

- **Disadvantage**
  - Permanent dysphonia

Posterior micro-trapdoor flap
Posterior micro-trapdoor flap
Posterior micro-trapdoor flap

- Advantages
  - Relatively simple to perform
  - Allows immediate assessment of return of passive cricoarytenoid motion
  - May result in immediate airway improvement

- Disadvantage
  - Will not work if CA joint is fibrotic

Reversible Temporary Management

- Aforementioned treatments performed only after considerable amount of time from onset (6-12 months)

- Spontaneous recovery in 40-86% of unilateral and bilateral vocal fold immobility cases—if recurrent nerves not transected
Treatments Options

- Intubation
  - short period of time (hours to days)

- Tracheotomy

- Reversible laterofixation
  - Lichtenberger 1st implemented procedure as single temporary measure

**Lichtenberger Needle Carrier**

Reversible Suture Lateralization

BVFP- Pre-op Exam
Post-op exam
Experimental New Techniques

- Laryngeal Pacing
- Botulinum Toxin injection

Laryngeal Pacing

- Functional neuromuscular stimulation of PCA during inspiration
- Vocal folds passively relax to midline in expiration to phonate
Botox

- 11 patients with bilateral vocal fold immobility treated with bilateral TA Botox injections
- 10 of 11 had symptomatic improvement and pursued repeat injections
- Patient without relief had bilateral crico-arytenoid joint fixation
- Complications limited to mild dysphagia to liquids