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CASE REPORT

Diaphragmatic hernia in a cat mimicking a pulmonary mass

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A seven-year-old castrated British shorthair cross cat was presented for coughing of five-weeks duration. Thoracic radiographs and an unguided bronchoalveolar lavage showed changes consistent with inflammatory airway disease. In addition, a soft tissue density was evident in the thoracic films between the heart and the diaphragm. Exploratory thoracotomy demonstrated a diaphragmatic hernia, probably congenital in origin, with incarceration of a portion of the hepatic parenchyma. The herniated portion of liver was resected surgically and the defect in the diaphragm closed. The cat was given a 10-day course of doxycycline post-operatively and the cough did not recur subsequently. In retrospect, the hernia was potentially an incidental problem, the cat's coughing being attributable to inflammatory airway disease.

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A seven-year-old castrated British short hair-cross cat (8 kg) was presented for investigation of a non-productive cough of five weeks duration. There was no alteration in exercise tolerance or appetite. The cat had been acquired as an adult stray three years earlier and had no other historical abnormalities. Previous consultations had been for routine vaccinations (killed feline herpesvirus, calicivirus and panleukopenia) and worming.

Physical examination was unremarkable apart from periodontal disease and mild mandibular lymph node enlargement. The cat showed no evidence of increased respiratory effort and thoracic auscultation was unremarkable. Thoracic radiographs and an unguided bronchoalveolar lavage (BAL) were performed under general anaesthesia.

A mild diffuse bronchial pattern was evident in the thoracic films. Additionally a soft tissue density was evident and thought to be present in the right caudal or accessory lung lobe (Fig 1). Mild cardiomegaly was also present (vertebral heart score 8.7; range for normal cats 6.6 to 8.0 vertebrae) (Lister and Buchanan 2000). Diff Quik® stained smears of BAL fluid showed moderate numbers of eosinophils and degenerate cuboidal to low columnar epithelial cells. Eosinophils comprised 20 to 40% of the total cell count. Microorganisms, neutrophils or neoplastic cells were not visualised. Culture through a commercial laboratory was negative. Echocardiography demonstrated unclassified cardiomyopathy with mild to moderate left atrial dilatation (16.5 mm diameter).

The differential diagnoses for coughing includes parasitic, allergic, infectious or neoplastic conditions of the larynx, airways and lungs, intra-tracheal foreign bodies, mediastinal masses and heartworm disease. The main diagnostic possibilities considered in this case were (i) primary bronchial disease or (ii) stimulation of bronchial cough receptors by a mass lesion in the caudal thorax. The differential diagnosis for the mass lesion included a pulmonary neoplasm, abscess or granuloma. The location of the lesion precluded biopsy via ultrasound or fluoroscopically guided transthoracic needle aspiration. As the BAL cytology was not helpful in determining the aetiology of the mass, excision biopsy was considered the most expedient method of obtaining a diagnosis.

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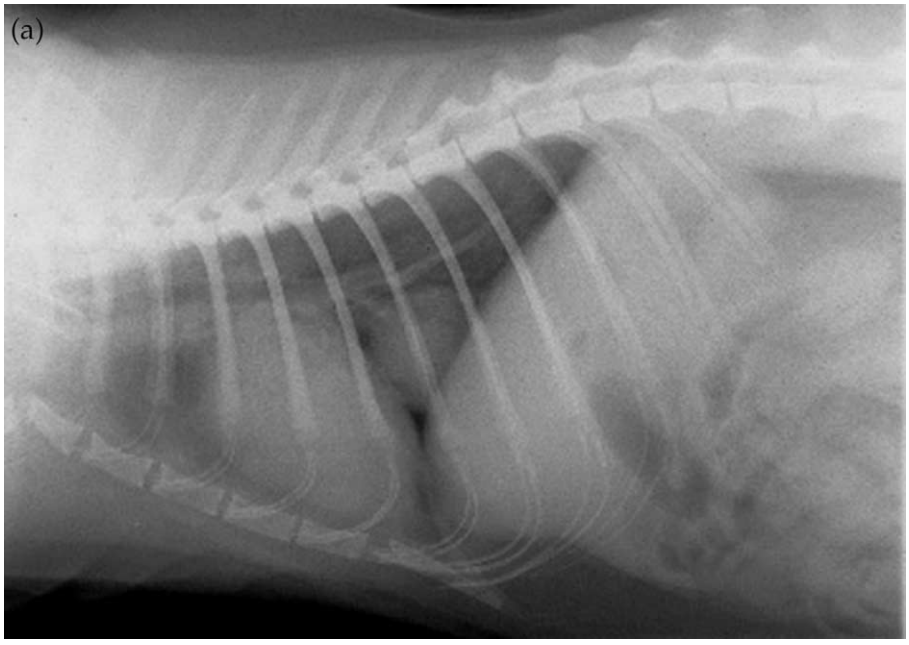

Fig 1. Lateral (A) and ventro-dorsal (B) thoracic radiographs.

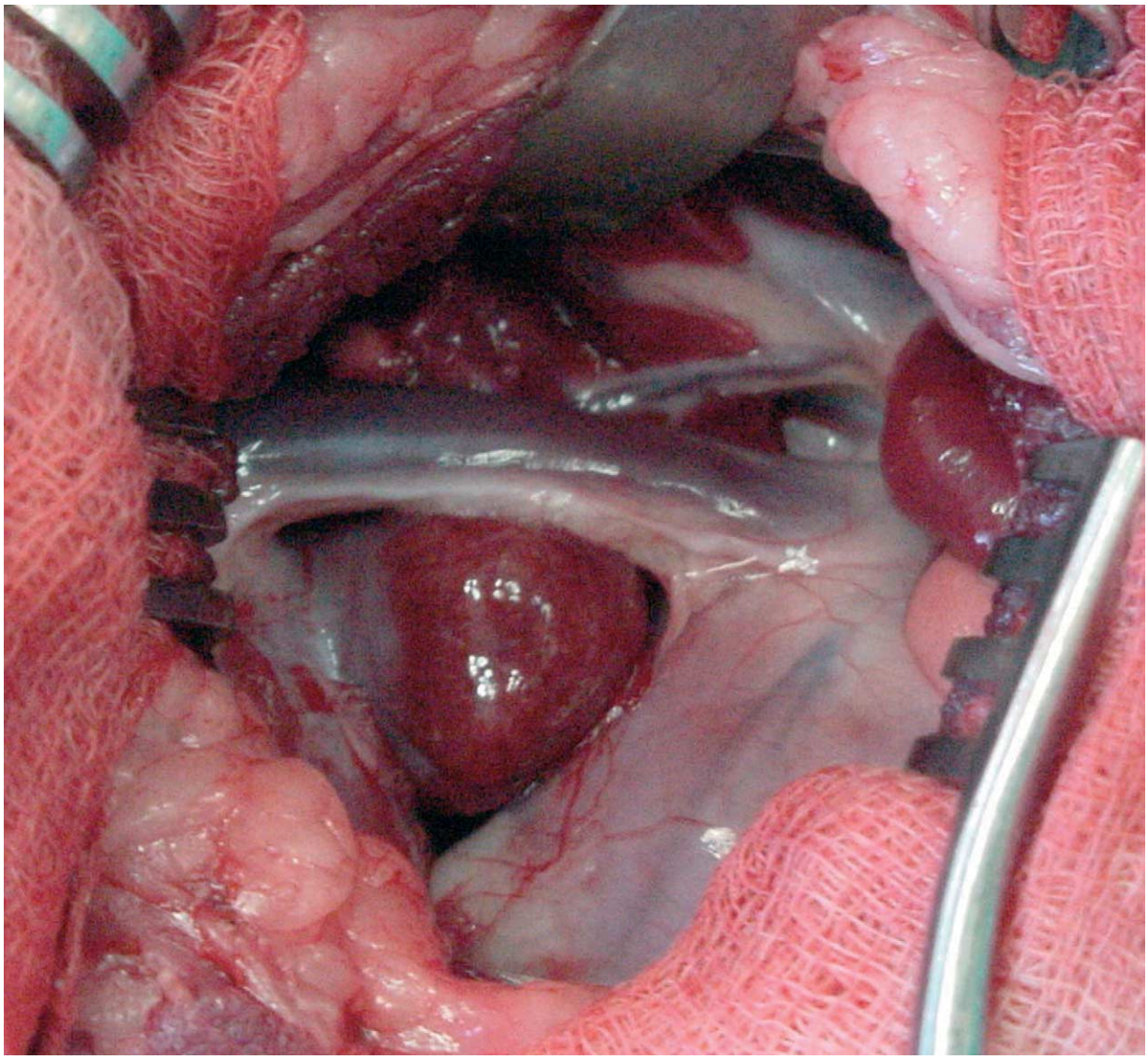

Fig 2. Intra-operative view of herniated hepatic tissue.

A right lateral thoracotomy was performed at the eighth intercostal space. Caudal to the accessory lung lobe, a small portion of liver was observed entrapped by an elliptical defect in the diaphragm (Fig 2). The diaphragmatic defect was smooth, round and had fibrous edges. The herniated liver was covered with serosa considered parietal pleura. The herniated liver was adherent to the encircling portion of diaphragm. The incarcerated liver parenchyma was crushed with haemostats, and then ligated with 2-0 polydioxannone. The diaphragmatic defect was closed with single interrupted sutures, the chest was closed routinely and a thoracic drain maintained for the first 24 h following surgery.

The cat recovered uneventfully. As it was considered unlikely that the cat's presenting sign of coughing was attributable to the herniated liver, a provisional diagnosis of inflammatory bronchial disease was made. Doxycycline (Vibravet; Pfizer) (37.5 mg twice daily for 10 days postoperatively) was prescribed as empiric therapy to treat anaerobic bacteria or mycoplasmas that may have been contributing to the problem (Foster et al 1998, Chandler and Lappin 2002). Coughing resolved and the cat remains well at the time of writing, six months later.

Discussion

Herniated abdominal tissue can be misdiagnosed as a pulmonary mass, especially when other radiographic signs of diaphragmatic herniation are absent (Voges et al 1997). Radiographic signs

caused by, or associated with, diaphragmatic rupture, are well documented and include loss of the diaphragmatic line, displacement or loss of the cardiac silhouette, lung lobe collapse, pleural effusion and cranial displacement of abdominal organs into the chest (Sullivan and Lee 1989). Diaphragmatic defects may be congenital or acquired, although the latter is more common, typically as a result of blunt trauma. Trauma may be recent, historical or unapparent (Wilson and Hayes 1986). Of all abdominal contents, hepatic tissue is the most likely to herniate (Garson et al 1980). The presence of pleural fluid and absence of obvious displacement of abdominal organs can make some diaphragmatic ruptures challenging to diagnose (Sullivan and Lee 1989).

Alternate methods for diagnosing diaphragmatic hernias include barium contrast studies (Sullivan and Lee 1989) and positive contrast celiography (Stickle 1984). In some cases abdominal sonography may be diagnostic of diaphragmatic rupture. Sonography may be able to demonstrate a discontinuity in the hyperechoic border of the diaphragm-lung interface and/or protrusion of abdominal organs into the thorax (Nyland and Mattoon 1995). The main differential diagnosis considered for this radiographic lesion was a pulmonary mass. Ultrasound guided fine needle aspiration of such a lesion through the liver parenchyma is possible but was considered unacceptably risky given the lesion's proximity to the caudal vena cava. Had a higher index of suspicion been entertained for a diaphragmatic hernia, abdominal ultrasonography may have demonstrated protrusion of hepatic contents through the line of the diaphragmatic. However, detection of small or subtle hernias, especially ventrally, can be difficult using ultrasound and normal abdominal ultrasound findings have been reported in surgically confirmed cases of diaphragmatic herniation (Voges et al 1997). Exploratory surgery remains a final definitive diagnostic option.

Surgical repair is recommended for all diaphragmatic hernias due to the potential for additional organ displacement over time and sequelae that result from incarceration of liver or intestines (Mann and Aronson 1991). Healing of diaphragmatic tears is thought not to occur and eventually organs herniate due to changes in the pleuroperitoneal pressure gradient (Levine 1987).

Congenital diaphragmatic hernias are considered uncommon in cats and dogs (Thrall 1994). The most common congenital diaphragmatic abnormalities are peritoneopericardial hernias (Levine 1987) and these have been well reported in the cat (Neiger 1996). It is not possible to determine if this cat had an acquired or congenital defect, although the gross appearance at surgery was more suggestive of a congenital defect. Congenital defects may not result in herniation of abdominal organs unless the animal experiences a sudden increase in intra-abdominal pressure (Thrall 1994).

This cat's presenting sign of coughing did not recur following the original presentation. It is most likely that coughing was due to primary bronchial disease (allergic, parasitic or bacterial in origin) and that the herniated liver mass was an incidental finding. Coughing is the most common historical sign associated with primary bronchial disease (Moise et al 1989). The response to doxycycline suggests that a component of the bronchial disease was bacterial, although the anti-inflammatory effects of tetracyclines may also have contributed to resolution of clinical signs (Seymour and Heasman 1995). Routine culture was negative but the potential remains for anaerobic bacteria or mycoplasmas to be involved, as these bacteria require special culture techniques not available in the commercial laboratory utilised. The mild eosinophilia present in the BAL fluid was most consistent with allergic or parasitic airway disease although specific pathogen free cats can have up to 30% eosinophils in BAL fluid (Hawkins et al 1994). Given the rapid resolution of coughing post-operatively, it is also possible that herniated liver stimulated peripheral bronchial cough receptors and was responsible for the presenting complaint.

A major differential diagnosis under consideration for the soft tissue density in this patient was pulmonary neoplasia. Adenocarcinomas and squamous cell carcinomas have been described as focal, solitary, well-circumscribed masses (Koblik 1986), although the radiographic findings in individual cases can be variable (Barr et al 1987). The poor prognosis associated with pulmonary neoplasia may discourage clients from further investigations in an older cat. Given the potential for surgical cure, it is therefore important to recognise that soft tissue densities contiguous with the diaphragm may be diaphragmatic hernias.

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