Type I Laryngeal Clefts: To Stitch or Not to Stitch

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Disclosures

- NONE
Objectives

- Review anatomy of laryngeal clefts
- Current methods of repair of Type I Laryngeal clefts
  - Benefits
  - Drawbacks
- Review new techniques in endoscopic laryngeal repair
  - Benefits
  - Drawbacks
History of Laryngeal Clefts

- Rare congenital anomaly
- Congenital laryngeal anomaly occurs in 1 in 2000 live births
  - 0.3% are laryngeal clefts
- Boy:Girl… 5:3 ratio
- Associated with VACTERL, Opitz-Frias syndrome, Pallister-Hall syndrome
Embryology of Larynx

- Respiratory primordium develop from diverticulum on foregut
- Tracheobronchial groove arise on either side and fuse in the midline and for tracheoesophageal septum
- Fusion complete in 6th week of gestation
- Cricoid cartilage forms 5th week
- Incomplete fusion of tracheoesophageal septum or cricoid cartilage result in laryngeal cleft/T-E fistula
Laryngeal Development

Diagram showing the development of the larynx, including:
- Esophagotracheal ridge
- Foregut
- Esophagus
- Trachea
- Lung buds
- Tuberculum impar
- Lat. lingual swell
- Epiglottal swellings
- Laryngeal orifice
Laryngeal Clefts

Benjamin and Inglis classification of laryngotracheal clefts

<table>
<thead>
<tr>
<th>Type</th>
<th>Laryngotracheal Defect</th>
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<tbody>
<tr>
<td>I</td>
<td>Supraglottic interarytenoid defect; the level of the cleft remains above the level of the (true) vocal cord</td>
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<tr>
<td>II</td>
<td>The cleft extends below the level of the (true) vocal cords and partially into the cricoid cartilage</td>
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<tr>
<td>III</td>
<td>The cleft extends completely through the posterior cricoid cartilage, with or without further extension into the cervical tracheo-esophageal wall</td>
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<tr>
<td>IV</td>
<td>Common tracheo-esophagus that extends into the thorax and may extend all the way down to the carina</td>
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Classification of Laryngeal Clefts
Clinical Significance

- Chronic Cough
- Aspiration
- Dysphagia
- Pneumonia
- Weight Loss
- Stridor
- Regurgitation
- Cyanosis
- Failure to Thrive
Current Methods of Treatment

- **Diagnosis**
  - Rigid endoscopy +/- esophagoscopy
  - Preoperative Modified Barium Swallow evaluation

- **Conservative Management**
  - Anti-reflux medication
  - Thickened feeds
  - Positioning
  - Nasogastric tube

- Age, comorbidity status, severity of aspiration, and the ability to tolerate a feeding regimen should be taken into account when deciding on conservative or surgical management for children with a type 1 laryngeal cleft.
Cleft Examples

Type 1 Cleft

Type 2 Cleft

Type 3 Cleft
Current Repair Methods

- **Endoscopic Injection Laryngoplasty**
  - Bovine gelatin, Carboxymethylcellulose, Calcium hydroxyapatite, Collagen base, Hyaluronic acid base

- Filler material injected direct stab into the center of the interarytenoid area.

- Repeat injection often necessary

Ref 5, 6
Current Repair Methods

- **Endoscopic Surgical Repair**
- **Suspension laryngoscopy**
  - Edges of cleft denuded with microlaryngeal scissors or Co2 laser
  - Denuded area apposed with 5.0 or 6.0 vicryl
- NG tube placed
- Intubation due to possible edema
- Pre/post op anti-reflux therapy
Current Repair Method

New Techniques in Endoscopic Repair

- Type Laryngeal Cleft repair with Fibrin Sealant
  - Proper candidate

- Suspension Laryngoscopy
  - Insufflation or apneic technique

- Denude the interarytenoid region (cleft edges)

- Reapproximation of mucosa with Fibrin Sealant.

- NG tube placed

- Patient intubated x 24-48 hours
Fibrin Sealant

2. www.tisseel.com
Postoperative Assessment

- Speech therapy consultation
- Modified Barium Swallow evaluation
- Functional endoscopic evaluation of swallow

***continue reflux therapy in the initial postoperative period.
Case 1

- 9mo otherwise healthy female
  - Coughing, choking, frequent breaks during eating, croup cough, weight loss (FTT)
  - Failed Modified Barium Swallow (MBSS) to all consistencies, with residual in pyriform
  - Attempted laryngeal cleft repair
  - After edema set in, fibrin glue was placed
  - Postop MBSS
    - No laryngeal penetration or primary aspiration
Case 2

- 2.5 month female with VACTERL
  - Imperforate anus, tracheoesophageal fistula (TEF), esophageal atresia, ASD, Tricuspid Valve dysplasia
  - At time of consult, imperforate anus and TEF s/p repair
  - Patient with microaspiration, pulmonary infiltrates, failure to wean to extubate
- Rigid endoscopy revealed Type I cleft and tracheomalacia
  - s/p repair patient extubated and decreased respiratory distress
  - Unfortunately reintubated 1 month later after esophageal atresia repair. Scheduled for tracheostomy due to worsening tracheomalacia
Case 3

- 1.5 month female with hypoplastic left heart, VSD, tricuspid atresia s/p shunt day of life 2.
  - At time of consult, patient stable but with unexplained cyanotic spells
  - Characterized by cyanosis, choking, stridor desaturation, and tachycardia with spontaneous recovery
  - Oral feeding stopped—spells decreased
  - OPMS normal
  - Barium swallow normal
  - OR for assessment of cleft or fistula
Case 3 cont.

- Dx with deep interarytenoid groove, type I cleft and mild laryngomalacia
- Spells ceased postop
- 4 week post op assessment patient with well healed cleft, minimal edema.
Traditional endoscopic Pros vs. Cons

- **Injection Laryngoplasty**
  - **Pros**
    - Decreased operative time
    - Limited manipulation
  - **Cons**
    - Often requires repeat injection
    - Laryngeal edema
    - Overinjection
    - Reaction to filler

- **Endoscopic Stitch**
  - **Pros**
    - Documented success rate
  - **Cons**
    - Longer operative time
    - Increased manipulation (edema)
    - Potential for technical difficulty
    - Suture tracts shown to predispose to infections
    - Infection along needle tracts
    - Granulation formation

Ref. 4,5,6,7
Fibrin Sealant
Pros vs. Cons

- **Endoscopic Fibrin Sealant**
- **Pros**
  - Decreased operative time
  - Decreased manipulation
  - Decreased technical difficulty
  - Eliminates suture tracts
  - Wound healing enhanced by immediate stimulation of fibroblasts
  - Well documented in thoracic literature
- **Cons**
  - Limited evidence based research in larynx
  - Need ideal candidate
  - Do not inject—risk of thromboembolic event
  - Does not provide rigid fixation

Ref. 1, 2, 3, 8
References


