





## CASE REPORT

# Gastroesophageal intussusception and extreme esophageal dilatation secondary to bilateral laryngeal paralysis in a cat

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## Abstract

Gastroesophageal intussusception, extreme esophageal dilatation, and laryngeal paralysis are individually rare clinical entities in cats and the simultaneous occurrence in a single animal has not been described. We describe these 3 conditions occurring concurrently in a geriatric cat, and resolution of the cat's clinical signs after treatment with unilateral arytenoid lateralization. This finding supports the need for thorough history taking and examination in cats with extreme esophageal dilatation to determine if upper respiratory tract abnormalities are present, as appropriate treatment might resolve the esophageal dilatation.

## KEYWORDS

esophageal, feline, hiatal hernia, upper respiratory tract obstruction

## 1 | INTRODUCTION

Extreme dilatation of the esophagus might result from severe aerophagia, or might represent megaesophagus, which can present as segmental diffuse esophageal dilatation on thoracic imaging. Megaesophagus in cats is an uncommon clinical presentation and can be idiopathic, congenital, or associated with dysautonomia, persistent right aortic arch, lead toxicosis, focal myasthenia gravis with or without a cranial mediastinal mass, esophageal stricture, esophagitis or upper respiratory tract obstructive disease, such as nasopharyngeal stenosis and polyps.<sup>1-8</sup> Information regarding prognosis in cats is lacking. In dogs, megaesophagus is associated with a variable prognosis with treatment being largely centered around management and prevention of secondary consequences instead of curative treatment, with the exception of myasthenia gravis, which has a 50% response rate to treatment.<sup>9,10</sup>

Laryngeal paralysis is also an uncommon clinical finding in cats and can be idiopathic, congenital, or secondary to trauma, neoplasia or iatrogenic (eg, post-thyroidectomy).<sup>11-14</sup> Bilateral laryngeal paralysis is more common than unilateral, with unilateral being amenable to medical management with weight loss and exercise restriction in some

cases.<sup>11</sup> Bilateral laryngeal paralysis can lead to respiratory obstruction, and surgical correction with unilateral arytenoid lateralization might be necessary, with good responses to surgery described.<sup>11,15</sup>

Gastroesophageal intussusception is infrequently described in animals, with the majority of reports in dogs and a small number of single case reports of the disease in cats.<sup>16-18</sup> Acute gastroesophageal intussusception might present with life-threatening clinical signs requiring immediate surgical intervention, and can be fatal in some cases; however, prompt surgical treatment can result in good outcomes.<sup>16</sup> There are also rare case reports of chronic, intermittent gastroesophageal intussusception in dogs and cats, with good response to treatment with surgical gastropexy.<sup>17,18</sup>

As separate entities, laryngeal paralysis, megaesophagus, and gastroesophageal intussusception are uncommon and, in the case of gastroesophageal intussusception, rare clinical presentations in cats.<sup>1-8,11,18</sup> This case report describes a geriatric cat with extreme esophageal dilatation and gastroesophageal intussusception presumed to be secondary to airway obstruction due to bilateral laryngeal paralysis, and resolution of the esophageal dilatation and clinical signs after surgical correction with unilateral arytenoid lateralization.

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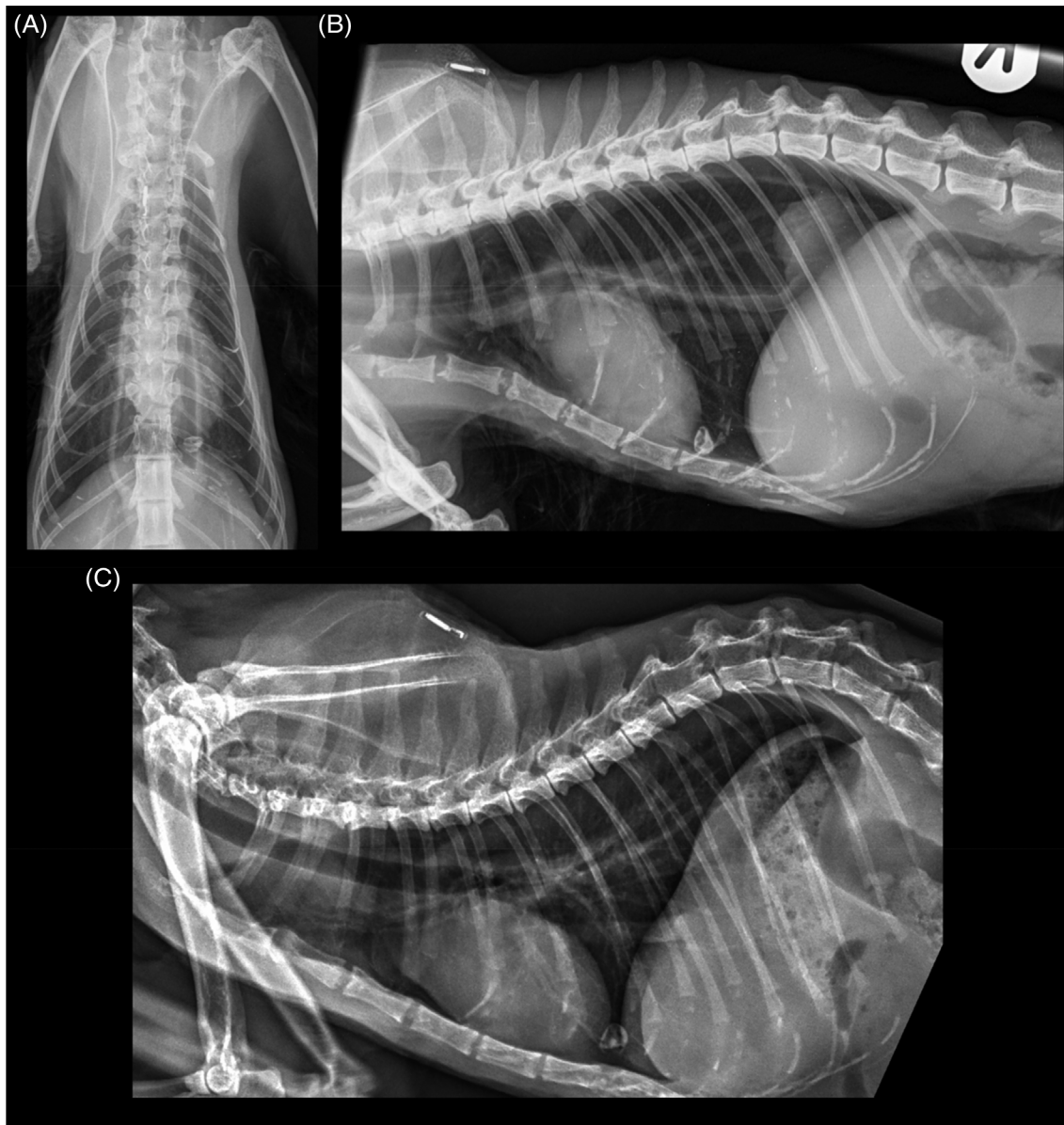
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## 2 | CASE HISTORY, CLINICAL FINDINGS, AND OUTCOME

A 14-year-old female neutered Domestic Shorthair was presented with a 12-month history of vomiting and weight loss, and 3-week history of regurgitation and progressive dyspnoea. The cat had a long-term history of hyperthyroidism, which was well controlled on thiamazole (Thyronorm, 2.6 mg/kg PO once daily), with serum total thyroxine concentration the month before presentation of 25.4 nmol/L (reference interval = 19-50). For 3 weeks, the owner had been feeding blended chicken; however, in the 3 days before presentation the cat was unable to eat without regurgitating.

The cat underwent sedation with butorphanol, midazolam, and alfaxalone for thoracic radiographs and became progressively dyspnoeic during this procedure. Thoracic radiographs obtained at that time showed generalized gas dilatation of the esophagus of up to 35 mm diameter. In the caudal thoracic esophagus, there was a region of homogeneous soft tissue opacity with a well-defined curved margin cranially, and absence of the normal gastric luminal gas in the cranial abdomen, consistent with a gastroesophageal intussusception (Figure 1A,B). The cat was subsequently referred to a teaching referral hospital for further investigations and treatment.

Radiographs taken of the unsedated cat on admission revealed resolution of the gastroesophageal intussusception; however, there



**FIGURE 1** Dorsoventral (A) and right lateral (B) thoracic radiographs obtained on initial presentation at the primary care practice. There is generalized gas dilatation of the esophagus with a sharp, curved gas-soft tissue interface caudally, characteristic of a gastroesophageal intussusception. Left lateral (C) thoracic radiograph obtained 48 hours after arytenoid lateralization surgery. There is esophageal dilatation and the stomach is normally positioned in the cranial abdomen

was a persistent extreme esophageal dilatation. There was no radiographic evidence of aspiration pneumonia. Both sets of radiographs were reviewed by a veterinary diagnostic imaging specialist in training and supervising diplomate in veterinary diagnostic imaging. The cat was in poor body condition (body condition score 2 out of 9) with generalized moderate muscle atrophy, and had moderate inspiratory and expiratory respiratory effort. The cat was purring; however, there was noticeable inspiratory stridor with abdominal effort to her breathing. She was provided with supplemental oxygen via an oxygen cage, which did not result in a change to her breathing pattern. Neurological examination did not reveal abnormalities. The cat's heart rate was 180 beats/min, respiratory rate was 24 breaths/min, and rectal temperature was 38.6°C.

Hematology revealed a mild lymphopenia ( $1.44 \times 10^9/L$ ; reference interval = 1.5-7.0) and biochemistry revealed a mildly increased urea (10.6 mmol/L; reference interval = 2.5-9.9), mildly increased alanine aminotransferase activity (110.4 U/L, reference interval = 5-60), and moderately increased creatine kinase activity (9569 U/L; reference interval = 57-574). Repeat measurement of creatine kinase activity 4 days later revealed a resolution of this variable (272 U/L; reference interval = 57-574). Serum cobalamin was 230 ng/L (reference interval > 200).

Abdominal ultrasound revealed a large amount of gas throughout the gastrointestinal tract, limiting the examination. There was diffuse thickening of the muscularis layer throughout the small intestine, most marked at the ileum. In the liver, a single, focal anechoic cystic lesion was present, and a moderate amount of nonshadowing echogenic, gravity-dependent material was present in the gallbladder. There was a possible hypoechoic mural lesion at the cardia of the stomach; however, full interrogation of this area was limited by the presence of luminal gas. The distal esophagus was dilated and fluid-filled.

General anesthesia was performed for an airway examination and advanced imaging. The cat was premedicated with midazolam (0.2 mg/kg IV) and methadone (0.2 mg/kg IV). Anesthesia was induced with alfaxalone to effect, with a light plane of anesthesia for examination of laryngeal movement. On laryngeal examination at inspiration, there was bilateral complete paralysis of the arytenoid cartilages, with no gap and complete contact between the cartilages at rest. Computed tomography of the head, neck, and thorax (Canon Aquilion ONE Genesis Edition, Canon Medical Systems Ltd, UK) was performed before and after IV administration of 600 mg/kg iohexol. This revealed generalized esophageal dilatation with mild, diffuse thickening of the esophageal wall and slight cranial displacement of the gastroesophageal junction to the level of the diaphragmatic esophageal hiatus. There was a homogeneous, poorly contrast-enhancing 1 cm nodule in the left thyroid gland. In the ventral aspects of the left cranial lung lobe, there was a slight reduction in lung volume and the presence of multifocal regions of parenchymal bands and ground-glass attenuation, consistent with pulmonary atelectasis. Within the caudal mediastinal reflection, there was a mineralized body, likely representing a region of fat necrosis (Bates body).

A left-sided unilateral arytenoid lateralization was performed. The cat was positioned in right lateral recumbency with a small

sandbag placed under its neck. The skin incision was centered over the thyroid cartilage and was followed by careful dissection of both the subcutaneous tissue and the platysma muscle using a combination of blunt and sharp dissection. The left external jugular vein was identified and retracted with the aid of a blunt tipped Gelpi self-retaining retractor. The dorsal border of the thyroid cartilage was palpated and the overlying thyropharyngeus muscle was sharply transected along its dorsocaudal aspect. A stay suture using 4-0 polypropylene was placed in the left lamina of the thyroid cartilage to facilitate surgical retraction. The cricothyroid joint was not disarticulated. The cricoarytenoideus dorsalis muscle was isolated using a curved mosquito hemostatic forcep before sharp transection using a bipolar electrosurgery device. The muscular process of the arytenoid cartilage was subsequently identified and the caudal aspect of the cricoarytenoid joint was disarticulated by blunt stretching with a curved iris scissor. After this, a single cricoarytenoid suture was placed using 4-0 polypropylene suture material. This suture was passed from the dorsocaudal aspect of the cricoid cartilage followed by the articular surface of the muscular process before completion of the ligature. The thyropharyngeus muscle was opposed with a simple continuous pattern using 4-0 poliglecaprone 25 followed by routine tissue closure.

On recovery, there was an immediate improvement in the cat's breathing pattern. She was fed a commercial therapeutic hypoallergenic diet (Purina ProPlan Veterinary Diets Feline HA dry food) because of her chronic history of vomiting and weight loss that preceded the history of regurgitation, with no further episodes of vomiting or regurgitation noted. Thoracic radiographs obtained 48 hours after surgery revealed resolution of the esophageal dilatation and no evidence of gastroesophageal intussusception (Figure 1C). The cat was discharged with no medication other than thiamazole and the hydrolyzed diet.

On re-examination 2 weeks later, the owner reported the cat to have an excellent appetite, with no vomiting or regurgitation. The cat had gained 700 g since discharge from hospital. Further laboratory testing was performed to investigate the perceived polyphagia. Repeat serum cobalamin had increased (302 ng/L, reference interval > 200) and repeat serum total thyroxine concentration was <5.1 nmol/L. Trypsin like immunoreactivity was measured and was within normal limits (28.4 µg/L; reference interval = 12.1-82).

### 3 | DISCUSSION

This is a case report of bilateral laryngeal paralysis in a cat resulting in extreme esophageal dilatation and gastroesophageal intussusception, with resolution of clinical signs after unilateral arytenoid lateralization.

We speculated that the massive aerophagia secondary to the laryngeal paralysis resulted in gas distension of the esophagus and resultant extreme esophageal dilatation. The increased negative intrathoracic pressure as the cat inhaled against a closed larynx is likely to have led to the gastroesophageal intussusception, with a previous study documenting an association between airway obstruction in

brachycephalic cats with hiatal herniation.<sup>19</sup> Resolution of the airway obstruction resulted in normalization of the intrathoracic pressure and aerophagia, resulting in rapid resolution of the secondary problems. Thoracic radiographs performed 48 hours after surgery documented complete resolution of the esophageal dilatation, indicating that the pressure change after surgery had an immediate and profound effect.

Megaesophagus occurs in conjunction with upper respiratory tract obstructive disease in cats.<sup>3,4,20</sup> All affected cats with surgical treatment of their upper airway obstruction have resolution of megaesophagus after surgery. Not all cats with laryngeal paralysis and concurrent megaesophagus undergo surgical treatment of their laryngeal paralysis.<sup>15</sup> Laryngeal paralysis can occur in conjunction with megaesophagus in dogs as part of a generalized degenerative polyneuropathy.<sup>21</sup> The 2 conditions can occur concurrently in cats suggesting that a similar condition to that seen in dogs could occur in cats.<sup>15</sup> However, based on the findings from this case, we feel a polyneuropathy was unlikely, and the 2 conditions are linked by the changes in intrathoracic pressure.

There has been 1 previous case report of chronic, intermittent gastroesophageal intussusception in a cat that was treated surgically with an incisional gastropexy.<sup>16</sup> Gastroesophageal intussusception in cats is uncommon, and might result in euthanasia due to severe clinical signs or lack of response to treatment.<sup>22</sup> Gastroesophageal intussusception is more common, yet still rare, in dogs and is most commonly seen in young German Shepherd dogs.<sup>23,24</sup> These dogs often present with severe, life threatening clinical signs and require immediate surgical intervention for successful treatment. Chronic, intermittent gastroesophageal intussusception occurs in dogs but is less common than the acute presentation.<sup>17</sup>

Other differential diagnoses for concurrent laryngeal paralysis and extreme esophageal dilatation were considered for this case. Methimazole causes myasthenia gravis in both cats and humans.<sup>25,26</sup> Myasthenia gravis was considered as a differential diagnosis in this cat; however given the rapid resolution of the esophageal dilatation after surgery, further testing was not performed. Full neurological examination was also performed, and the cat was considered neurologically normal; however, this does not rule out a focal myasthenia gravis which occurs in cats.<sup>1</sup> The chronology of the clinical signs also made thiamazole an unlikely cause, as the cat had been receiving this medication for 18 months before presentation without clinical concerns. The cat initially presented with a moderately increased serum creatine kinase activity, therefore a polymyositis was considered. However, after normalization of this variable despite no interventions being performed before repeat sampling, it was considered unlikely. Hypothyroidism was ruled out based on a normal serum total T4 1 week before presentation, and atypical hypoadrenocorticism was considered unlikely, as this has not been reported to cause megaesophagus in cats.

The cat was fed a commercial therapeutic hydrolyzed diet trial, with resolution of its chronic vomiting and weight loss. Although the laryngeal paralysis was thought to be the main driving factor for the development of megaesophagus in this case, it is possible that a chronic food responsive enteropathy and gastroesophageal reflux were contributing to the clinical signs. Thickening of the esophagus

was noted on thoracic computed tomography, which could be consistent with chronic gastroesophageal reflux causing esophagitis. Esophagitis resulted in megaesophagus in a cat with diaphragmatic rupture, again supporting its possible contribution to the clinical signs and esophageal changes in this cat.<sup>7</sup>

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#### CONFLICT OF INTEREST DECLARATION

Authors declare no conflict of interest.

#### OFF-LABEL ANTIMICROBIAL DECLARATION

Authors declare no off-label use of antimicrobials.

#### INSTITUTIONAL ANIMAL CARE AND USE COMMITTEE (IACUC) OR OTHER APPROVAL DECLARATION

Authors declare no IACUC or other approval was needed.

#### HUMAN ETHICS APPROVAL DECLARATION

Authors declare human ethics approval was not needed for this study.

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