

## Subepiglottic cyst with aspiration pneumonia in a Japanese Black calf

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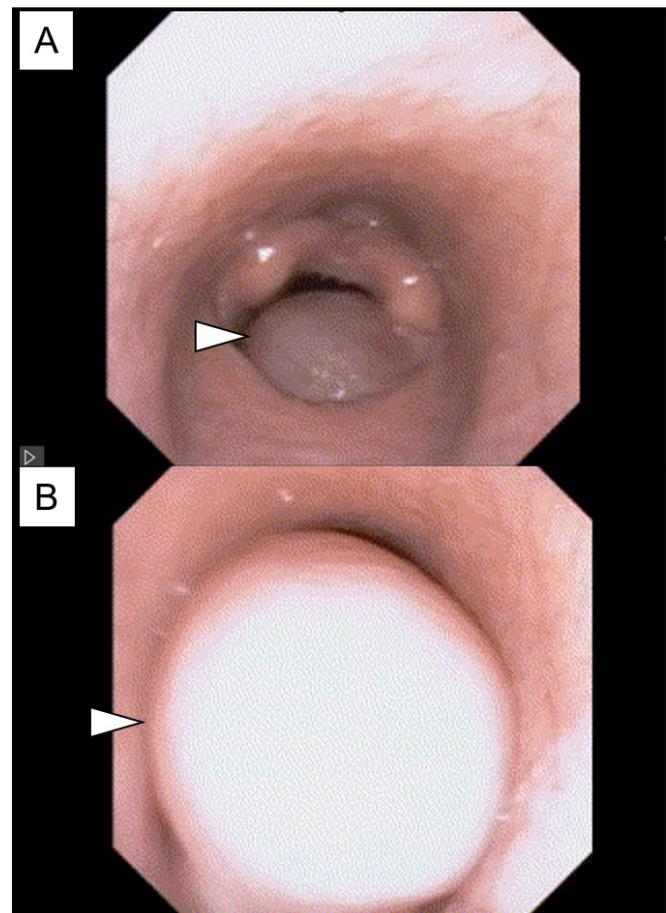
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**ABSTRACT.** A four-month-old Japanese Black calf with stridor was diagnosed with a subepiglottic cyst and aspiration pneumonia. Despite treatment, the calf died 17 days after hospital admission. The present case suggests a link between the presence of the subepiglottic cyst and the development of aspiration pneumonia.

**Keywords:** aspiration pneumonia, calf, endoscopy, subepiglottic cyst.

Subepiglottic cysts have been reported as a cause of upper airway obstruction (Koch & Tate, 1978), and numerous cases of subepiglottic cysts in horses have been documented with established diagnostic and therapeutic procedures in horses (Tulleners, 1991; Hobo *et al.*, 1994; Dougherty & Palmer, 2008; Salz *et al.*, 2013). Conversely, a few subepiglottic cysts have been reported in cattle (Mattoon *et al.*, 1991; Kirmizigül *et al.*, 2008; Yoneshige *et al.*, 2022), with no complications beyond wheezing, respiratory noise, or dyspnea. Consequently, the significance of diagnosing and treating subglottic cysts in cattle and their prognosis remains inadequately addressed. Herein, the authors describe a case of a subepiglottic cyst with aspiration pneumonia in a Japanese Black calf.

A four-month-old Japanese Black male calf (107 kg), initially diagnosed with stridor by a local veterinarian, was presented to the Animal Hospital for Large Animals at Kitasato University. The calf was treated with a mixture of penicillin (10,000 IU/kg) and streptomycin (12.5 mg/kg) (Meiji Seika Pharma Co., Ltd., Japan) and dexamethasone (5 mg/head) (ZENOAQ, Japan) for one week prior to hospitalization, but the stridor persisted, and the general condition deteriorated. Upon examination, the calf exhibited anorexia, dysphagia, pulmonic murmur, and wheezing sounds. Ultrasonography (MyLabOne VET; Esaote Europe B.V., Netherlands) revealed pulmonary consolidations in the right third and fourth intercostal spaces. An endoscopic examination (endoscope VQ5112B; Olympus Corporation, Japan) through the nasal cavity, revealed a cyst-like structure on the subepiglottis (Figure 1) that, obstructed the trachea on inspiration (Figure 1A), and was pushed outwards by the closed epiglottis while breathing and obstructed the airway on exhalation (Figure 1B). Subsequently, bronchoalveolar lavage was performed, and the fluid was subjected to bacterial culture by outsourcing to a company (Meiji Seika Pharma Co.,



**Figure 1.** Subepiglottic cyst observed by endoscopy. A: on inspiration, a cyst-like structure in the subglottis obstructs the trachea; B: on exhalation, the cyst-like structure appears large in the foreground, pushed outwards by the closed epiglottis. Arrowhead: the cyst-like structure.

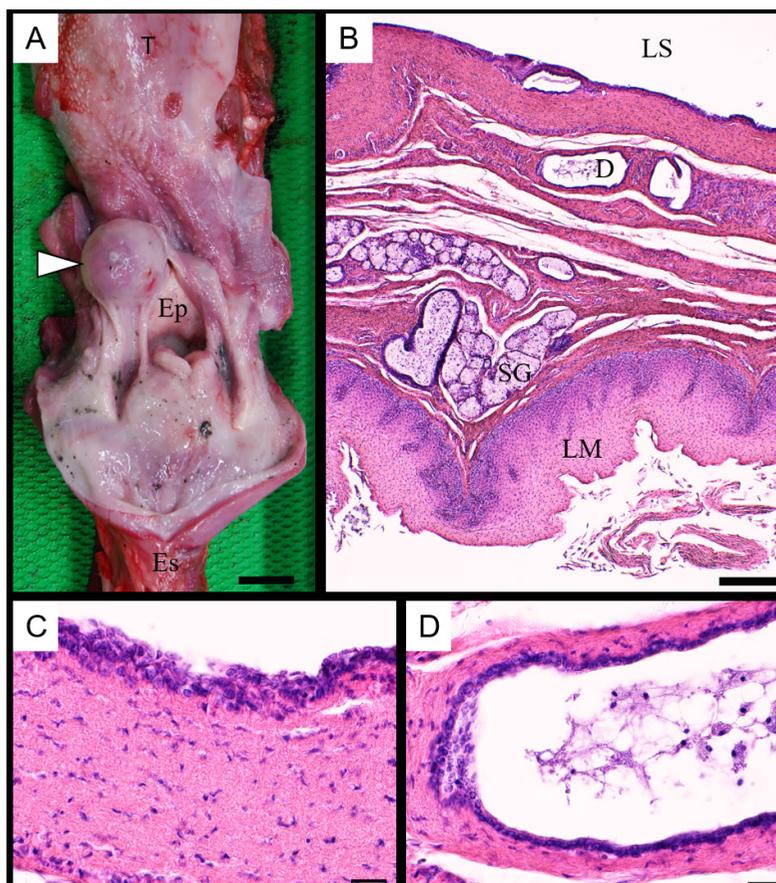
Ltd., Japan), isolating *Truperella pyogenes*. Drug susceptibility testing showed that isolates were susceptible to penicillin, ampicillin, cefazolin, ceftiofur, tylosin, doxorubicin, tiamulin, tianfenicol, florfenicol, enrofloxacin, norfloxacin, and marbofloxacin.

Based on the results of clinical examinations, the case was diagnosed as laryngitis and pneumonia with the cyst. The treatment was then started with dexamethasone (2 mg/day) and marbofloxacin (2 mg/kg, Marbocyl; Meiji Animal Health, Japan), and a mixture of procaterol (1 mL, MEPTIN Inhalation Solution 0.01%; Otsuka Pharmaceutical Co., Ltd., Japan), acetylcysteine (1 mL, Mucofilin 20% Inhalant Solution; Eisai Co., Ltd., Japan), and tyloxapol (2 mL, Arevel; Alfresa Pharma Corporation, Japan) in 3 mL of physiological saline for inhalation via nebulizer. Although the wheezing decreased with treatment, the pneumonia signs progressed, and the patient died 17 days after admission.

Necropsy revealed a 3 cm diameter subepiglottic cyst with a grayish-white spot (approximately 3 mm in diameter)

on the top of the cyst white-beige spot (Figure 2A). The cyst was filled and taut. The thin cyst wall (approximately 1 mm thick) adjacent to laryngopharyngeal mucosa (Figure 2B), contained a cloudy aqueous solution (approximately 14 mL). The epithelium lining the cyst (Figure 2C) was histologically similar to submucosal gland ductular epithelium (Figure 2D). The cloudy fluid collection within the cyst was aseptically collected using a sterilized needle and a 10 mL syringe for bacterial culture, and *T. pyogenes* was isolated, likewise the procedure for the bronchoalveolar lavage fluid collected on the first day of hospitalization. Aspiration pneumonia was also observed in the anterior lobe of the right lung, with plant materials suggesting aspiration of feed, foreign body multinucleated giant cells, bacterial colonies, and fibrosuppurative bronchopneumonia (Figure 3).

In the present case, the subepiglottic cyst was likely originated from the dilation of submucosal gland duct, as the histological features matched those of submucosal gland ductular epithelium without villi. Similar histological char-



**Figure 2.**

Subepiglottic cyst. A: the cyst is observed under the epiglottis (bar = 2 cm); B: cyst wall adjacent to the mucosal lining (bar = 250  $\mu$ m); C: epithelium lining the cyst (bar = 25  $\mu$ m); D: submucosal glandular duct: the cyst epithelium resembles the ductular epithelium of the submucosal glands (bar = 25  $\mu$ m).

Arrowhead: cyst; D: duct of salivary gland; Ep: epiglottis; Es: esophagus; LS: luminal surface of the cyst; LM: laryngopharyngeal mucosa; SG: salivary gland; T: tongue.

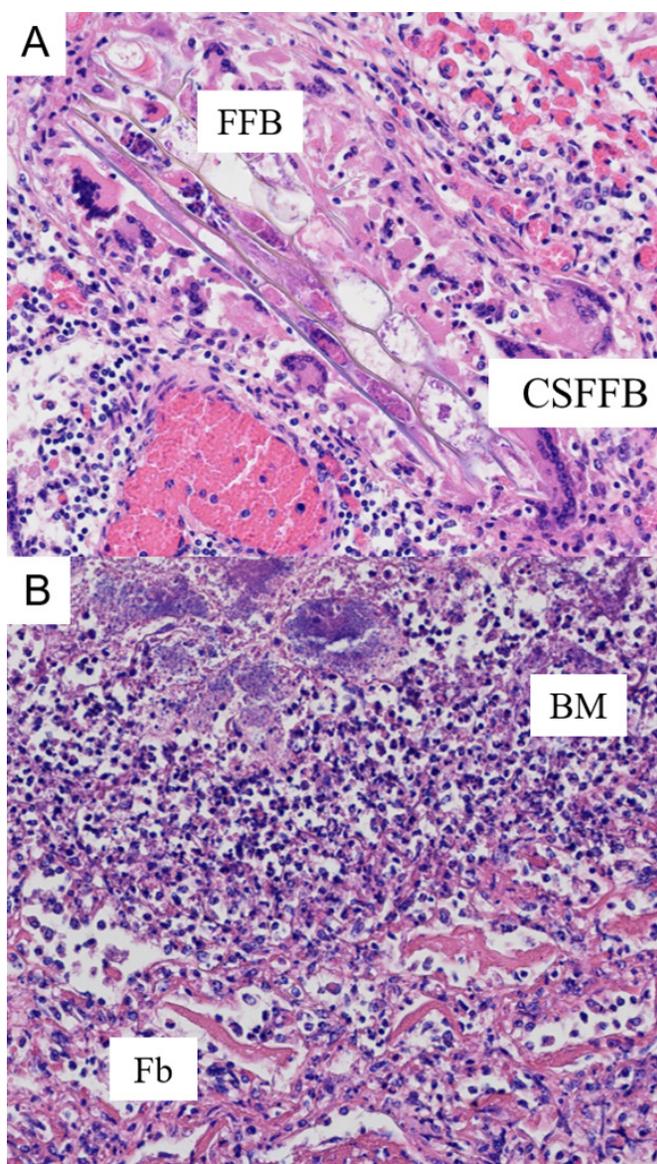
acteristics have been reported in calves (Yoneshige et al., 2022) and dogs (McCally et al., 2012). Therefore, it is suggested that submucosal gland is a major origin of animal subepiglottic cysts.

Aspiration pneumonia secondary to the subepiglottic cyst was deemed the cause of death. Surgical removal of the cyst was not performed due to the calf's compromised condition, likely exacerbated by aspiration pneumonia. Early diagnosis and surgical intervention are crucial for a favorable prognosis in cases of subepiglottic cysts. Endoscopy is the gold standard for evaluating the upper respiratory

tract in horses (Desmaizieres et al., 2009) and to diagnose subepiglottic cysts (Tulleners, 1991; Salz et al., 2013). In addition, it has been proven that X-ray (Mattoon et al., 1991), ultrasonographic examination, and computer tomography (Yoneshige et al., 2022) are useful for diagnosing subepiglottic cysts in calves. Previous cases have shown favorable outcomes following surgical intervention in cattle and other species (Mattoon et al., 1991; Hobo et al., 1994; McCally et al., 2012; Salz et al., 2013; Yoneshige et al., 2022). In the present case, the presence of the cyst was confirmed by endoscopy and the patient was diagnosed with a subepiglottic cyst before death and could not be removed surgically owing the compromised condition of the patient meaning that these imaging tests should have been performed before our clinical visit. Therefore, subepiglottic cysts should be considered in the differential diagnosis for calves presenting with wheezing, and appropriate diagnostic procedures should be conducted early to prevent general condition deterioration or concomitant diseases.

In this case, it was impossible to determine whether the primary disease was a subepiglottic cyst or aspiration pneumonia. In horses, it has been reported that subepiglottic cysts may less frequently be associated with aspiration pneumonia (Koch & Tate, 1978). On the other hand, cattle may be at higher risk for aspiration pneumonia than horses, since rumen contents are a major cause of aspiration pneumonia (Pancieria & Confer, 2010). This patient presented persistent wheezing as the main clinical sign, and although the ultrasound examination on the initial day of hospitalization confirmed pneumonia lesions, the clinical symptoms, such as bronchial breath sound or cough, were not clear. During the period of hospitalization and treatment, the general condition of the case deteriorated, and the animal died. Moreover, *T. pyogenes* was isolated from both bronchoalveolar lavage and cyst fluid which may suggest a link between the subepiglottic cyst and aspiration pneumonia, although the sequence of events remains unclear. White-beige patches on the surface of the cyst may indicate that bacteria isolated from the cyst have invaded.

In conclusion, this is the first report of a subepiglottic cyst and aspiration pneumonia in a Japanese Black calf. Further investigation is needed to elucidate the relationship between these conditions.



**Figure 3.** Aspiration pneumonia in the anterior lobe of the right lung. A: multinucleated giant cells surround the fiber-like foreign body; B: bacterial masses and fibrin are present in the lung parenchyma. FFB: fiber-like foreign body, CSFFB: cells surround a fiber-like foreign body, BM: bacterial mass, Fb: fibrin.

## DECLARATIONS

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### Competing Interest

The authors declare no competing interest.

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