Chapter 43 – Excision of Laryngocele

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Laryngoceles are uncommon disorders of the larynx. Galen first mentioned the laryngeal ventricle in the second century ad.[1] Morgagni described the laryngeal ventricle in 1741.[2] Napoleon's surgeon Baron Larrey is credited with the first clinical observation of a laryngocele in 1829.[3] He suspected that it was a form of goiter that caused “air tumors” in religious cantors and army drill instructors. In 1837, Hilton detailed the anatomy of the laryngeal saccule, which is also known as Hilton's saccule.[4] Virchow first coined the term “laryngocele” in 1863, calling it a tumor-like lesion with an anomalous air sac communicating with the laryngeal ventricle.[5] Abercrombie in 1881 described congenital laryngeal cysts in infants.[6] In 1915, Shambaugh and Lewis described laryngeal diverticula.[7] In 1970, DeSanto, Devine, and Weiland from the Mayo Clinic published what is currently considered to be the definitive system for classifying laryngeal cysts.[6] They suggested that the term laryngocele be confined to air-filled sacs that communicate freely with the laryngeal lumen. Saccular cysts develop from congenitally large saccules, are filled with fluid, and do not communicate with the laryngeal lumen. They distinguished three forms of laryngocele and grouped them by the anatomic area involved into internal, external, and mixed types. An internal laryngocele is confined to the larynx and extends posterosuperiorly into the false vocal cord and aryepiglottic fold. In the external type, there is a cystic enlargement in the neck only that is typically manifested as a mass lateral to the thyroid ala. The mixed or combined form combines the internal and external types, with a connecting isthmus passing through the thyrohyoid membrane (Fig. 43-1).[4] Laryngoceles may be unilateral or bilateral and are classically filled with air, but they may also contain mucus or other inspissated material. A laryngopyocele is defined as a secondary infection in an existing laryngocele.[6]

The saccule of the laryngeal ventricle is a normal structure seen as an outpouching of mucous membrane that contains mucous glands between the true and false vocal cords at the anterior one third of the ventricle.[8] Internal laryngoceles remain inside the larynx and are located in the laryngeal ventricle beneath the mucosa of the false vocal cord and the aryepiglottic fold. The size of the saccule in normal persons varies greatly.[9–11] Broyles[9] showed that the height of the saccule is less than 8 mm in 75% of normal larynges, between 10 and 15 mm high in 17%, and greater than 15 mm in 8%.

Laryngoceles are usually air filled but may be filled with mucus or pus and form a mucocele or mucopyocele, respectively.[12] A laryngocele may become symptomatic at any time during the patient's life. Holinger[13] reported on nine children in whom a laryngocele was diagnosed. Eight were infants younger than 2 months, and one was 3 years old and had been symptomatic since birth. Most laryngoceles, however, are said to arise in the sixth decade of life.[6]

There is confusion in the literature regarding the exact nomenclature between an internal laryngocele and saccular or ductal cysts, which may be clinically and histologically indistinguishable from each other, particularly if the laryngocele is filled with fluid. Histologically, more than one half of cysts are lined by respiratory epithelium; the remainder have a stratified squamous, columnar, or cuboidal epithelium or some combination of these types. Aggregates of lymphoid tissue have been observed in about one half of the patients. The presence of lymphoid tissue is not diagnostic of this lesion and does not support a branchial origin of these cysts because the larynx develops medial to the visceral pouches.[14] Normally, the secreted mucus is evacuated through the ventricular opening. However, after laryngeal trauma, neoplasm, or chronic inflammation, obstructed mucus can stagnate in the laryngocele and lead to stenosis of the neck of the saccule. The glands continue to secrete mucus, which causes an increase in size of the laryngocele.

The presence of a laryngocele/saccular cyst in a newborn is classified as congenital. Laryngoceles in adults are thought to be acquired. There are anecdotal descriptions of an increased incidence of laryngoceles in patients who are glassblowers or who play a wind instrument, singers, and patients with partial laryngeal obstruction. This suggests that chronic increases in intralaryngeal pressure predispose an individual to the development of a laryngocele. Most patients with a laryngocele do not have these occupations; therefore, it would appear that there may have been a congenital abnormality that did not become apparent until later in life. Dray and colleagues described a patient with bilateral internal laryngoceles who used the false vocal cords for phonation.[15] However, careful review of the case report suggests that the laryngoceles were probably due to obstruction caused by long-standing recurrent laryngeal papilloma. Khan and coauthors reported a previously asymptomatic 14-year-old patient who underwent reconstructive hand surgery under general anesthesia with a laryngeal mask.[16] Several minutes after normal ventilation, bilateral neck swelling was noticed. During face mask ventilation, the neck swelling increased with positive pressure and then collapsed. An endotracheal tube was inserted and the remainder of the

procedure was uneventful, and postoperatively the patient recovered satisfactorily with no further treatment. Based on the clinical course it was assumed that the patient had bilateral internal/external laryngoceles.

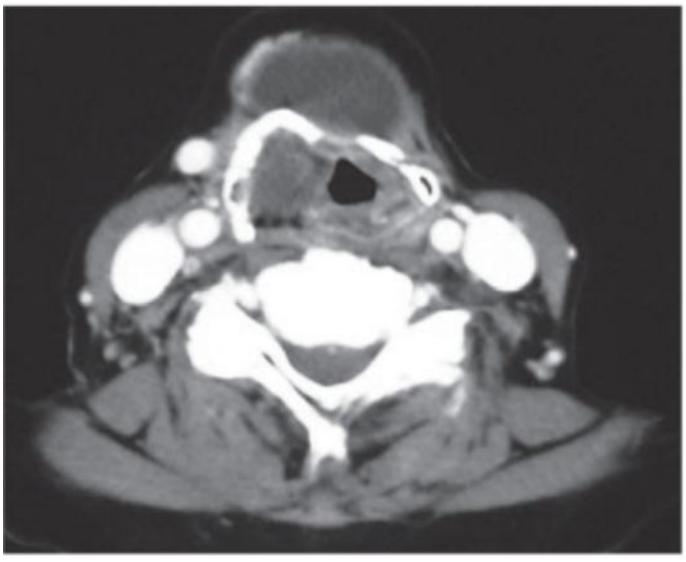
Two other interesting aspects about laryngoceles should be mentioned. One is that these sacs usually contain mucus and may therefore become secondarily infected and be manifested as a laryngopyocele. Patients in this situation may be “septic” and have stridor requiring stabilization of the airway by either tracheotomy or drainage of the cyst together with antibiotic therapy. Computed tomography (CT) is helpful in making this diagnosis and demonstrating uniform low density, although the density of the cyst may vary with its protein content.

The second interesting aspect is that a laryngocele may be related to squamous cell carcinoma of the larynx. Approximately 70 reports, encompassing 336 patients in whom laryngoceles were found to coexist with squamous cell carcinoma of the larynx, have been published in the literature. Studies devoting special attention to the detection of laryngoceles suggest that squamous cell carcinoma is associated with occult laryngoceles in up to 28% of patients. When the tumor and the laryngocele are closely associated anatomically, treatment is less straightforward. Embryologically, the saccule arises from the roof of the ventricle and is a supraglottic structure. In theory, a supraglottic tumor, even when associated with a laryngocele, should be amenable to supraglottic laryngectomy if the usual criteria are met.[11] Cassano and associates reported a patient with a decreased laryngeal airway in whom a laryngopyocele was diagnosed that proved on biopsy to be squamous cell carcinoma.[17] The patient underwent subtotal reconstructive laryngectomy with bilateral neck dissection. The authors emphasized that the presence of a laryngocele is always a precise indication for detailed inspection of the ventricle in search of cancer. I encountered a patient recently who had a laryngocele associated with squamous cell carcinoma of the larynx (Fig. 43-2).

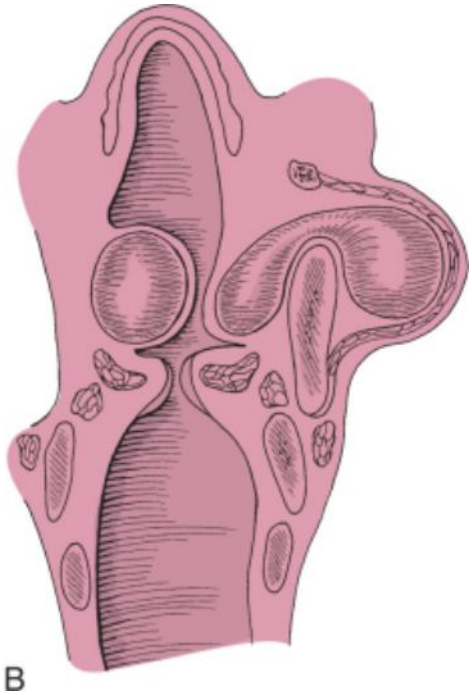
Symptoms of laryngocele include hoarseness, dyspnea, dysphagia, and cough. These symptoms are present to varying degrees, depending on the extent of the laryngocele. A laryngocele should be considered in the differential diagnosis when painful swelling of the neck and fever are present. The authors recommended excision through a transcervical approach, including the internal component of the laryngocele. Direct laryngoscopy is always used to evaluate the interior of the larynx and to rule out cancer.

Harney and coworkers reported a laryngocele in a patient with hoarseness and a long history of cigarette smoking.[12] CT demonstrated a large laryngocele with an adjacent tumor mass involving the supraglottic larynx that on biopsy revealed squamous cell carcinoma. The patient was treated with radiation therapy. Carrat and colleagues reported a patient with squamous cell carcinoma who was treated by supracricoid laryngectomy and some years later an external laryngocele developed, presumably secondary to scarring.[18]

When therapy is being planned, patients with concurrent laryngocele and laryngeal cancer can be categorized into two groups. In the first group, the squamous cell carcinoma involves the larynx but does not invade the laryngocele or the ipsilateral ventricle; standard treatment of the laryngeal tumor would appear logical. In these cases one may regard the laryngocele as an incidental finding. In the second group, the cancer is located within the laryngocele and may be the cause of the laryngocele by obstructing the ventricle. Because carcinoma within a laryngocele is difficult to diagnose endoscopically, it is advisable to study the larynx radiologically in the preoperative period.[19]



A



B

Figure 43-1 **A**, Computed tomography scan demonstrating a large internal and external laryngocele manifested as a mass in the neck. **B**, Diagram of a combined internal-external laryngocele.

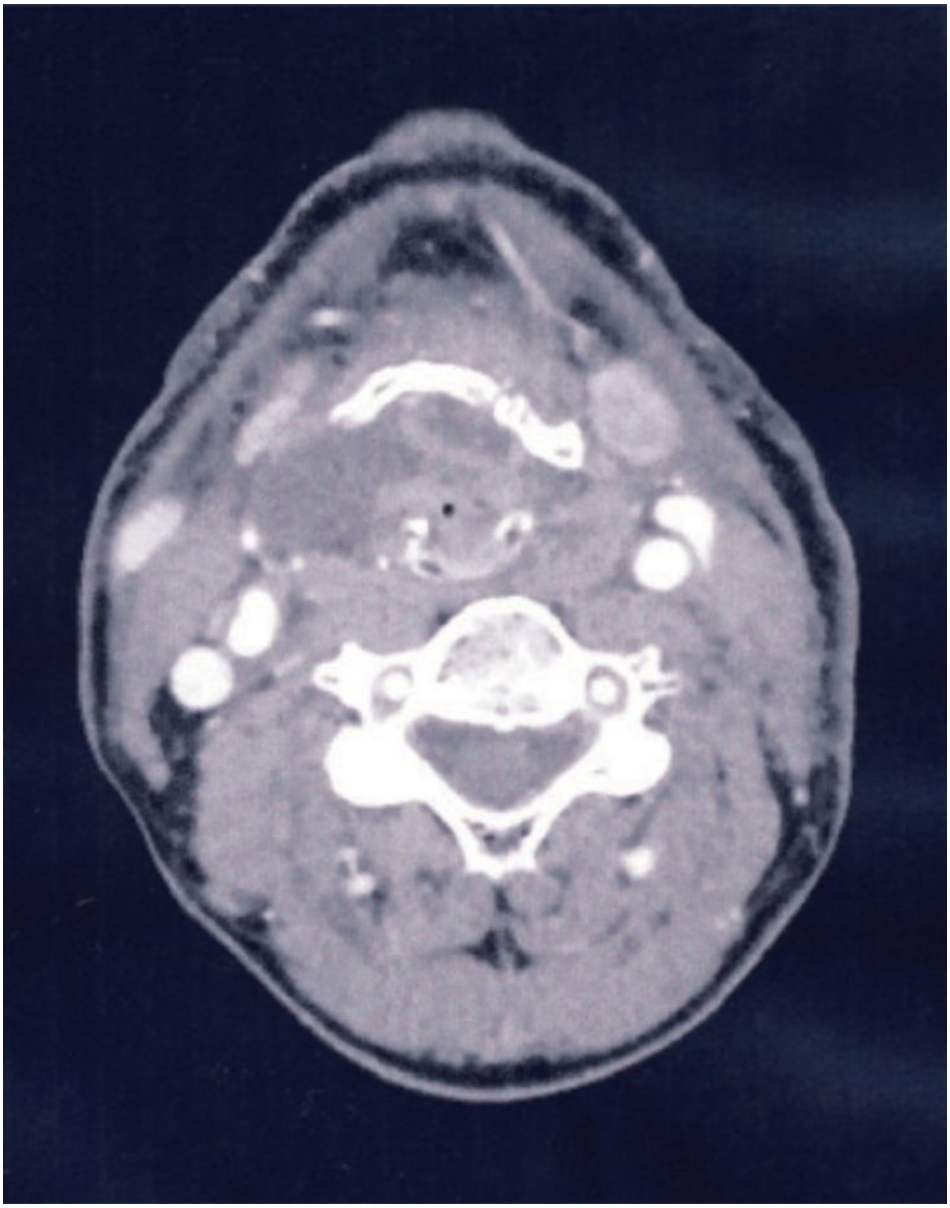


Figure 43-2 Computed tomography scan revealing a laryngocele associated with squamous cell carcinoma.

PATIENT SELECTION

A laryngocele may become clinically apparent in several ways. Symptoms depend on the size and location of the cyst and the patient's age. Respiratory distress in infants as a result of a laryngocele may be aggravated by head position or feeding. The most frequent symptoms of a laryngocele/saccular cyst include hoarseness, dysphagia, pain, and progressive airway obstruction. Adults may have a muffled voice, stridor, dysphagia, or a mass in the neck. Pennings and associates described two patients with upper airway obstruction.[20] One patient had a giant laryngocele and required urgent tracheotomy to stabilize the situation; the other had a giant saccular cyst. A laryngocele is normally in open communication with the laryngeal lumen and is at least partially filled with air, whereas a saccular cyst does not communicate with the laryngeal lumen and is generally filled with mucus. Affected patients usually have an occasional intermittent minor change in their voice, hoarseness, or a vague unexplained fullness in their neck. A patient with an infected laryngocele may have signs of cellulitis or an abscess in the neck with pain, tenderness, hyperemia, and fullness in the area of the false vocal cord and aryepiglottic fold on laryngeal examination. Impending airway distress and sepsis may be present. In the case of an external laryngocele, a mass may be palpated in the neck adjacent to the thyroid cartilage.

The interior of the larynx should be examined in the office by indirect flexible laryngoscopy. The classic finding is submucosal swelling of the area of the false cord and aryepiglottic fold. Visualization of the ipsilateral and sometimes contralateral vocal cord may be obscured by the mass. This finding and the status of the vocal cord should be confirmed at direct laryngoscopy. The neck should be examined for the presence of an external component. Swelling will often appear in the neck ipsilateral to the mass in the larynx when a Valsalva maneuver is performed. If an external component is noted and compressed, a hissing and gurgling sound may be produced and is known as Bryce's sign.[21]

CT is valuable and may demonstrate an air- or fluid-filled cystic mass that may be confined to the larynx or have an external component and may be unilateral or bilateral. These masses appear as hypodense homogeneous endolaryngeal or combined endolaryngeal and extralaryngeal masses extending extralaryngically through the thyrohyoid membrane. CT has been the primary imaging study used because of its ability to provide a definitive diagnosis of laryngocele through cross-sectional imaging and its superior contrast resolution.[22] CT is also useful in mapping the extent of a laryngocele and aiding in treatment planning.[23,24] Magnetic resonance imaging (MRI) is superior in its ability to evaluate soft tissue and can generally distinguish obstructed mucus and inflammation from neoplastic disease. An uncomplicated laryngeal cyst is usually homogeneously hypodense on non–contrast-enhanced CT scanning. Laryngopyocele displays peripheral rim enhancement, whereas mucus or purulent contents have a CT density similar to that of adjacent soft tissue.

Harvey and colleages reported a patient who underwent radiation therapy for squamous cell carcinoma of the vocal cord.[25] The patient was seen later with a 1-month history of progressive hoarseness. Physical examination revealed that the right true vocal cord was fixed. MRI showed thickening of the right vocal cord consistent with recurrent cancer, as well as an internal laryngocele. MRI accurately depicted the vocal cord lesion and its extent.

Close and coauthors, in their report of 305 patients undergoing CT scanning of the neck for unrelated circumstances, discovered 39 cases of laryngocele, 38 of which were asymptomatic.[26]

Gallivan and Gallivan reported two brass instrumentalists who while playing their instruments noted remarkable bulging in the anterior triangle of the neck.[1] Flexible laryngoscopy revealed internal and external laryngoceles that appeared during brass playing and disappeared spontaneously with cessation of playing.

SURGICAL TECHNIQUE

An internal laryngocele (Fig. 43-3) or saccular cyst may be treated by transoral endoscopic CO_2 laser excision. Once the laryngoscope is inserted and suspended, the cyst may be removed in one of two ways. If a CO_2 laser is available, the entire false vocal cord is removed in an anterior-to-posterior direction with an interrupted cutting pulse (Fig. 43-4). Dissection is carried down to the perichondrium of the ventricle, and the tissue is removed. The cystic structure that will be revealed is the epithelial lining of the laryngocele; this is dissected out with the lesion. The procedure can be safely carried out even with a large internal laryngocele, which often relieves progressive airway obstruction.[27] The authors correctly point out that endoscopic laser marsupialization or laser vestibulectomy have been used for the treatment of intact laryngocele and symptomatic saccular cysts. We have encountered several patients with benign cystadenoma that was thought preoperatively to be a laryngocele. The diagnosis was made only after the lesion was removed for pathologic examination. During the laser procedure, effort should be made to protect the underlying vocal cord from injury by the laser.

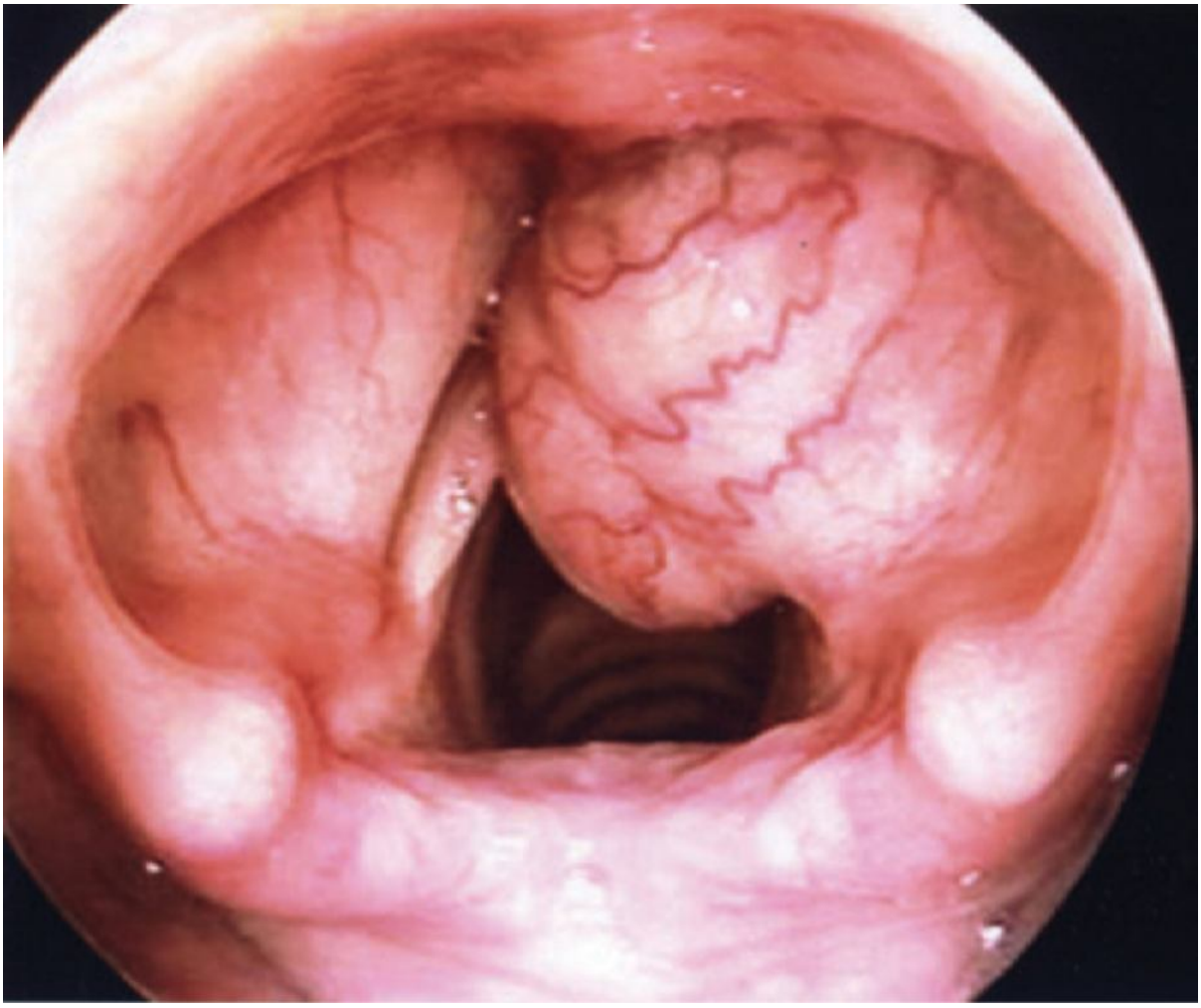


Figure 43-3 Endoscopic view of an internal laryngocele. *(The authors gratefully acknowledge the contribution of this photo by Eiji Yanagisawa, MD.)*

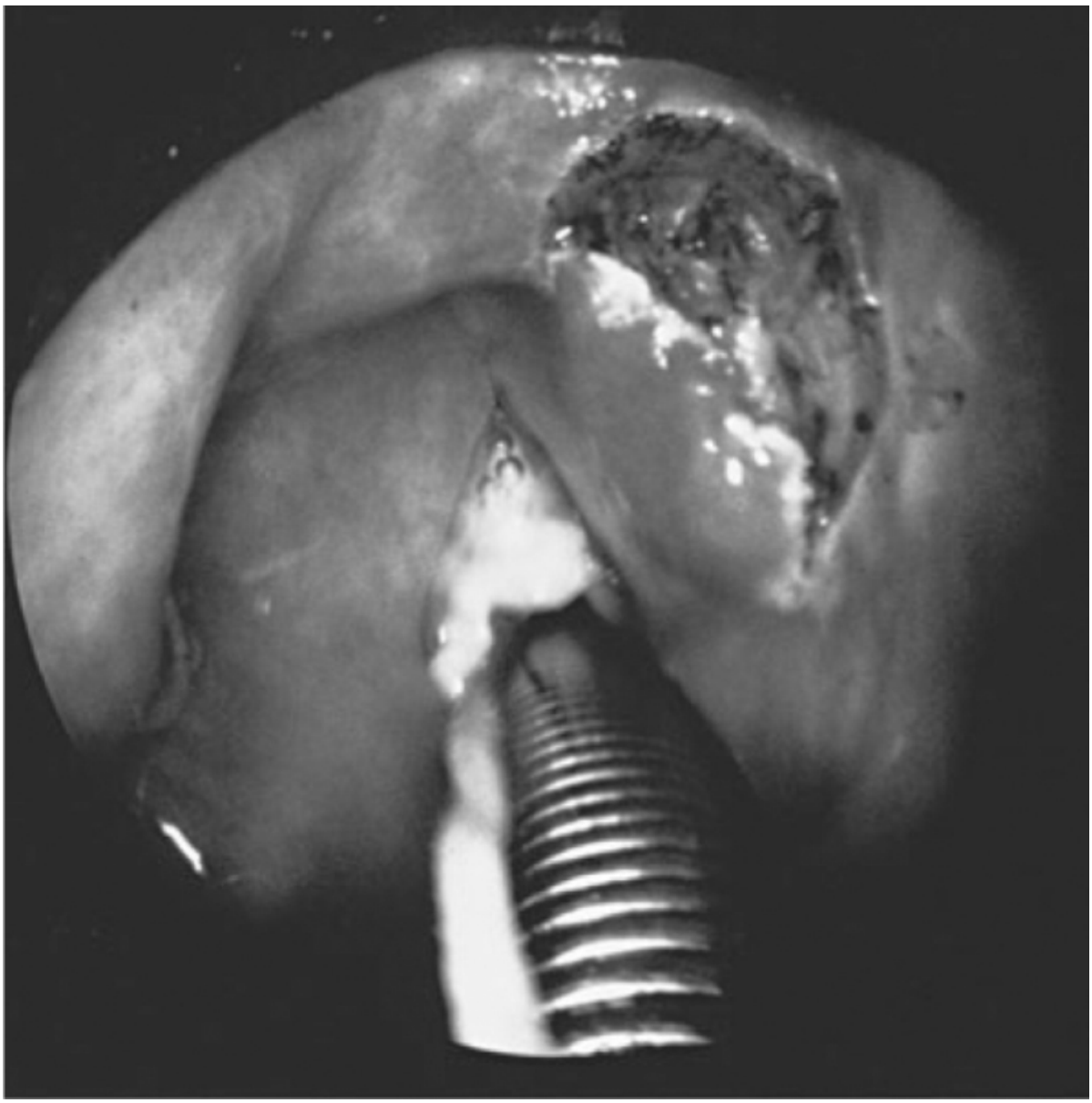


Figure 43-4 The incision is made with the CO_2 laser used for excision of an internal laryngocele.

If a CO_2 laser is not available or the surgeon is not trained in this technique, the incision in the false vocal cord can be made as described earlier with upward-biting microscissors. Via sharp dissection, the false vocal cord may also be removed piecemeal with large-cup biting forceps. Once the false vocal cord is removed, the cystic lesion is revealed and dissected free from the mucosa or perichondrium of the ventricle without injuring the vocal cord.

Thyrotomy Approach

The lateral thyrotomy approach to the paraglottic space through a vertical split of the thyroid lamina just anterior to the superior cornu was first proposed by Lewis in 1914.[28] New and Erich modified this approach by dividing the thyroid lamina at the junction of the anterior and middle third, splitting it in half, retracting the halves, resecting the cyst under direct vision, and suturing the halves of the lamina back into position.[29,30] Accessibility to the paraglottic space has also been achieved by resecting a horizontal portion of the thyroid lamina through an en bloc[31–35] or a biting-forceps surgical technique.[36] Keim and Livingstone removed a triangular segment at the superior thyroid lamina and the greater cornu of the hyoid bone to enlarge the operative field for resection of an internal laryngocele that had previously been irradiated.[37] Malis and Seid developed a lateral thyrotomy technique in which a rectangular, fold-down, lateral thyroplasty (“trapdoor” flap) was used to approach congenital lateral saccular cysts, and an inferiorly based thyroid cartilage perichondrial flap was raised.[38] Netterville and coworkers gained access to the paraglottic space through a window or a trapdoor flap in the lateral thyroid lamina, which they used for complete removal of Teflon granuloma.[39] Thome and associates used a lateral thyrotomy approach to the paraglottic space.[40] The authors excised a triangle of thyroid cartilage, the base of the triangle being superior along the posterior aspect of the thyroid lamina and the apex interior. This technique allows access to the

paraglottic space and provides superb visibility for resection of a laryngocele of any size under direct vision, thereby avoiding recurrence, morbidity, and complications.

The cervical approach is used in patients who have a combined laryngocele. A rolled-up blanket is placed under the shoulders for extension, and the patient's head is turned away from the side of the lesion. The patient is prepared and draped in the usual manner for a cervical approach under endotracheal anesthesia. An incision is made in a skin crease at the level of the thyrohyoid membrane (Fig. 43-5A). Dissection is carried down through platysma muscle and fascia. The laryngocele can be palpated and will easily be identified in the neck (Fig. 43-5B). The wall of the sac is grasped gently and dissected medial to its point of origin in the larynx, which protrudes through the thyrohyoid membrane just superior to the thyroid ala. An incision is made in the perichondrium of the superior aspect of the thyroid cartilage; a sharp periosteal elevator is used to elevate the perichondrium of the inner aspect of the thyroid cartilage while the soft tissue attachments of the laryngocele to the thyrohyoid membrane and false vocal cord are dissected out (Fig. 43-5C). If further exposure is necessary, an oscillating saw may be used to resect the superior one third of the thyroid ala. This technique does not result in any difficulties postoperatively. Further medial dissection leads to the ventricle, where the remainder of the sac can be identified, dissected out, and excised. Hemostasis is obtained, the wound is irrigated and closed in layers over a Hemovac drain, and a dressing is applied. The interior of the larynx should be examined by direct laryngoscopy. Usually, there is more space than there was at the beginning rather than edema or other problems, and a tracheotomy is not usually necessary. Care must be taken to avoid injury to the superior or recurrent laryngeal nerves and their branches.

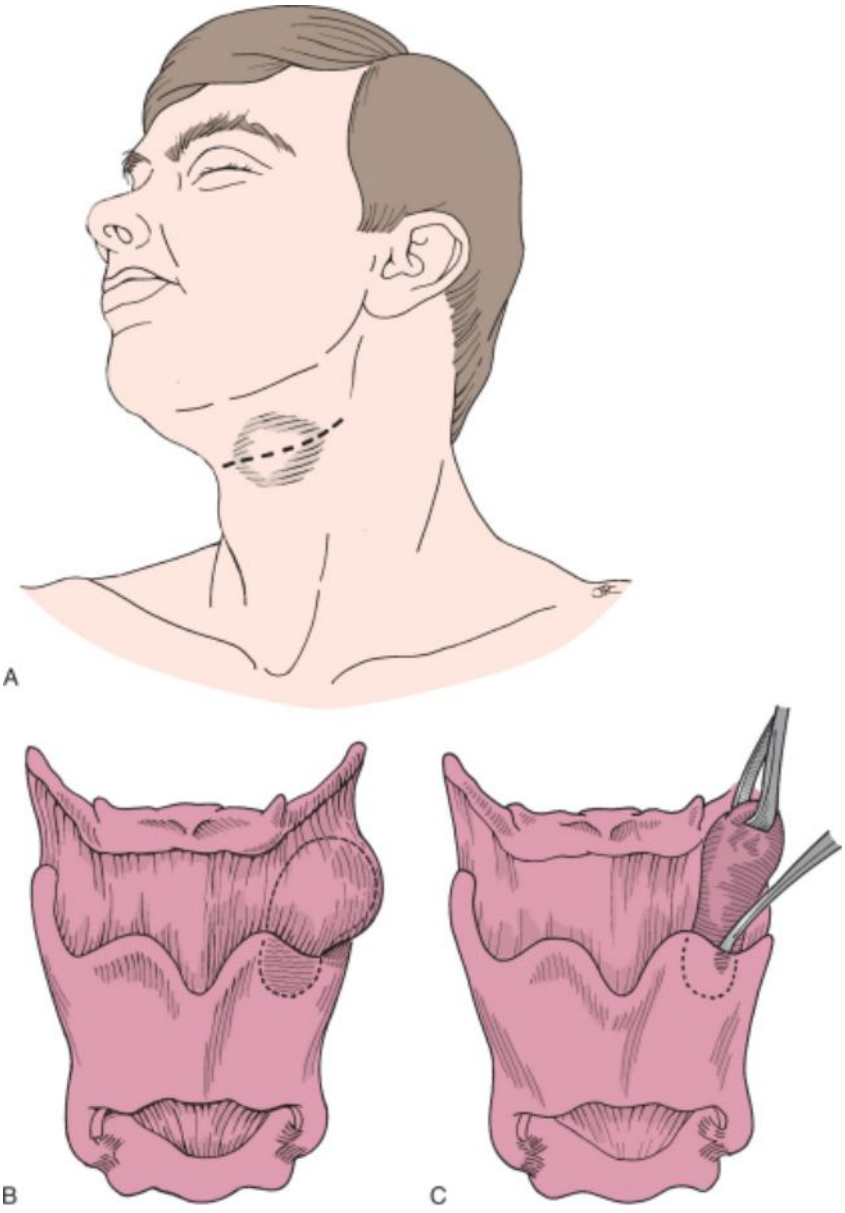


Figure 43-5 **A**, An incision is made in a skin crease at the level of the thyrohyoid membrane. **B**, The laryngocele is identified and dissected to the point of entry into the larynx. **C**, An incision is made in the perichondrium of the thyroid ala. The soft tissue attachments of the sac to the thyroid membrane and the false vocal cord are dissected free.

In children, aspiration of the intralaryngeal portion of the cyst has been reported to provide temporary relief. However, mucus will again fill the cystic space, and the same symptoms will recur. If the cyst is confined to the ventricle, the procedure described earlier should be carried out as early after the diagnosis is made as possible without putting the patient through unnecessary minor procedures. If there is an external component, the external approach should be carried out.

POSTOPERATIVE MANAGEMENT

Intravenous antibiotics are administered perioperatively for excision of an external laryngocele, because the neck is exposed to the potentially contaminated secretions of the airway. Patients who are currently or have previously been infected should also receive antibiotics. The Hemovac drain may be removed when drainage has stopped, after which the patient may be discharged safely.

COMPLICATIONS

Airway problems are the most frequent complication. Unless the airway is definitely compromised in some way, a tracheostomy is not usually necessary. Care should be taken to make certain that there is no communication between the laryngeal ventricle and the neck to prevent subcutaneous emphysema and infection. The internal and external branches of the superior laryngeal nerve do not necessarily have to be identified, but the surgeon must be aware of the proximity of an external laryngocele to branches of the superior laryngeal nerve. Unless a great deal of previous infection has caused scar tissue, the dissection is simple and straightforward and should be done bluntly to avoid injury to neurovascular structures.

The major pitfall in this procedure is the possibility of not resecting the entire sac, whether it be internal, external, or combined, in which case recurrence would be expected.

PEARLS

- Internal laryngocele/saccular cysts should be removed by direct suspension microlaryngoscopy and CO_2 laser.
- Internal and external laryngoceles are approached through a transcervical approach.
- Imaging studies are valuable in determining whether a pure internal or an internal-external laryngocele is present.
- Intralaryngeal manipulation must be kept to a minimum to avoid airway obstruction.
- Patients with airway obstruction as a result of a giant laryngocele or laryngopyocele may need a tracheotomy to establish a safe airway.

PITFALLS

- Lack of imaging studies may result in leaving an external component behind after removal of what clinically appeared to be a pure internal laryngocele.
- Failure to resect the entire laryngocele may result in recurrence.
- Subcutaneous emphysema or recurrent infection may occur if any communication remains between the larynx and the neck.
- Airway management is a key feature in managing a giant or infected laryngocele.
- Dissection of the external component of the laryngocele may be difficult in patients who have had a laryngopyocele. Care should be taken to avoid injury to the neurovascular bundle.