Laryngeal webs

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Laryngeal webs occur in the glottic level and affect the vocal cords.

More than 90% of laryngeal webs are located anteriorly and extend toward the arytenoids.

The webs vary in thickness from a thin structure to one that is thicker and more difficult to eradicate.
INTRODUCTION

- Other types include the posterior glottic web, causing interarytenoid vocal cord fixation; subglottic webs, which may occur with or without cricoid cartilage involvement and subglottic stenosis; and supraglottic webs.
INCIDENCE

- Congenital laryngeal webs are uncommon, constituting 5% of all congenital laryngeal lesions.
- The incidence has been estimated at approximately 1 in 10,000 births.
- Most congenital webs present at birth or in the first few months of life.
About 75% occur at the glottic level, and the rest are supraglottic or subglottic.

Posterior glottic webs occur in only 1 to 4% of patients.

10% of children with webs have associated congenital anomalies, especially higher in the airway.

Acquired lesions are more common than congenital lesions, in a 60 to 40 ratio.
ETIOLOGY

- Congenial laryngeal webs are formed during embryogenisis of the laryngotracheal groove.
- Actively proliferating epithelium temporarily obliterates the developing laryngeal opening.
- The lumen is normally reestablished as the vocal cords appear separately on each side.
- Laryngeal web, subglottic stenosis, and congenital laryngeal atresia result from different degrees of failure of the epithelium’s resorption during the 7th and 8th weeks of intrauterine development.
Many anterior webs are associated with deletions of chromosomes 22q11.

These same microscopic and submicroscopic deletions cause a wide range of phenotypes including DiGeorge syndrome, velocardiofacial (Shprintzen) syndrome, conotruncal anomaly face syndrome, and sporadic or familial heart defects.
ETIOLOGY

❖ The acronym CATCH 22 (cardiac defect, abnormal facies, thymus hypoplasia, cleft palate, hypocalcemia, and chromosome 22 deletion) has been used to describes the various phenotypes.

❖ For this reason all patients diagnosed with a laryngeal web should undergo genetic screening and a thorough cardiovascular evaluation, with particular attention to the aortic arch.
ETIOLOGY

- **In the past**, acquired laryngeal web was often caused by an *inflammatory* process, such as after infection by diphtheria or TB.
- **Today**, the main causes are *iatrogenic*, such as after an intralaryngeal surgery or a traumatic intubation.
Symptoms of laryngeal webs are present at birth in 75% of patients, and within 1 year in all patients.

Major clinical features: abnormal cry or voice, respiratory distress, and croup.
SIGNS AND SYMPTOMS

Abnormal voice

- Vocal dysfunction is the most frequent symptom
- The cry may be absent or husky.
- Cause of highpitched voice
- When this structure is small enough not to interfere with breathing or when it does not contribute to stridor, it may go undetected until the voice is observed as abnormal.
SIGNS AND SYMPTOMS

**Abnormal voice**

- Its effect is to **shorten the free portions of the folds** and thereby produce **faster vibration** and a resulting **higher pitch**.
- The vocal tone in children with webs resembles **falsetto** and tends to be **weak**.
- **Hoarseness** may be present also, accompanied by the audible evidence of **vocal strain**, particularly with men who have attempted to force a lower pitch.
SIGNS AND SYMPTOMS

- **Respiratory distress**
  - The second most common symptom is airway obstruction, and the severity is directly proportional to the degree of obstruction.
  - The compromise may be so severe that stridor cannot be produced because of limited air movement through the larynx.
SIGNS AND SYMPTOMS

Respiratory distress

- If stridor is present, it will occur in both inspiratory and expiratory phases.
- Respiratory distress includes cyanosis at birth, an unexplained airway obstruction, and severe stridor, which requires immediate intubation or a tracheotomy to provide an artificial airway before further assessment.
**Croup**

- Recurrent or atypical croup occurs in some patients, especially those whose web is associated with subglottic stenosis.
- Croup rarely occurs in children younger than 6 months.

- Some children are asymptomatic until they are stressed, have an infection, or are intubated for a surgical procedure.
DIAGNOSIS

- The only way to diagnose the extent of the web correctly is by direct laryngoscopy under general anesthesia.
- The flexible scope may also have a role in the initial diagnosis, but experience in using it in patients with laryngeal webs is limited.
- A lateral radiograph may give valuable information about the anterior thickness of the web, the presence or absence of congenital subglottic stenosis.
Endoscopy of various congenital laryngeal webs:

A. Thin web in a newborn  
B. Thicker web in a newborn  
C. Medium web  
D. Thick web with subglottic stenosis  
E. Severe web with small glottic opening  
F. Congenital interarytenoid web
It is important to detect associated anomalies of the larynx, the respiratory tract, and other organ systems.

Many patients have major congenital anomalies of other systems, principally of the upper respiratory tract, most often subglottic stenosis.

Congenital subglottic stenosis is commonly seen when the glottic web is severe.
A subglottic web can mimicking cricoid cartilage deformities or subglottic stenosis.

A slight female predominance has been reported.

Symptoms include aphonia, respiratory distress, and biphasic stridor.

Diagnosis must be made by flexible fiberoptic or rigid endoscopy.
Cohen divided laryngeal webs (glottic webs) into four types, based on their appearance and an estimation of the degree of airway obstruction.
Type 1 glottic web

- Uniform in thickness
- No subglottic extension
- True vocal cords clearly visible in web
- Compromises < 35% of the airway.
- Although there is usually no airway obstruction, voice dysfunction is common.
- Hoarseness is usually only slight.
CLASSIFICATION

- **Type 2 glottic web**
  - Slightly thicker, with a significantly thicker anterior component.
  - True cords are usually visible within the web.
  - Subglottic involvement is minimal.
  - The web restricts the airway by 35 to 50%.
  - Usually causes little airway distress, unless the patient has an acute infection or is traumatized during intubation.
  - The voice is usually husky.
CLASSIFICATION

- **Type 3 glottic web**
  - A thick web that the anterior portion of the web is solid and extends into the subglottis
  - The true vocal cords not well delineated.
  - The web restricts the airway by 50 to 75%, obstruction is moderately severe.
  - Marked vocal dysfunction, with a weak and whispy voice.
CLASSIFICATION

- **Type 4 glottic web**
  - The web is uniformly thick
  - Extends into the subglottic area with resulting subglottic stenosis.
  - Occluding 75 to 90% of the airway.
  - Respiratory obstruction is severe, and the patient is almost always aphonic.
CLASSIFICATION

- **Supraglottic webs**
  - Diaphragmatic growths of differing thickness that partially occlude the supraglottic lumen.
  - Symptoms depending on the size and position of the web
  - Voice changes and dyspnea.

- **Posterior glottic web**
  - Rare but usually consists of a thin membranous sheet between the posterior true vocal folds.
Grading scale for laryngeal stenosis

<table>
<thead>
<tr>
<th>Grade</th>
<th>Laryngeal lumen obstruction</th>
</tr>
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<tbody>
<tr>
<td>I</td>
<td>&lt;50%</td>
</tr>
<tr>
<td>II</td>
<td>51% to 70%</td>
</tr>
<tr>
<td>III</td>
<td>71% to 99%</td>
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<tr>
<td>IV</td>
<td>Complete obstruction</td>
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Treatment of laryngeal webs depends on the thickness of the web.

Approximately 60% of patients require surgical intervention.

Of all patients with laryngeal webs, 30 to 40% require a tracheostomy.

The type of lesion dictates the surgical approach.
In general, the thinner webs are easier to treat and the better the result; the more severe webs are resistant to surgical management.

Thin glottic webs alone respond well to simple incision or rupture.

For the remainder, obtaining a satisfactory result (judged by the voice) is difficult, as is improving the airway to achieve decannulation after a tracheotomy.
Many forms of management for congenital laryngeal webs have been advocated:

1. **Dilation**, which may be done deliberately (knowing that a web is present) or inadvertently (while passing an endotracheal tube or a bronchoscope)

2. **Simple endoscopic microsurgical division** with scissors

3. **Endoscopic division** with an attempt to prevent recurrence by **using sutures** through the free cut edge of the web or the **repeated use of dilators**

4. **Endoscopic insertion of a keel**

5. **Laser** management

6. **Laryngofissure** to allow removal of redundant soft tissues in the subglottic area with or without the use of a keel.
Type 1

- Type I is not life threatening, many do not require surgery.
- If surgery is performed, dilations or excisions with a knife, scissors, or laser are effective.
- Recommended management of a thin laryngeal web involves endolaryngeal division of the web with a knife or CO₂ laser with temporary placement of a keel to prevent readhesion.
- An attempt should be made to incise the web along one vocal cord, followed 2 weeks later by incision along the opposite side (to prevent further web formation).
Type 2

- Type 2 lesions require treatment, but not in childhood.
- Multiple procedures are necessary for excising small portions of the web in multiple steps.
- Corticosteroids and antibiotics decrease the amount of scarring, and speech therapy may be necessary to maximize phonation.
Type 3

- Type 3 lesions **frequently require tracheostomy** to establish the airway.
- These lesions may **require multiple excisions** and frequently necessitate the placement of a keel.
- McGuirt and associates described a method using the laser to develop flaps of the web and reported near-normal results in all patients.
Type 4

- Type 4 lesions all require a tracheostomy and excision of the web with placement of a keel.
- Most surgeons would resect the web and place the keel through a laryngofissure.
- The airway results are good, but the voice is poor.
- Approach through precise midline thyrotomy, a laryngofissure with removal of excess tissue under direct vision, and placement of a mucosal graft fixated with fibrin glue or stenting.
**Posterior glottic webs**
- Minor webs may respond to simple division and dilation
- Interarytenoid webs with significant posterior glottic stenosis may require a laryngofissure, a posteriorly placed costal cartilage graft, and stenting.

**Supraglottic webs**
- Treatment consists of surgical lysis using either the laser or sharp instrumentation, followed by dilatation.
- Tracheotomy should be considered if the web is large and supraglottic swelling is anticipated postoperatively.
TREATMENT

- Bailey atlas of head and neck surgery-otolaryngology
TREATMENT

Microlaryngeal scissors

Inject small amount of Kenalog-40 near anterior commissure
TREATMENT

Nylon is brought out through mouth, then sutured to keel or stent.

Keel sutured in place toward anterior commissure

Keel or stent

Buttons tied over anterior neck skin
Ju-Yin Hsueh: Intralaryngeal approach to laryngeal web using lateralization with silastic

A. With 18-gauge needles punctured through the skin into the larynx, the upper and lower poles of the right-side vocal fold were marked, and 4-0 Prolene sutures were passed through the lumen of the needles.

B. The upper Prolene suture was passed through the Silastic sheet.

C. A surgical knot was tied with the other suture emerging from the lower pole.

D. From the exterior, the four Prolene thread ends were simultaneously pulled laterally in such a fashion that the Silastic sheet covered flatly the raw surface of the right vocal fold. The knots were exteriorized outside the skin surface.

E. The Prolene sutures were fixed on rubber tubings.
John Schweinfurth: Single-stage, stentless endoscopic repair of anterior glottic webs

**Fig. 1.** Anterior glottic web extending to the vocal processes.

**Fig. 2.** The width of the posterior leading edge is incised, and the flaps are raised. The incision in the superior flap is outlined.
Fig. 3. The superior flap is incised and reflected laterally. The inferior flap may be incised in the midline or offset depending on mucosal redundancy.

Fig. 4. The flaps are sutured to provide sufficient mucosal coverage.


