Laryngeal paralysis in cats: 16 cases (1990–1999)

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Objective—To determine clinical signs, physical examination findings, radiographic features, and concurrent diseases in cats with laryngeal paralysis, as well as evaluate the outcome of medical or surgical management.

Design—Retrospective study.

Animals—16 cats.

Procedure—Medical records from January 1990 to April 1999 were examined for cats with laryngeal paralysis. Signalment, clinical signs, physical examination findings, cervical and thoracic radiographic findings, laryngeal examination results, and clinical outcome were reviewed.

Results—No breed or sex predilection was identified in 16 cats with laryngeal paralysis. The most common clinical signs included tachypnea or dyspnea, dysphagia, weight loss, change in vocalization, coughing, and lethargy. Clinical signs were evident for a median of 245 days. Airway obstruction was apparent on cervical and thoracic radiographic views in 9 cats. Examination of the larynx revealed bilateral laryngeal paralysis in 12 cats and unilateral laryngeal paralysis in 4 cats. The 4 cats with unilateral disease were managed with medical treatment, and 3 of these had acceptable long-term outcomes. Seven of 12 cats with bilateral paralysis underwent surgery; procedures performed included left arytenoid tie back, bilateral arytenoid tie back and ventriculocordectomy, and partial left arytenoidectomy. One cat was euthanatized as a result of complications from surgery.

Conclusions and Clinical Relevance—Laryngeal paralysis is an uncommon cause of airway obstruction in cats. Cats with less severe clinical signs (often with unilateral paralysis) may be successfully managed with medical treatment, whereas cats with severe airway obstruction (often with bilateral paralysis) may benefit from surgical intervention.(*J Am Vet Med Assoc* 2000;216:1100–1103)

Laryngeal paralysis results from impaired abduction of the arytenoid cartilage, which leads to narrowing of the glottic lumen.[1-5] Laryngeal paralysis is a well-documented cause of obstruction of the upper portion of the respiratory tract in horses, dogs, and humans.[1-9] There have been sporadic reports of laryngeal paralysis in cats,[1,10-15] but no studies have characterized the disorder in a large population of cats. Potential causes of this disorder in horses, dogs, and humans include idiopathic neurogenic atrophy of the intrinsic laryngeal muscles, trauma to the recurrent laryngeal nerve, intra- or extrathoracic masses interfering with the recurrent laryngeal nerve, neuromuscular disorders, hypothyroidism, and congenital causes.[1,2,4,7,9,16-25] The purpose of the study reported here was to characterize the signalment, clinical signs, physical examination findings, cervical and thoracic radiographic features, and concurrent diseases in cats with laryngeal paralysis and to evaluate the outcome of medical and surgical management.

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Criteria for Selection of Cases

Medical records were reviewed for all cats examined at the **Veterinary Medical Teaching Hospital, University of California, Davis (VMTH-UCD)** between January 1990 and April 1999 in which laryngeal paralysis was the clinical diagnosis. Cats were included in this study if a laryngeal examination had been performed to document laryngeal paralysis. For each cat, the following information was obtained from the medical record when available: signalment, body weight, clinical signs and duration of clinical signs, physical examination findings, cervical and thoracic radiographic features, medical treatment prior to referral, concurrent diseases, results of laryngeal examination, surgical technique if surgery was performed, and complications of surgery. Follow-up evaluation was performed by telephone conversations with referring veterinarians.

Results

Sixteen cats met the criteria for inclusion in the study. Breeds included domestic shorthair (n = 8), domestic longhair (3), Siamese (3), Abyssinian (1), and Balinese (1). Of these, 8 were males (1 was sexually intact) and 8 were spayed females. Median age was 11 years (range, 4 months to 17 years). Five cats were < 3 years old at the time of diagnosis, and 4 of these cats had clinical signs of airway obstruction from the time they were first obtained by their owners. Median weight was 3.9 kg (8.6 lb; range, 2.2 kg [4.8 lb] to 5.5 kg [12.1 lb]).

Clinical signs relating to the respiratory system, as reported by owners, included tachypnea or dyspnea (n = 16), change in vocalization (5), and coughing (4). Other clinical signs included dysphagia (n = 6), weight loss (6), anorexia (5), and lethargy (3). None of the cats had a history of regurgitation. Prior to evaluation, cats had clinical signs for a median of 245 days (range, 2 days to 8 years). On physical examination, 15 cats were tachypneic or dyspneic, with varying degrees of inspiratory stridor. Mild hyperthermia was recorded in only 1 cat (rectal temperature, 39.2 C [102.6 F]). Median respiratory rate was 48 breaths/min (range, 18 to 90 breaths/min). One cat had cranial nerve deficits on neurologic examination, and 1 cat had a tracheostomy tube in place from the referring veterinarian. Eight cats were treated medically, with corticosteroids (n = 6), bronchodilators (3), antibiotics (3), and furosemide (1), before evaluation at the VMTH-

UCD. No improvement in clinical signs was observed with these treatments in any of the 8 cats.

Cervical and thoracic radiographs were obtained in 15 cats, and most commonly, radiographs revealed airway obstruction (n = 9). Radiographic evidence of airway obstruction included hyperinflation of the lungs, prominent caudal displacement of the larynx, and air in the pharynx, larynx, esophagus, and stomach. Other radiographic findings included increased soft-tissue density in the region of the larynx (n = 2), cardiomegaly (2), megaesophagus (2), aspiration pneumonia (1), pleural effusion (1), mild bronchointerstitial pattern with prominent pulmonary vessels (1), pulmonary nodules (1), and sternal and rib fractures (1).

Concurrent diseases were identified in 7 cats and included cardiac disease (n = 3), megaesophagus (2), renal insufficiency (2), rhinitis (2), aspiration pneumonia (1), inflammatory bowel disease (1), feline immunodeficiency virus infection (1), seizures (1), pulmonary nodules (1), spinal deformity (1), hyperthyroidism (1), and laryngeal neoplasia (1). Onset of laryngeal paralysis was associated with trauma in 1 cat and with unilateral left thyroidectomy in 1 cat. Acetylcholinesterase antibody titers were measured in 4 cats, including the 2 cats with megaesophagus, and all titers were negative. One cat with dysphagia had a normal esophagram as evidenced by fluoroscopy.

Laryngeal examination revealed unilateral left-sided paralysis in 4 of 16 (25%) cats and bilateral laryngeal paralysis in 12 of 16 (75%) cats. Cats with unilateral laryngeal paralysis were not treated surgically. Conservative medical management, including moving cats to an indoor environment, avoidance of excitement, and exercise restriction, was recommended for the 4 cats with unilateral paralysis. Three of these cats did not have signs of considerable (ie, life-threatening) respiratory compromise and were perceived by their owners as clinically stable, with no progression of signs of respiratory dysfunction; 2 of the 3 cats died from unrelated causes, and 1 cat is still alive. The fourth cat did not have progression of signs of respiratory dysfunction, but was euthanatized because of severe dysphagia 2 weeks after being evaluated at the VMTH-UCD.

Of the 12 cats with bilateral laryngeal paralysis, surgery was not performed in 5 cats because of concurrent dysphagia or megaesophagus (n = 2), laryngeal squamous cell carcinoma, which was diagnosed at the time of laryngeal examination (1), mild clinical signs (1), and financial constraints of the owner (1). Subjectively, it was believed that 4 of these cats had milder clinical signs than cats that were treated surgically, and their outcomes varied. Of these cats, 1 had minimal clinical signs until it died from a mesothelioma 6 years after diagnosis; 2 were alive, with no progression of clinical signs 4 and 24 months after diagnosis; and 1 cat was lost to follow-up. The fifth cat had severe clinical signs and was euthanatized at the time of diagnosis.

Seven cats with bilateral laryngeal paralysis underwent surgery. Surgical correction was performed on the left side only in 5 cats and bilaterally in 2 cats. Surgical techniques included left arytenoid tie back (n = 4), bilateral arytenoid tie back and ventriculocordectomy (2), and partial left arytenoidectomy (1). Two cats had complications following surgery, including transient Horners syndrome and change in vocalization (n = 1) and severe obstructive laryngeal stenosis that developed 3 days after partial left arytenoidectomy was performed (1). Clinical signs of aspiration pneumonia were not evident in any cats following surgery.

Of the 7 cats that had surgery, 1 was euthanatized because of laryngeal stenosis 3 days after surgery, 1 cat died 3 days after surgery from complications caused by a gastrotomy tube, and 1 was lost to follow-up. The remaining 4 cats had successful long-term outcomes and remained asymptomatic 18 to 60 months after surgery, although 2 of these cats required additional surgery 4 and 12 months after the first surgical procedure failed. Both of these cats initially had a bilateral tie back and ventriculocordectomy performed; the second surgery included a bilateral arytenoidectomy in 1 cat and a left-sided laryngoplasty in the other cat.

Discussion

Laryngeal paralysis is a common cause of airway obstruction in middle-aged, large-breed dogs,[1-6,8,16,18,23,24] but has only been sporadically reported in cats.[1,10-15] Laryngeal paralysis can be congenital or acquired. The congenital form has been described in Dalmations, Rottweilers, Siberian Huskies, and Bouvier des Flandres; onset of clinical signs ranges from 6 weeks to 3 years of age.[21,24-26] It has been reported that the congenital form accounts for 21 to 30% of all instances of laryngeal paralysis in dogs.[3,27] Acquired laryngeal paralysis usually involves damage to the recurrent laryngeal nerve that supplies the cricoarytenoideus dorsalis muscle, which abducts the arytenoid cartilage.[1] Suggested causes of acquired laryngeal paralysis in dogs include trauma, neoplasia, hypothyroidism, intra- or extrathoracic masses, neuromuscular diseases, and idiopathic.[3-5,7,18,23,24] Trauma is one of the most common causes of laryngeal paralysis in humans,[18] but is less commonly documented in dogs because of the more protective anatomy of the neck in dogs.[4] Hypothyroidism has been proposed as a cause of laryngeal paralysis in dogs, although this is still controversial.[17,18,20] Masses interfering with the function of the recurrent laryngeal nerve can cause laryngeal paralysis in humans and dogs.[9,10] Idiopathic laryngeal paralysis is the most common form in dogs, although it is possible that many cases of presumptive idiopathic laryngeal paralysis are actually a part of a more generalized polyneuropathy.[17] Laryngeal paralysis is deemed idiopathic in 30% of cases in humans, and has been reported to be idiopathic in up to 89% of dogs.[6,9,10]

The etiopathogenesis of laryngeal paralysis in cats is unknown, although it is believed that cats also have congenital and acquired forms of this disorder. Laryngeal paralysis has been observed in kittens and young cats (< 2 years old), and the cause has been hypothesized to be congenital.[10,12,14] Acquired causes include infiltration of the vagus nerve by lymphoma in 1 cat,[11] secondary to thyroidectomy,[28] and as a part of a presumptive generalized neuromuscular disorder in 2 cats with progressive weakness.[12] An additional report suggested lead toxicosis as a cause of megaesophagus

and laryngeal paralysis in 1 cat, but a laryngeal examination was not performed.[29]

Cats with laryngeal paralysis have many of the same clinical signs as dogs, including dyspnea, inspiratory stridor, coughing, and change in vocalization.[1,6,10-14,18] It is interesting that only 1 cat in the study reported here was hyperthermic. This is in notable contrast to dogs, in which hyperthermia is a common, potentially life-threatening complication of laryngeal paralysis.[2,3] Airway obstruction from failure of arytenoid cartilage abduction during inspiration can be exacerbated by labored respiration, exercise, or excitement, inducing laryngeal edema and inflammation.[2,16] Laryngeal paralysis may interfere with the normal function of the glottis, predisposing the animal to aspiration pneumonia. Aspiration pneumonia may also be caused by a more generalized neuromuscular disorder affecting the intrinsic laryngeal muscles.[6,27] It has been reported that cats with laryngeal paralysis may initially be evaluated for signs of pneumonia[12,13]; this was also documented in 1 cat in the present study.

Because laryngeal paralysis is a functional condition, radiography is not considered useful in the definitive diagnosis of this disorder, but it is recommended that radiographs be obtained to rule out other causes of dyspnea.[2,5,16] Radiographic abnormalities in dogs with laryngeal paralysis may include increased soft-tissue density in the region of the larynx, megaesophagus, and pneumonia.[5,16-18,26] It is often reported that radiographic findings are normal in cats with laryngeal paralysis,[10,11,14] although abnormalities consistent with airway obstruction have been described.[12] In our study, radiography was useful to rule out other causes of airway obstruction, particularly tracheal collapse or rupture, tracheal foreign body, and tracheal masses (abscess, granuloma, or neoplasia).[30,31] In 1 cat in our study, cervical radiographs revealed increased soft-tissue density in the area of the larynx; laryngoscopy was performed, and laryngeal neoplasia was diagnosed. In another cat, cervical radiographs revealed evidence of a laryngeal mass, which was not detected at the time of laryngeal examination; this has also been reported in dogs, and is presumptively caused by laryngeal edema secondary to airway obstruction.[18] Megaesophagus was detected radiographically in 2 of the cats reported here, 1 of which had evidence of aspiration pneumonia at that time. In dogs, laryngeal paralysis and megaesophagus may be observed concurrently as part of a more generalized polyneuropathy.[16-18,20,21,26] To the authors' knowledge, megaesophagus in conjunction with laryngeal paralysis (confirmed by laryngeal examination) has not been reported in cats.[1,10-15,29]

Laryngeal paralysis is not typically diagnosed in most dogs until the condition is bilateral, because dogs with unilateral laryngeal paralysis are rarely symptomatic.[4,8,10,24,27] In humans, dogs, and horses, it is reported that the left side is more commonly affected than the right side, most likely because of the longer course of the left recurrent laryngeal nerve and the fact that it has fewer nerve fibers than the right recurrent laryngeal nerve.[9,10,19,22] In the study reported here, laryngeal examination revealed bilateral laryngeal paralysis in 75% of cats. In other studies, it has been documented that cats with clinical signs of airway obstruction have unilateral and bilateral laryngeal paralysis.[1,10-15] To the authors' knowledge, there has been only one report of a cat with unilateral right-sided laryngeal paralysis, which was attributed to infiltrative neoplasia.[11] All of the cats with unilateral disease in our study had left-sided laryngeal paralysis.

Surgery was not performed in any of the 4 cats with unilateral disease. Three of these cats had acceptable clinical outcomes with conservative medical management. The fourth cat was euthanatized because of severe dysphagia that developed 2 weeks after initial evaluation. Unilateral laryngeal paralysis has been associated with severe dyspnea in cats,[10,11,13] and surgery resulted in resolution of clinical signs in 1 cat.[10] Results of the present study suggest that surgery may not be indicated for all cats with unilateral laryngeal paralysis, and if performed, should be based on severity of clinical signs.

In comparison with conservative medical management, which may be successfully used for unilateral laryngeal paralysis, surgery is the treatment of choice for bilateral laryngeal paralysis that causes severe airway obstruction.[1-3,5,8,10,12,16,18,32] Many surgical techniques have been described in small animals, including partial laryngectomy, ventriculocordectomy, arytenoidectomy, castellated laryngofissure, and arytenoid tie back.[1,2,5-8,12,14,16] Success rates for resolution of airway obstruction for the various surgical techniques vary from 65 to 100%, although not all studies reported long-term outcome.[1,2,6,8,16,32] Complication rates range from 10 to 58%, depending on the study and the procedure performed.[3,5-7] Commonly observed surgical complications include coughing and gagging, dysphagia and subsequent aspiration, stricture formation, change in vocalization or complete loss of vocalization, and breakdown of the surgical repair.[2,3,5-7,27] Aspiration, which is associated with laryngeal paralysis by itself and as a complication of surgery, is the most common cause of death after surgery in dogs.[1,2,16] Partial arytenoidectomy by an oral approach is believed by some to have an unacceptably high complication rate, particularly in small dogs.[5,7,32,33]

To the authors' knowledge, 5 other reports of cats undergoing surgical repair for laryngeal paralysis have been published, for a total of 11 cases.[1,10-15] Surgical techniques performed included arytenoid tie back, partial arytenoidectomy by oral approach, and castellated laryngofissure. All were reported to be successful, with survival times ranging from 4 to 26 months. Complications reported were breakdown of surgical repair in 2 cats (1 that had a castellated laryngofissure performed and 1 that had a partial laryngectomy) and coughing in the former cat. Recurrence of clinical signs in these 2 cats necessitated a second surgical procedure.[10,14] Aspiration pneumonia has not been reported as a postoperative complication in cats.[1,10,12,14] In the present study, surgery was performed in 7 cats with bilateral laryngeal paralysis, and the only notable complication observed was laryngeal stenosis in a kitten that underwent partial laryngectomy. The remaining cats did well perioperatively, with 1 cat that developed

transient Horners syndrome and change in vocalization (this cat was still alive and doing well 48 months after surgery). Two cats ultimately had breakdown of the initial surgical repair 2 to 12 months later and required a second surgery.

Laryngeal paralysis should be considered as a differential diagnosis in any cat with clinical signs of tachypnea, dyspnea, inspiratory stridor, change in vocalization, dysphagia, or coughing.[10-14] The cats in this study did not undergo an extensive neurologic evaluation, and further studies evaluating cats with laryngeal paralysis for more generalized neuromuscular disorders by measuring acetylcholinesterase antibody titers or performing nerve and muscle biopsies, electromyography, and nerve conduction velocities are warranted.

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