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BENIGN LARYNGEAL LESIONS: INTRODUCTION

The human larynx plays a pivotal role in airway protection, respiration, and phonation. Most patients with benign laryngeal disorders present with dysphonia. These disorders are particularly prevalent in individuals who use their voices professionally. Malignant neoplastic disease should be excluded as an underlying cause of voice problems: Every patient who presents with dysphonia should undergo a thorough head and neck examination. Once it is established that there is no evidence of malignancy, patients can be treated appropriately, ideally within a voice clinic. A properly equipped voice clinic must have access to video-laryngo-stroboscopy and be conducted with a suitably qualified speech therapist.

The diagnosis should include a thorough appreciation of the patient's lifestyle and occupational habits as well as a detailed examination of the vocal folds including stroboscopy. Most benign laryngeal lesions are treatable with a combination of surgery and speech therapy, but measures to prevent the recurrence of disease by instigating and maintaining lifestyle changes are also necessary.

ANATOMY & PHYSIOLOGY

The larynx consists of a cartilaginous framework comprising the single thyroid, cricoid, and epiglottic cartilages and the paired arytenoid, corniculate, and cuneiform cartilages. The larynx is suspended from the hyoid bone by the thyrohyoid membrane. The vocal folds run from the angle formed by the thyroid lamina anteriorly to the vocal process of the arytenoid cartilages posteriorly. Alteration in the position and length of the vocal folds is primarily the result of movement of the synovial cricoarytenoid joints, with a contribution from movement of the cricothyroid joints. Above the vocal folds run the false cords, formed by the medial border of the aryepiglottic folds. These are separated from the vocal folds by horizontal sinus known as the laryngeal ventricle, which contains numerous mucin-secreting glands.

The vocal folds are covered with a stratified squamous epithelium that has up to 20 layers; this epithelium covers the lamina propria, which has three layers, beneath which lies the vocal ligament and vocalis muscle. Loose collagen cross-linkages between the epithelium and the superior layer of the lamina propria (ie, Reinke space) allow oscillation of the mucosal wave during phonation, as the epithelium is able to glide over Reinke space.

Sound is produced following creation of subglottic pressure as expiration occurs against a closed glottis. As air passes between the adducted vocal folds, the Bernoulli effect causes vibration of the mucosa of the vocal folds, producing sound. Abnormalities preventing full adduction of the vocal folds or directly interfering in vibration of the mucosa produce dysphonia.

Rosen AC, Murray T. Nomenclature of voice disorders and vocal pathology. *Otolaryngol Clin North Am.* 2000;33:1035. (Classification of the pathology of vocal cord lesions and voice disorders.) [PMID: 10986070]

CLINICAL ASSESSMENT

PATIENT HISTORY

The onset, duration, and progression of any voice change should be ascertained. Any preceding upper respiratory tract infections, direct or vocal trauma, or endotracheal intubation should be

noted. Persistent, progressive dysphonia in a smoker must always raise the possibility of malignant disease, particularly if associated with dysphagia or odynophagia.

A key consideration is the patient's age. Adults have a greater incidence of malignant disease, whereas in children who are hoarse the chief differential diagnosis is between vocal cord nodules and juvenile papillomatosis. An occupational history is of particular relevance, because the voice disorder may be secondary to the pattern of voice use or working conditions. A history of previous surgery is essential, as is documenting any previous laryngeal treatment or speech therapy. Additional patient history questions should include (1) smoking habits; (2) fluid intake, including caffeine and alcohol intake; and (3) symptoms of nasal allergy or sinusitis. Direct questioning should assess the presence of symptoms suggestive of gastroesophageal (or laryngopharyngeal) reflux, and hypothyroidism.

PATIENT EXAMINATION

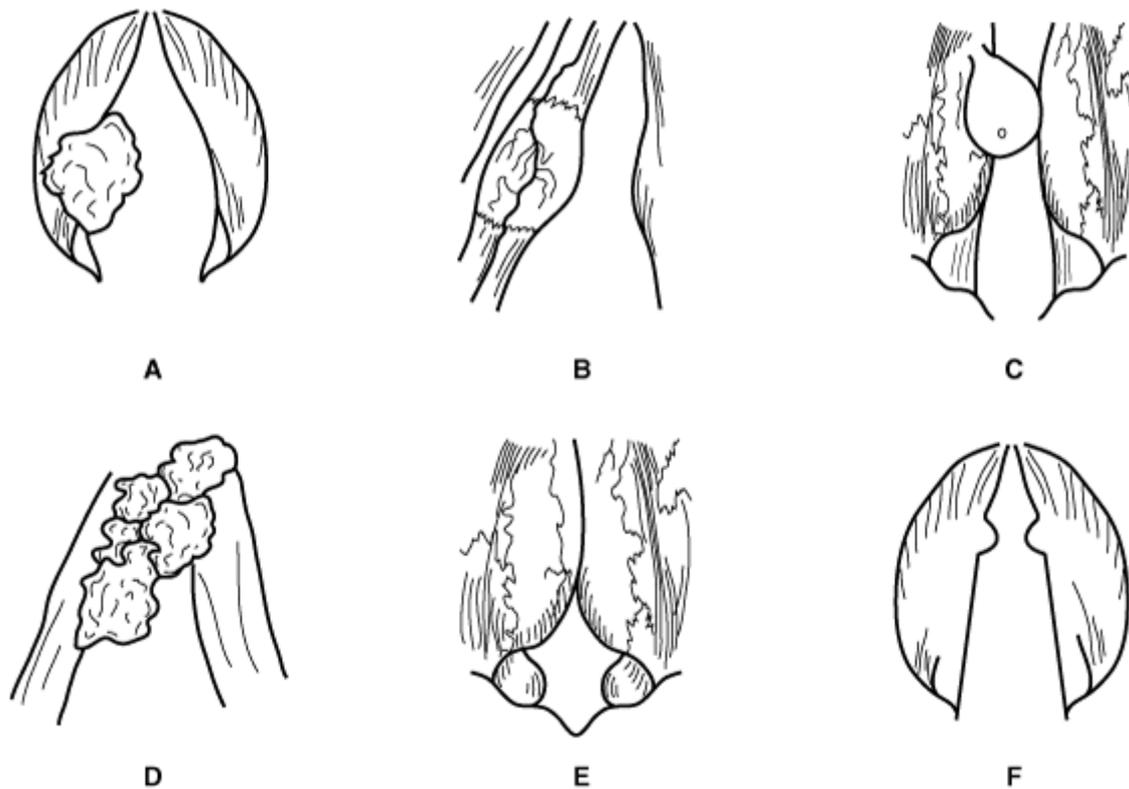
The patient examination should include a full ear, nose, and throat exam, including a conventional inspection of the larynx followed by a more detailed evaluation of vocal fold movement using video stroboscopy.

A full ENT examination is performed, including mirror indirect laryngoscopy. This guides the chances of successfully performing rigid laryngoscopy and often makes the diagnosis. The two alternative methods, which allow photodocumentation and a more leisurely view, are flexible nasolaryngoscopy, or rigid endoscopy, using a 70° or a 90° endoscope. In both techniques, stroboscopic light may be used to identify defects of the mucosal wave.

Nasolaryngoscopy allows thorough inspection of the nose, postnasal space, pharynx, and larynx in a physiologic position. Rigid endoscopy, conducted via the oropharynx, offers the most detailed view of the larynx in the compliant patient. Both methods can use video systems for photodocumentation: Visualization of the larynx by patients significantly improves understanding and compliance with speech therapy.

Figure 29-1 illustrates the characteristic appearances of some common benign laryngeal lesions.

Figure 29-1.



Source: Lalwani AK: *Current Diagnosis & Treatment in Otolaryngology—Head & Neck Surgery*, 2nd Edition: <http://www.accessmedicine.com>
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Benign laryngeal lesions. **(A)** Vocal cord granuloma, **(B)** intracordal cyst, **(C)** pedunculated vocal cord polyp, **(D)** laryngeal papillomatosis, **(E)** Reinke edema, and **(F)** vocal cord nodules.

VIDEOSTROBOSCOPY

Videostroboscopy is an important tool in monitoring rehabilitation and providing feedback during speech therapy. It is also useful in the diagnosis of lesions such as intracordal cysts and in differentiating these lesions from vocal cord nodules.

Stroboscopic examination allows visualization of the mucosal wave occurring at the medial edge of the vocal fold, the appearance being one of a 'slow motion' film. This appearance is created by the flickering stroboscopic light illuminating consecutive mucosal waves at a similar point in the wave form. The frequency of stroboscopic illumination differs slightly from the frequency of the mucosal wave, creating the perception of a slowly moving mucosal wave. This effect is lost if pathology results in a mucosal wave lacking a consistent periodicity. High-speed video recording now allows direct visualization of the mucosal wave, rather than the perception of visualizing the wave created by stroboscopy. This technique has some advantages; however, it requires greatly slowed playback and therefore does not allow "live" images, which are particularly helpful in patients' understanding of their pathology.

Herteg-Ård-Stellan. What have we learned about laryngeal physiology from high-speed digital videoendoscopy? *Curr Opin Otolaryngol Head Neck Surg.* 2005;13:152. [PMID: 15908812]

Sataloff RT. Evaluation of professional singers. *Otolaryngol Clin North Am.* 2000;33:923. (Summary article of ENT history and examination in singers.) [PMID: 10984762]

Simpson CB, Fleming DJ. Medical and vocal history in the evaluation of dysphonia. *Otolaryngol Clin North Am.* 2000;33:719. (Review of history taking in voice disorders.) [PMID: 10918656]

COMMON LARYNGEAL LESIONS

PHONOTRAUMA

Pathogenesis

Most vocal cord nodules, polyps, and the condition known as Reinke edema arise as a result of repetitive trauma to the vocal cords, which is known as *phonotrauma*, and is associated with a local inflammatory response. Shear forces occur during phonation at the area of maximal wave amplitude, which is the border of the anterior and middle third of the vocal fold. Hence vocal pathology secondary to phonotrauma tends to occur at this site.

Dijkers FG, Nikkels PG. Lamina propria of the mucosa of benign lesions of the vocal cords. *Laryngoscope*. 1999;109:1684. (Study demonstrating correlation between duration and pattern of phonotrauma and the histopathology of benign vocal cord lesions.) [PMID: 10522943]

Verdolini K, Rosen CA, Branski RC, Hebda PA. Shifts in biochemical markers associated with wound healing in laryngeal secretions following phonotrauma: a preliminary study. *Ann Otol Rhinol Laryngol*. 2003;112(12):1021. (Study demonstrating elevation of markers of acute inflammation in the vocal folds following prolonged voice use.) [PMID: 14703104]

VOCAL CORD NODULES

Essentials of Diagnosis

- Usually affects children or individuals who use their voices professionally.
- History of voice abuse common, such as frequent shouting in a young child.
- Bilateral, pale lesions at the junction of the anterior one third and posterior two thirds of the vocal cords.

General Considerations

Vocal cord nodules are the most common cause of persistent dysphonia in children. They are also a frequent cause of deterioration in the voice quality of individuals who use their voices professionally, particularly singers; these nodules are commonly referred to as "singers' nodules." Treatment strategies should be conservative; speech therapy is the primary treatment. The patient is taught how to use the voice appropriately, which often promotes regression of the vocal cord nodules.

Clinical Findings

Laryngoscopy clearly shows the presence of small, well-defined vocal cord lesions. These lesions are distinguishable from the normal vocal fold by their whitish hue and are most commonly found at the junction of the anterior third and posterior two thirds of the vocal fold. They are bilateral, though often asymmetric.

Treatment

SPEECH THERAPY

Speech therapy should be used as a first-line treatment. It is the mainstay of treatment in both children and adults. Photodocumentation of the nodules in voice clinic indicates the treatment progress and aids patient compliance during speech therapy.

MICROLARYNGOSCOPY

Microlaryngoscopy should be performed under the following circumstances: (1) vocal cord nodules are suspected in a child, but the age or noncompliance of the patient prevents examination; and (2) in adults, either when microsurgical excision of the nodules is considered or when the diagnosis is not clear. Nodules may be excised using appropriate microsurgical instruments, or vaporized using a pulsed CO₂ laser.

Benninger MS. Microdissection or microspot CO₂ laser for limited vocal fold benign lesions: a prospective randomized trial. *Laryngoscope*. 2000;110:1. (Study establishing the efficacy of the CO₂

laser in the treatment of superficial benign vocal fold lesions.) laser in the treatment of superficial benign vocal fold lesions.) [PMID: 10678578]

VOCAL CORD POLYPS

Essentials of Diagnosis

- Usually unilateral, pedunculated lesions.
- Associated with smoking and voice abuse.
- Located throughout the glottis, particularly between the anterior and middle thirds of the vocal folds.

General Considerations

Vocal cord polyps are most commonly found in men with a history of voice abuse and heavy smoking. The treatment is most often surgical to confirm the diagnosis, exclude any coexisting malignant neoplasms, and provide resolution. Conservative voice therapy is often not successful.

Clinical Findings

Polyps are pedunculated, unilateral lesions that are morphologically similar to the laryngeal epithelium. They often occur on the true vocal folds and may have noticeable vascular markings. They generally occur at the point of maximal vibration, the middle of the true junction of the anterior and middle thirds of the vocal fold, in contrast to vocal process granulomas.

Treatment

The treatment involves a microlaryngoscopic examination of the larynx plus excision of the polyp both to confirm the diagnosis and exclude any other coexistent pathology. A large polyp may conceal an occult, early laryngeal squamous cell carcinoma. Excision is performed using appropriate microsurgical instruments, or laser. Smoking and vocal abuse should also be addressed.

VOCAL PROCESS GRANULOMAS (INTUBATION GRANULOMA)

Essentials of Diagnosis

- Arise posteriorly, adjacent to the vocal process.
- Frequent history of intubation trauma.

General Considerations

Vocal process granulomas are often associated with endotracheal intubation. There is an association with gastroesophageal reflux.

Clinical Findings

Patients present with dysphonia and a combination of other symptoms, including odynophagia, cough, and globus symptoms. Vocal process granulomas are usually unilateral and are related to the vocal processes of arytenoid cartilage with an underlying perichondritis. Forceful glottic closure further traumatizes the lesion and is likely to be a factor in its failure to resolve.

Treatment

The initial focus of treatment should be on conservative voice therapy, combined with aggressive antireflux therapy. Antibiotics and systemic steroids may be of use. Microlaryngoscopy is rarely required to exclude malignancy. Recurrence after surgical excision is common; the incidence may be reduced by the concomitant use of botulinum toxin to paralyze the affected hemilarynx and hence prevent further vocal process trauma.

REINKE EDEMA

Essentials of Diagnosis

- Strong association with cigarette smoking and heavy voice use.
- Diffuse edematous changes of the vocal cords.
- Usually bilateral.

General Considerations

Although a definite mechanism of injury has not been identified, there is a very strong association of cigarette smoking with the development of Reinke edema. The distinguishing feature of this condition is the diffuse nature of the swelling, which is an accumulation of fluid in the superficial layer of the lamina propria of the vocal fold.

Clinical Findings

Patients present with diffuse swelling of the vocal cords, which is usually bilateral. The cords feel boggy when manipulated during microlaryngoscopy, and the swelling can be rolled beneath the instruments.

Treatment

Smoking cessation is the key to resolving Reinke edema. In mild cases, speech therapy may also prevent the need for surgical treatment. However, severe Reinke edema, which is intractable to speech therapy, may have to be treated surgically. Surgical measures involve making a lateral incision on the superior aspect of the vocal fold and extravasating the fluid before carefully replacing the mucosa. Trimming the excess mucosa may be required, but care must be taken not to injure the underlying vocal ligament.

LARYNGEAL CYSTS

Mucous glands are found throughout the larynx, with the exception of the medial edge of the vocal cord, and associated cysts may therefore occur also throughout the larynx. Their presentation and treatment are dictated primarily by their site; therefore, they are dealt with here on this basis.

Intracordal Cysts

Essentials of Diagnosis

- Often found within the middle third of the vocal cords.
- Unilateral, associated small area of hyperkeratosis on opposite cord.
- Do not respond to speech therapy.

General Considerations

Intracordal cysts may be simple mucous retention cysts or epidermoid cysts containing keratin.

Clinical Findings

Laryngoscopy reveals a unilateral cyst, usually of the middle third of the vocal cord with a corresponding area of hyperkeratosis on the opposite cord. Stroboscopy reveals loss of the mucosal wave at the site of the lesion.

Treatment

Intracordal cysts do not respond to voice therapy and should be excised with phonosurgical instruments, using a local flap technique.

Saccular Cysts

Essentials of Diagnosis

- May be congenital or acquired.
- Adults generally present with voice change.

- Children commonly present with airway compromise.
- Unilateral supraglottic mass, overlying mucosa unremarkable.

General Considerations

The laryngeal saccule arises as a diverticulum from the anterior end of the laryngeal ventricle. It extends upward between the false vocal fold and the inner surface of the thyroid cartilage and contains mucus-secreting glands. A saccular cyst occurs as a result of obstruction of these glands, which may be secondary to a congenital anomaly or acquired.

Clinical Findings

Examination reveals expansion of the aryepiglottic fold by the cyst within it, which may extend into the neck through the thyrohyoid membrane. Computed tomography (CT) imaging demonstrates a cyst expanding the supraglottis; the absence of air within the lesion distinguishes it from a laryngocele. Mesodermal tissue may be apparent in the wall of congenital saccular cysts and may influence the surgical approach.

Treatment

Most saccular cysts may be managed endoscopically, either by marsupialization or excision, generally with the aid of a CO₂ laser. Lesions extending beyond the larynx and congenital cysts containing mesodermal elements are optimally managed by a transcervical approach. The excised cyst should undergo histologic examination. Cysts displaying oncocytic metaplasia (oncocytic cysts) are more often multiple and more prone to recurrence.

LARYNGOCELE

Essentials of Diagnosis

- Generally present as an anterior triangle neck mass.
- Increase in size with elevated intralaryngeal pressure.
- Associated with malignancy in the laryngeal ventricle.

General Considerations

A laryngocele is an abnormal expansion of the laryngeal ventricle, which may be confined by the thyroid cartilage (internal laryngocele) or extend through the cricothyroid membrane into the neck (external laryngocele). Their development is often associated with activities leading to raised intralaryngeal pressure—classically trumpet playing—but may occur secondary to a malignancy within the laryngeal ventricle, which must be excluded.

Clinical Findings

Laryngoscopy demonstrates a smooth swelling of the affected supraglottis; external laryngoceles are also palpable as a smooth, relatively soft anterior triangle mass. CT imaging demonstrates the characteristic finding of air within the lesion, which may be partially fluid filled.

Treatment

Internal laryngocele may be managed by endoscopic laser surgery; external laryngocele requires a transcervical approach.

PAPILLOMATOSIS

Essentials of Diagnosis

- Patient age at onset is usually 2–4 years.
- Rare after age 40.

- Multiple warty lesions of "true" and "false" vocal cords.

General Considerations

Recurrent respiratory papillomatosis (RRP) is characterized by the development of exophytic warty lesions, primarily within the larynx, but which may be found in the nose, pharynx, and trachea. The condition is benign but associated with significant morbidity and mortality.

There is a bimodal distribution; juvenile-onset RRP is generally diagnosed between the ages of 2 and 4 years and is more aggressive than adult-onset disease, which peaks in the third decade.

Pathogenesis

RRP is caused by human papilloma virus (HPV), subtypes 6 and 11, and less commonly by subtypes 16 and 18. HPV 6 and 11 are also the most common causes of genital papillomatosis, and transmission from the genital tract is believed to be the primary cause of RRP.

Vertical transmission of the virus from mother to child occurs either as ascending uterine infection or through direct contact in the birth canal. However, the risk of a child developing RRP after vaginal delivery in the presence of a condyloma acuminatum is estimated at only 1 in 400. The factors dictating susceptibility remain under investigation.

Clinical Findings

Papillomas typically appear as multiple, friable, irregular warty growths in the larynx. These lesions particularly affect the "true" and "false" vocal cords, but they are also found in other parts of the larynx and upper aerodigestive tract.

Presentation depends on the site of the lesion. Patients with glottic lesions present with dysphonia; those with supraglottic lesions may present with stridor.

Treatment

HPV cannot be eradicated from the larynx. Even after spontaneous remission, HPV DNA can be detected in otherwise normal mucosa. The aim of treatment is therefore to remove symptomatic lesions with minimal morbidity. Suitable techniques include CO₂ laser resection, cold steel dissection, or use of the laryngeal microdebrider. Tracheostomy should be avoided and is associated with distal airway involvement. Adjuvant treatments include intralaryngeal injection of cidofovir (Vistide), which is an off-label use with no conclusive evidence of efficacy, although an excellent response has been noted in some patients.

A vaccine for HPV 6, 11, 16, and 18 is currently undergoing trials, and its introduction could significantly reduce the incidence of RRP.

Prognosis

Spontaneous remission does occur, but recurrence can arise many years later. There is a small risk of malignant change.

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Forte V, Fuoco G, James A. A new classification system for congenital laryngeal cysts. *Laryngoscope.* 2004;114:1123. (Classification for laryngeal cysts that correlates with management.) [PMID: 15179225]

Hogikyan ND, Bastian RW. Endoscopic CO₂ laser excision of large or recurrent laryngeal saccular cysts in adults. *Laryngoscope.* 1997;107(2):260. (Review of laser excision of saccular cysts.) [PMID: 9023253]

Orloff LA, Goldman SN. Vocal fold granuloma: successful treatment with botulinum toxin. *Otolaryngol Head Neck Surg.* 1999;121(4):410. [PMID: 10504597]

Shehab N, Sweet BV, Hogikyan ND. Cidofovir for the treatment of recurrent respiratory papillomatosis: a review of the literature. *Pharmacotherapy.* 2005;25:977. (Review of cidofovir in recurrent respiratory papillomatosis.) [PMID: 16006276]

Steinbrook R. The potential of human papillomavirus vaccines. *N Engl J Med.* 2006;354:1109. (Review of human papilloma virus vaccination.) [PMID: 16540608]

RARE LARYNGEAL LESIONS

CHONDROMAS

Chondromas are benign tumors of the laryngeal cartilages that predominantly affect men in the fourth to sixth decades. Patients present with a slowly progressive dysphonia, dyspnea, and dysphagia; therefore, these benign growths can mimic malignant neoplasms in their presentation. Chondromas commonly appear as smooth, firm lesions of the subglottic larynx or any of the other cartilages. Occasionally, they present as a lump in the neck.

CT scanning is useful in delineating the extent of the neoplasm whereas CO₂ laser is useful in performing a biopsy. However, the definitive treatment relies on total surgical excision of the tumor through an open approach. Endoscopic excision is reserved for small tumors.

NEUROGENIC NEOPLASMS

Neurogenic neoplasms are rare tumors and are usually either schwannomas or neurofibromas. It has now been confirmed that granular cell neoplasms are also of nerve sheath origin.

Schwannomas originate from Schwann cells that cover the nerve fibers outside the central nervous system. These lesions are solitary, encapsulated neoplasms that are benign and slow growing, although they can undergo sarcomatous change. **Neurofibromas** are benign proliferations of nerve fibers and are often multiple (eg, in von Recklinghausen disease). In contrast to schwannomas, they are not encapsulated.

Because neurogenic neoplasms are slow growing, patients present with voice change, throat clearing, and the sensation of a lump in the throat. Cough and respiratory compromise follow.

Neurogenic neoplasms are submucosal and smooth and are often located in the aryepiglottic folds. CT scans can accurately define the extent of the lesion prior to treatment. Small tumors may be resected endoscopically, but larger tumors require an open approach.

AMYLOIDOSIS

The larynx is the most common site in the respiratory tract for amyloid deposition. Patient presentation is characterized by the presence of a submucosal mass, which may arise anywhere in the larynx and may impair vocal cord mobility.

The diagnosis is confirmed by the presence of "apple green" birefringence seen with a polarizing microscope after staining with Congo red dye. Treatment involves local resection, usually accomplished endoscopically. Laryngeal amyloid is usually primary and localized, but has been associated with cardiac involvement and thorough systemic evaluation is essential.

SARCOIDOSIS

One to five percent of patients with sarcoidosis present with lesions within the larynx. The epiglottis is the most common site of involvement. Small, noncaseating granulomas are present on histology, but other granulomatous conditions such as fungal or mycobacterial infections should be ruled out. Spontaneous remission occurs, and treatment is therefore symptomatic, with endoscopic resection

when required and systemic steroids in certain cases.

WEGENER GRANULOMATOSIS

Wegener granulomatosis is a multisystem autoimmune disease that may involve necrotizing granulomata of the respiratory tract, disseminated vasculitis, and glomerulonephritis. Focal disease may arise throughout the laryngotracheobronchial tree, but is particularly associated with the immediate subglottic region. Presentation is usually with obstructive symptoms, although dysphonia may be present. Systemic disease is treated with immunosuppressive agents. Local disease without systemic involvement is optimally managed with local treatment, including intralesional corticosteroids.

Dean CM, Sataloff RT, Hawkshaw MJ, Pritikin E. Laryngeal sarcoidosis. *J Voice*. 2002;16:283. (Etiology, presentation, and management of laryngeal sarcoidosis.) [PMID: 12150382]

Franco RAJ, Singh B, Har-El G. Laryngeal chondroma. *J Voice*. 2002;16:92. (Summary of presentation, investigation, and management of laryngeal chondroma.) [PMID: 12008653]

Hoffman GS, Thomas-Golbanov CK, Chan J, Akst LM, Eliachar I. Treatment of subglottic stenosis, due to Wegener's granulomatosis, with intralesional corticosteroids and dilation. *J Rheumatol*. 2003;30:1017. (Discussion of intralesional corticosteroid in Wegener granulomatosis.) [PMID: 12734898]

Pribitkin E, Friedman O, O'Hara B et al. Amyloidosis of the upper aerodigestive tract. *Laryngoscope*. 2003;113:2095. (Review of laryngeal amyloidosis.) [PMID: 14660909]

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