Laryngeal Disease in Dogs and Cats

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KEYWORDS

• Upper airway obstruction • Laryngeal paralysis • Aspiration pneumonia
• Megaesophagus • Laryngeal collapse • Tracheostomy

KEY POINTS

- The most common disease process involving the larynx is laryngeal paralysis, which occurs much more frequently in dogs than in cats.
- Diagnosis of laryngeal paralysis requires close attention to anesthetic plane and coordination of respiratory effort with laryngeal motion.
- Surgical arytenoid lateralization improves respiration and quality of life in dogs with laryngeal paralysis; however, aspiration pneumonia is a recognized complication, and generalized neuropathy can progress.
- Laryngeal collapse can result from any cause of chronic upper airway obstruction, but is most often associated with unaddressed brachycephalic airway syndrome.
- Laryngeal neoplasia, while generally uncommon, occurs more frequently in cats than in dogs. Histologic confirmation is required to exclude inflammatory laryngeal disease.

INTRODUCTION

Laryngeal disease in dogs and cats results in varying degrees of upper airway obstruction and can be life-threatening. Conditions most commonly affecting the larynx include laryngeal paralysis, laryngeal collapse, and laryngeal masses. Differentials for laryngeal disease include nasal, nasopharyngeal, and tracheal conditions that also result in clinical signs of upper airway obstruction, such as stertor, stridor, wheezing, and gagging. Visual upper airway examination is the fundamental diagnostic tool for localizing the anatomic area involved in airway obstruction.

ANATOMY AND PHYSIOLOGY

The larynx is the collection of cartilages surrounding the rima glottidis. It is responsible for control of airflow during respiration. The four cartilages that constitute the larynx are the paired arytenoids and the unpaired epiglottis, cricoid, and thyroid

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cartilages. Each of the arytenoid cartilages has a cuneiform process rostrally, a corniculate process dorsally, a muscular process dorsolaterally, and a vocal process ventrally. The vocal processes are the attachment points for the vocal folds. The glottis consists of the vocal folds, the vocal process of the arytenoid cartilages, and the rima glottides. The laryngeal saccules are mucosal diverticula that sit rostral and lateral to the vocal folds. The larynx of the cat differs from that of the dog as the arytenoid cartilage lacks cuneiform and corniculate processes. Also, true aryepiglottic folds are absent and the sides of the epiglottis connect directly to the cricoid lamina by laryngeal mucosa.

The intrinsic muscles of the larynx (cricoarytenoideus dorsalis, cricoarytenoideus lateralis, thyroarytenoideus, vocalis, ventricularis, arytenoideus transversus, hyoepiglotticus, and cricothyroideus) are responsible for all laryngeal functions. These functions include regulation of airflow, protection of the lower airway from aspiration during swallowing, and control of phonation. The cricoarytenoideus dorsalis muscle is solely responsible for enlarging the glottis during inspiration. This muscle originates on the dorsolateral surface of the cricoid and inserts on the muscular process of the arytenoid cartilages. Contraction of this muscle results in external rotation and abduction of the arytenoid cartilages that then pulls the vocal processes laterally. The caudal laryngeal nerve is the terminal segment of the recurrent laryngeal nerve and is responsible for innervation of all intrinsic laryngeal muscles, except the cricothyroid muscle, which is innervated by the cranial laryngeal nerve.

CANINE LARYNGEAL PARALYSIS

Cause

Laryngeal paralysis is a common unilateral or bilateral respiratory disorder that primarily affects older (>9 years) large- and giant-breed dogs. A congenital form occurs in certain breeds such as Bouvier des Flandres, Siberian huskies, bull terriers, and white-coated German shepherd dogs.[1,2] An autosomal-dominant trait has been documented in Bouvier des Flandres, resulting in Wallerian degeneration of the recurrent laryngeal nerves and abnormalities of the nucleus ambiguus.[3] Although the precise mode of inheritance has not been established, a hereditary predisposition has also been identified in Siberian husky dogs, Alaskan malamutes, and crosses of those 2 breeds.[4,5] A laryngeal paralysis-polyneuropathy complex has been described in Dalmatians, Rottweilers, Leonberger dogs, and Pyrean mountain dogs.[6–9]

For the more frequently encountered acquired laryngeal paralysis, the Labrador retriever is the most common breed reported, but golden retrievers, Saint Bernards, Newfoundlands, and Irish setters are also overrepresented. Proposed causes of laryngeal paralysis include accidental trauma, iatrogenic trauma, cervical masses, and neuromuscular disease (**Box 1**). In most dogs the cause remains undetermined, and these cases are traditionally classified as idiopathic.

Recently it was shown that many dogs develop systemic neurologic signs within 1 year following diagnosis of laryngeal paralysis, which is consistent with progressive generalized neuropathy.[10] Abnormalities in the results of electrodiagnostic tests and histopathologic analysis of nerve and muscle biopsy specimens reflecting generalized polyneuropathy have also been documented in dogs with acquired laryngeal paralysis.[11] It has been suggested that dogs previously thought to have idiopathic laryngeal paralysis could in fact have a progressive generalized polyneuropathy. The abbreviation GOLPP (geriatric onset laryngeal paralysis polyneuropathy) has been proposed as a more accurate term for dogs with acquired laryngeal paralysis where other causes have been ruled out.[10]

Box 1
Causes of laryngeal paralysis

- Congenital
- Accidental trauma
  - Cervical penetrating wounds
  - Strangulating trauma
- Iatrogenic surgical trauma
  - Ventral slot
  - Thyroidectomy/parathyroidectomy
  - Tracheal surgery
  - Cranial thoracic surgery
- Cervical/intrathoracic masses
  - Thyroid carcinoma
  - Thymoma
  - Lymphoma
  - Abscess
  - Granuloma
- Neuromuscular disease
  - Immune-mediated
  - Infectious
  - Toxins (lead; organophosphates)
  - Endocrinopathy
  - Polymyopathy
  - Progressive idiopathic polyneuropathy

Clinical Signs

With laryngeal paralysis, the arytenoid cartilages, and consequently the vocal folds, remain in a paramedian position during inspiration creating upper airway obstruction. Dogs typically present with noisy inspiratory respiration and exercise intolerance. Early clinical signs include voice change and mild coughing and gagging. Severe airway obstruction results in respiratory distress, cyanosis, and collapse. Dogs can also exhibit dysphagia or develop rear limb weakness associated with peripheral neuropathy. The classic finding on physical examination is the presence of stridor over the upper airway but this can be variable. A complete neurologic examination and assessment of proprioceptive placing should be performed in dogs suspected of laryngeal paralysis.

Progression of clinical signs is highly variable, and dogs can have clinical signs for several months to years before significant respiratory distress ensues. However, clinical signs are worsened by heavy exercise or increasing environmental temperature or humidity, which results in an acute exacerbation of a chronic condition. As respiratory rate increases, the mucosa covering the arytenoids becomes inflamed and edematous, which leads to further airway obstruction. A vicious cycle ensues that if unaddressed can become life threatening.

Diagnosis

Routine diagnostic evaluation for dogs thought to have laryngeal paralysis includes physical examination, neurologic examination, complete blood count, biochemical profile, urinalysis, thyroid function screening, thoracic radiographs, and laryngeal examination. Dogs with laryngeal paralysis are at risk of aspiration pneumonia both before and after surgery. Therefore thoracic radiographs are a necessary part of the diagnostic workup in dogs suspected of laryngeal dysfunction to rule out aspiration pneumonia, as well as overt megaesophagus, pulmonary edema, and concurrent cardiac or lower airway abnormalities (**Fig. 1**).

For dogs that present with dysphagia or vomiting, an esophagram should be obtained to investigate esophageal dysfunction or megaesophagus, which might not be apparent on plain thoracic radiographs. Severe progressive esophageal dysfunction has been reported in a set of dogs with idiopathic laryngeal paralysis and likely reflects the progressive polyneuropathy that has been proposed as a cause of laryngeal dysfunction in most geriatric dogs.[10]

Hypothyroidism occurs concurrently in approximately 30% of dogs with acquired laryngeal paralysis, although a direct causal link has not been established.[12,13] Regardless, thyroid function screening is performed routinely in the workup for laryngeal paralysis. Thyroid supplementation should be instituted if indicated, although this does not resolve clinical signs associated with laryngeal paralysis.

Definitive diagnosis of laryngeal paralysis requires laryngeal examination. This examination can be accomplished by direct visualization of the larynx with a simple laryngoscope, oral video-endoscopic laryngoscopy, transnasal laryngoscopy, ultrasound (echolaryngography), or computed tomography (CT). Findings indicate laryngeal paralysis on ultrasound, including asymmetry or absence of motion of the cuneiform processes, abnormal arytenoid movement, paradoxic movement, caudal displacement of the larynx, and laryngeal collapse.[14] CT findings in dogs with laryngeal paralysis included failure to abduct the arytenoid cartilages and collapse into the rima glottis on presumed inspiration, stenosis of the laryngeal inlet, and air-filled lateral ventricles.[15] Laryngoscopy, regardless of method, can be confounding as false-positive results are common due to the influence of anesthetic agents and sedatives on laryngeal function. Echolaryngography, transnasal laryngoscopy, and CT avoid the need for heavy sedation and general anesthesia; however, none of these methods have been shown to be superior to traditional oral laryngeal examination for definitive diagnosis.[16]

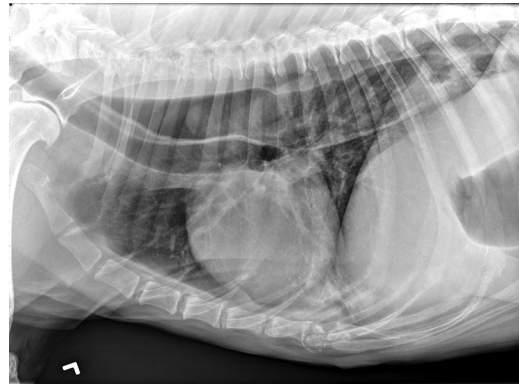

Fig. 1. Lateral thoracic radiograph of a dog with laryngeal paralysis showing megaesophagus.

Laryngeal paralysis is diagnosed based on the lack of arytenoid abduction during inspiration. Inflammation and swelling of the laryngeal cartilages can also be apparent. Diagnosis can be confounded by paradoxic movement of the arytenoids, resulting in a false-negative result. In this scenario, the arytenoid cartilages move inward during inspiration because of negative intraglottic pressure created by breathing against an obstruction. The cartilages then passively return to a normal position during expiration, which gives the impression of normal arytenoid movement. To avoid this situation, an assistant should state the phase of ventilation during laryngoscopy to help in distinguishing normal from abnormal motion.

Intravenous thiopental administered to effect is thought to be the best anesthetic choice for assessment of laryngeal function.[17] However, the recent lack of availability of thiopental leaves propofol as the most appropriate induction agent for laryngeal examination in dogs (**Box 2**). Doxapram HCl (1 mg/kg IV) has been advocated for routine use during laryngoscopy to increase respiratory rate and effort and improve intrinsic laryngeal motion, and it should be administered if the diagnosis is in doubt.[18,19]

Emergency Treatment

For dogs in acute respiratory distress associated with airway obstruction, initial treatment is directed at improving ventilation, reducing laryngeal edema, and minimizing the animal's stress. A typical treatment regimen involves oxygen supplementation and administration of short-acting steroids (eg, dexamethasone 0.1–1 mg/kg IV) and sedatives (eg, acepromazine 0.02 mg/kg IV). Additional administration of buprenorphine (0.005 mg/kg IV) or butorphanol (0.2 mg/kg IV) can also be considered to improve sedation. These dogs are often hyperthermic because of excessive respiratory effort, and appropriate cooling procedures should also be instituted including wetting the fur with cool water and application of a fan. If respiratory distress cannot be abated, intubation or a temporary tracheostomy should be considered. However, use of a temporary tracheostomy tube in dogs with laryngeal paralysis has been shown to be a negative prognostic indicator following surgery, because dogs that received a temporary tracheostomy preoperatively were more likely to experience major complications.[13]

Box 2
Drugs used during functional laryngeal examination

Premedications:

Glycopyrrolate: 0.005–0.01 mg/kg IV, IM, SC *and*

Butorphanol: 0.2–0.4 mg/kg IV, IM, SQ *or*

Buprenorphine: 0.005–0.02 mg/kg IV, IM, SC *or*

Hydromorphone: 0.1–0.2 mg/kg IV, IM, SC

Induction:

Propofol: 4–8 mg/kg IV, administered slowly

To stimulate respiration:

Doxapram HCl: 1–2 mg/kg IV

To decrease laryngeal swelling:

Dexamethasone: 0.1–1 mg/kg IV

Temporary tracheostomies are not without complications. The presence of a tube within the tracheal lumen causes epithelial erosion, submucosal inflammation, and inhibition of the mucociliary apparatus. Mucus production dramatically increases, and the tube must be suctioned or cleaned at very frequent intervals to prevent clogging. Therefore, a dog with a temporary tracheostomy tube requires intensive monitoring to avoid life-threatening complications. In a recent study, complications (clinical and incidental) were documented in 86% of cases receiving a temporary tracheostomy.[20] Sixteen types of complications were noted, but the most significant and frequent complications occurred in ~25% of dogs and were airway obstruction, tube dislodgement, aspiration pneumonia, and stoma swelling.

Medical Management

Often dogs are not severely affected clinically until they have bilateral laryngeal paresis or paralysis. Therefore, dogs with unilateral laryngeal dysfunction are typically not surgical candidates. For dogs with bilateral laryngeal paralysis, the decision to recommend surgery is based on the quality of life of the dog, severity of clinical signs, and time of year. The goal of conservative management of dogs with laryngeal paralysis is to improve the quality of life through environmental changes, reduction of daily exercise, owner education, weight loss, and consideration of anti-inflammatory drugs to minimize laryngeal swelling. Unfortunately, medical treatment is insufficient for long-term management. For dogs that are diagnosed with concurrent hypothyroidism, thyroid supplementation should be instituted, but as noted earlier this rarely improves clinical signs of laryngeal paralysis but can assist with weight loss.

Surgical Treatment

Laryngeal paralysis is a surgical condition for severely affected dogs, and numerous techniques have been described. Unilateral arytenoid lateralization is the current technique of choice for most surgeons but various types of partial laryngectomy (bilateral vocal fold resection, partial arytenoidectomy) are also performed. Bilateral arytenoid lateralization is not recommended because it results in unacceptable morbidity.[13] Other techniques include castellated laryngofissure, reinnervation of the laryngeal musculature, and permanent tracheostomy. Castellated laryngofissure is performed rarely because of the technical difficulty of the procedure and inconsistent outcomes. Reinnervation does not provide immediate clinical relief, so it is not a practical treatment option in dogs. Permanent tracheostomy is considered a salvage procedure for dogs most at risk of aspiration pneumonia, but it is associated with a high rate of major and minor complications and requires diligent postoperative and long-term care. Also, the risk for aspiration pneumonia remains despite the presence of a permanent stoma.

Several variations of unilateral arytenoid lateralization have been described. The most common technique involves suturing the cricoid cartilage to the muscular process of the arytenoid cartilage. This technique mimics the directional pull of the cricoarytenoideus dorsalis muscle and rotates the arytenoid cartilage laterally. An alternative technique involves suture placement from the muscular process of the arytenoid cartilage to the caudodorsal aspect of the thyroid cartilage. This technique pulls the arytenoid cartilage laterally rather than rotating it and increases the area of the rima glottidis to a lesser degree than the cricoarytenoid suture. Differences in surgical technique and the degree of increase in surface area of the rima glottis do not seem to affect postoperative clinical signs and outcome. However, increasing the surface area of the rima glottidis beyond the edges of the epiglottis could put the animal at higher risk of aspiration. Limited lateral displacement of the arytenoid cartilage will

significantly reduce airway resistance within the larynx and might decrease the risk of postoperative aspiration pneumonia.[21] This lateral displacement can be accomplished by minimizing the degree of dissection: separation of the cricothyroid articulation, transection of the sesamoid band connecting the paired arytenoids, and complete disarticulation of the cricoarytenoid joint are not necessary. A partial opening of the cricoarytenoid articulation allows accurate visualization of needle placement through the muscular process of the arytenoid but limits the degree of arytenoid cartilage abduction.

Partial laryngectomy encompasses various techniques for vocal cord excision and partial arytenoidectomy to increase the diameter of the glottis. Partial laryngectomy has been associated with complications, including laryngeal webbing, laryngeal scarring, and aspiration pneumonia. High complication rates have been reported; however, bilateral vocal fold resection alone resulted in fewer complications and better postoperative outcome than other partial laryngectomy techniques.[13,22–24] Bilateral vocal fold excision and thyroarytenoid lateralization performed through a ventral laryngotomy improves clinical signs and is associated with a low rate of aspiration pneumonia; however, recurrence of clinical signs is common, likely because of narrowing of the rima glottis.[25] Successful partial arytenoidectomy by photoablation of the left arytenoid cartilage tissue using a diode laser has been reported in a small set of dogs.[26] Recently, bilateral ventriculocordectomy via ventral laryngotomy was reported to have a reasonable long-term (>6 months) outcome with a low incidence of major complication (7%).[24]

Prognosis

Aspiration pneumonia is the most common complication in dogs surgically treated for laryngeal paralysis; it occurs in 10% to 21% of dogs undergoing unilateral arytenoid lateralization.[13,27,28] Although aspiration pneumonia is most likely in the first few weeks following surgery, dogs are at risk of this complication for the rest of their lives.[13] Factors that have been found to be significantly associated with a higher risk of developing complications and a negative effect on long-term outcome include preoperative aspiration pneumonia, development of esophageal dysfunction, progression of generalized neurologic signs, temporary tracheostomy placement, and concurrent neoplastic disease.[13] In one study, 10 of 32 dogs had neurologic signs at the time of enrollment into the study, but all dogs had neurologic signs by 1 year.[10]

In the absence of surgical complications, unilateral arytenoid lateralization results in less respiratory distress, less respiratory noise, and improved exercise tolerance. Owner satisfaction with this procedure has been reported as excellent, with most owners believing that the quality of the dog's life was improved dramatically.[13,27]

FELINE LARYNGEAL PARALYSIS

Laryngeal disease is uncommon in cats, but significant respiratory stress can result. In a review of laryngeal diseases in cats, laryngeal paralysis constituted 40% of cases.[29] Clinical presentation is similar to dogs in that it occurs most often in middle-aged to older cats (mean 9–14 years) and both unilateral and bilateral conditions have been documented. Significant unilateral dysfunction has been reported in 10% to 57% of cases.[29–31] There is also a predominance of left-sided unilateral laryngeal paralysis in cats, which is similar to that reported in humans and horses. Clinical signs and physical examination findings resemble those found in dogs, with inspiratory respiratory difficulty, change in meow, gagging, and stridor found most commonly.

The specific cause of laryngeal paralysis in cats often remains undetermined. Several cases have been reported in association with trauma, neoplastic invasion,

and iatrogenic damage to the recurrent laryngeal nerve (eg, postthyroidectomy). Neoplastic infiltration of the larynx can lead to fixed laryngeal obstruction with both inspiratory and expiratory dyspnea and noise and should always be considered in the differential diagnosis of laryngeal paralysis in the cat. In addition to traditional laryngoscopy (direct or endoscopically), the use of echolaryngography has been described for diagnosis of laryngeal paralysis in cats.[29,32]

Conservative management of cats with laryngeal paralysis consists of weight loss and minimization of excitement and rigorous exercise. Reported survival times in 7 cats treated conservatively for laryngeal paralysis ranged from 120 to 2520 days with a median survival of 811 days.[29] Successful surgical treatment using primarily unilateral arytenoid lateralization has been described in several small studies with reported median survival time of approximately 150 days.[29–31]

LARYNGEAL COLLAPSE

Laryngeal collapse is a consequence of chronic upper airway obstruction, most often associated with brachycephalic airway syndrome. Brachycephalic airway syndrome refers to the condition of obstructive airway distress attributable to anatomic abnormalities of breeds such as English and French bulldogs, pugs, Boston terriers, and Cavalier King Charles spaniels. Chronic upper airway obstruction from the main components of brachycephalic airway syndrome (stenotic nares, elongated soft palate) causes increased airway resistance and increased negative intraglottic luminal pressure. Over time this results in laryngeal collapse because of cartilage fatigue and degeneration. However, early onset of laryngeal collapse has also been reported, with affected brachycephalic dogs ranging in age from 4.5 to 6 months.[33] Finally, laryngeal collapse can also be associated with laryngeal paralysis, nasal and nasopharyngeal obstruction, or trauma.

There are 3 stages of severity to laryngeal collapse. Stage 1 is the eversion of the laryngeal saccules into the glottis (Fig. 2). Increased inspiratory effort creates a vacuum causing the mucosa of the laryngeal saccules to prolapse. In most studies regarding brachycephalic airway syndrome, everted laryngeal saccules are present in 50% to 60% of affected dogs.[34–36] The saccules are pulled from their crypts

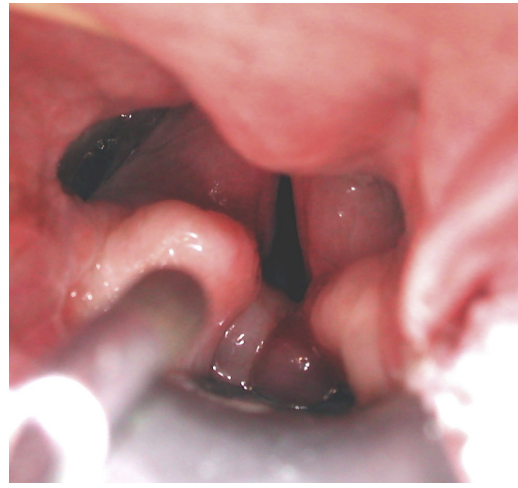

Fig. 2. Severely swollen and everted laryngeal saccules in a 6-year-old English bulldog.

because of the high negative pressure within the glottis. Once the saccules are everted, the tissue is exposed to highly turbulent airflow, resulting in edema and inflammation, which further obstructs the airway. During stage 2, the cuneiform processes of the arytenoid cartilages lose rigidity and collapse into the laryngeal lumen (Fig. 3). In addition, the aryepiglottic folds collapse ventromedially. The most advanced phase of laryngeal collapse is stage 3, in which the corniculate process of each arytenoid cartilage fatigues and then collapses toward midline, resulting in complete laryngeal collapse.

Diagnosis of laryngeal collapse requires oral laryngeal examination under heavy sedation or a light plane of general anesthesia without intubation. Functional, as well as structural, examination of the larynx should be performed. Recently, CT imaging with 3-dimensional internal rendering was used in 9 dogs with laryngeal collapse that had imaging performed in the absence of sedation or general anesthesia.[15] Findings consistent with laryngeal collapse included everted laryngeal saccules, collapse of the cuneiform processes and corniculate processes, and narrowed rima glottis.

The early stage of laryngeal collapse is still amenable to surgical treatment. Resection of the everted laryngeal saccules is relatively simple because each saccule is grasped with Allis tissue forceps and then sharply transected with Metzenbaum scissors. Options for treatment of advanced stages of laryngeal collapse are limited. Underlying components of brachycephalic airway syndrome should be addressed and degree of improvement should be assessed. Dogs with stage 2 and 3 laryngeal collapse have been shown to benefit markedly from removal of everted laryngeal saccules in addition to surgical correction of elongated soft palate and stenotic nares.[36] Unilateral arytenoid lateralization has recently been reported to have reasonable long-term outcome in dogs with laryngeal collapse, but this technique should be used with caution as the opposite cartilage can continue to collapse medially, leading to airway obstruction.[37] Permanent tracheostomy is the recommended treatment when dogs do not respond to other medical or surgical treatment, although many owners consider this an unacceptable option because of the high risk of complications and degree of maintenance required (Fig. 4).

LARYNGEAL MASSES

Neoplasia

Tumors of the larynx are uncommon in the dog and cat. Numerous types of tumor have been reported in the dog, including rhabdomyosarcoma (oncocytoma), squamous cell

Fig. 3. Moderate to severe (stage 2–3) laryngeal collapse.

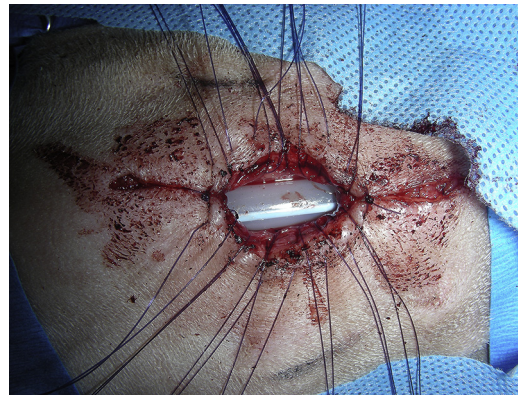

Fig. 4. Intraoperative view of a permanent tracheostomy.

carcinoma, adenocarcinoma, osteosarcoma, chondrosarcoma, fibrosarcoma, plasmacytoma, undifferentiated carcinoma, lipoma, and mast cell tumor. Squamous cell carcinoma and lymphoma are the most common tumors of the larynx in the cat, but adenocarcinoma and other poorly differentiated round cell tumors have also been reported.[29]

Small lesions can be resected by mucosal resection or partial laryngectomy through an oral approach or ventral laryngotomy. Aggressive surgical intervention involves complete laryngectomy with permanent tracheostomy but has been reported only in isolated cases. Radioresponsive tumors can be treated with radiation therapy. Otherwise most treatment is palliative, consisting of airflow bypass of the laryngeal area through a permanent tracheostomy.

Prognosis for laryngeal tumors is guarded because most cases are quite advanced at the time of diagnosis. There are only isolated reports of management of canine and feline laryngeal tumors. Treatment of 4 cats with laryngeal squamous cell carcinoma with tube tracheostomy alone resulted in a median survival of only 3 days; chemotherapeutic treatment of 5 cats with varying types of laryngeal masses resulted in a median survival of 141 days.[38] Two cats with laryngeal lymphoma were treated with chemotherapy resulting in survival times of 60 and 1440 days.[29] In this same study, one cat with laryngeal squamous cell carcinoma was treated with prednisolone and had a survival time of 180 days.

A recent study reported on the placement of permanent tracheostomies in 5 cats with laryngeal carcinoma.[39] Survival at home ranged from 2 to 281 days with 2 cats dying from tracheostomy site occlusion and 3 cats euthanized because of disease progression.

Benign Growths

Inflammatory laryngeal disease is an uncommon nonneoplastic condition of the arytenoid cartilages of the larynx that has been reported in both dogs and cats. It can be granulomatous, lymphocytic-plasmacytic, or eosinophilic in nature, with multiple factors likely contributing to the development of the disease. Severe cases can result in laryngeal stenosis and significant upper airway obstruction. Biopsy of the mass is crucial to differentiate this disease from neoplasia, although it is still possible that inflammatory changes can represent a secondary response to underlying neoplasia. Treatment of inflammatory laryngeal disease is palliative and consists of debulking

the mass, steroid therapy, or permanent tracheostomy. Permanent tracheostomy has been associated with a higher mortality in cats with inflammatory laryngeal disease than in cats undergoing permanent tracheostomy for any other reason.[40]

Benign laryngeal cysts also have been described in isolated cases.[41,42] Cysts are typically epithelial in origin and stem from the ventral aspect of the larynx. Surgical removal is usually curative.

SUMMARY

Diseases of the larynx can lead to life-threatening upper airway obstruction. Fundamental knowledge of laryngeal anatomy and use of appropriate sedation or anesthetic protocols are essential for thorough assessment of laryngeal structure and function. Prognosis is variable depending on the underlying cause.

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