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Biphasic pericardial and pleural mesothelioma in a cat: a case report

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ABSTRACT: An 11-year-old castrated male Persian cat was admitted to the veterinary clinic showing signs of lethargy, lack of appetite, laboured breathing, dyspnoea, and cyanosis. The echocardiogram showed a large amount of pleural effusion, fibrin, and a mass measuring 1.89 cm in diameter adhered to the parietal pericardium. Upon necropsy, several nodules were observed on the pericardium sac and pleura. Histological evaluation of the nodules and mediastinal lymph node revealed the presence of neoplastic cells of epithelial and mesenchymal origin. Immunolabelling was positive for both cytokeratin AE1/AE3 and vimentin in the primary tumour and in the mediastinal lymph node. In the present report, immunohistochemical analysis supported the diagnosis that had been obtained based on clinical signs, histopathological examination, and echocardiogram.

Keywords: oncology; feline; effusion

Mesothelioma is a primary neoplasia of mesothelial cells found on the serosal surface of tissues such as pleura, pericardium, and peritoneum (Head et al. 2002; Garret 2013). In humans, about 80% of mesotheliomas are associated with inhalation of asbestos (Orenstein and Schenker 2000). In cats, spontaneous mesotheliomas are rare and predominantly malignant (Bacci et al. 2006), with a few reports describing the tumours in the pericardium, pleura, and peritoneum (Piacenti et al. 2004; Weiss et al. 2010; Garret 2013).

Three main histological types of this neoplasia have been described in domestic animals: epithelioid, fibrous (spindle cells), and biphasic (or mixed) mesothelioma (Head et al. 2002; Garret 2013). In a study of ten cats diagnosed with mesothelioma, eight of them had the neoplasia in the pleura and two, in the peritoneum. Histologically, they were classified as epithelioid (n = 5), fibrous (n = 3), and biphasic (n = 2) (Bacci et al. 2006).

Clinical signs depend on the extension and localisation of the neoplasia. When the tumour is inside the thoracic cavity, the patient may present with lethargy, dry cough, dyspnoea, and weight loss. Although mesotheliomas rarely cause pleural and/or pericardial effusion in the cat, respiratory signs are attributed to effusions. In cats, no treatment has been effective and the prognosis is usually guarded-to-poor (Moore and Ogilvie 2001; Garret 2013).

This article describes the case of an aggressive biphasic pericardial mesothelioma with pleural extension and metastasis in the mediastinal lymph node in a cat.

Case description

An 11-year-old, 4-kg, castrated male Persian cat was admitted to the veterinary clinic for evaluation after showing signs of lethargy and lack of appetite over the preceding week. Upon clinical examination, the cat presented with laboured breathing, dyspnoea, and cyanosis. Thoracic auscultation revealed muffled cardiac and lung sounds (200 beats/min; 66 breaths/min). Other abnormalities included 6%

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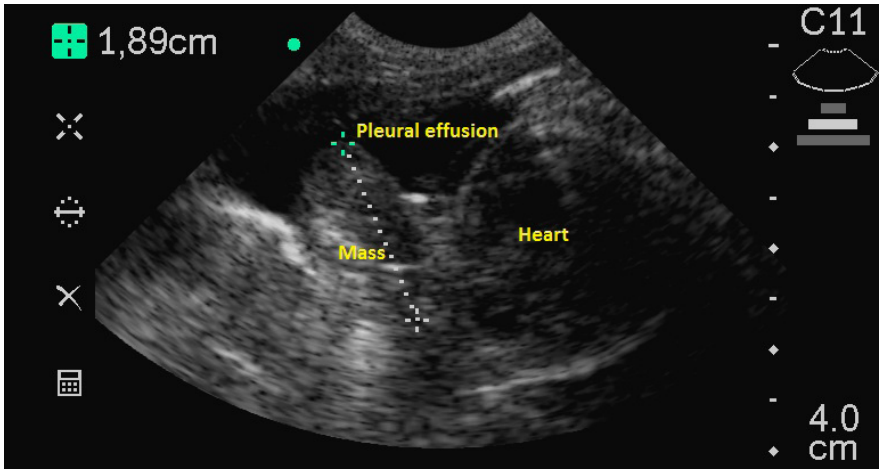

Figure 1. Echocardiographic image of the right parasternal short-axis showing a 1.89-cm mass located cranially to the heart. Pleural effusion can be seen dorsally to the mass and heart

dehydration and weak femoral pulses. Thoracic radiographs showed a collapsing of the lung lobes and large amounts of pleural effusion. The cardiac silhouette could not be visualised.

A chemistry panel and complete blood count were done, but no abnormalities were discovered. A thoracocentesis was performed and 150 ml of serosanguineous fluid were withdrawn. The echocardiogram revealed a large amount of pleural effusion, fibrin, and a mass measuring 1.89 cm in diameter adhering to the parietal pericardium (Figure 1). Cardiac function and chambers were normal. A pericardiocentesis was attempted but the patient died during venipuncture for placement of a peripheral intravenous catheter for fluid administration. The owner authorised a necropsy, which revealed the presence of serosanguineous liquid in the pleural space. Several nodules of up to 2 cm in diameter were found diffusely distributed over the entire pericardium sac. Some nodules were visualised on the pleural surface close to the pericardium (Figure 2). Pericardium and pleura were considerably thickened and rigid. The mediastinal lymph node was swollen and the medullar region was whitish. The abdominal cavity had nodules of up to 3 cm in diameter in the liver and up to 0.2 cm in the kidneys. Histological evaluation of the nodules on the pericardium, pleura, and mediastinal lymph node revealed the presence of neoplastic cells of epithelial and mesenchymal origin (Figure 3). Immunohistochemistry was performed with cytokeratin AE1/AE3 and vimentin antibodies (Figure 4). Immunolabelling was positive for both proteins in the primary tumour and in the mediastinal lymph node. The nodules found in the liver were classified as colangioma, and those in the kidneys, as cysts.

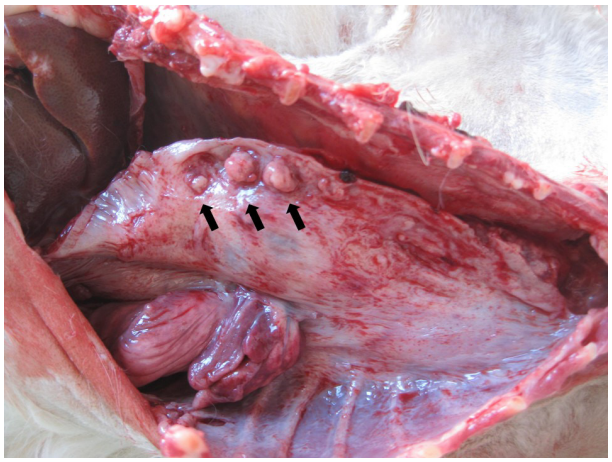

Figure 2. Thoracic cavity of a cat with thick and rigid pericardial and pleural surfaces, covered with nodules (arrows)

DISCUSSION AND CONCLUSIONS

Mesotheliomas are considered a rare type of neoplasm in cats (Bacci et al. 2006) and are found mostly in the thoracic cavity in this species (Weiss et al. 2010; Garret 2013). The neoplasia reported herein was primarily pericardial but extended to the pleura. It has been reported that pleural mesotheliomas may be found in focal lesions or may be the extension or combination of peritoneum and pericardial mesotheliomas (Head et al. 2002). Although the epithelioid form is more frequently found in cats (Weiss et al. 2010), the mesothelioma described in the present report was diagnosed as a biphasic one. Regardless of the type of mesothelioma, the prognosis is poor (Moore and Ogilvie 2001; Garret 2013).

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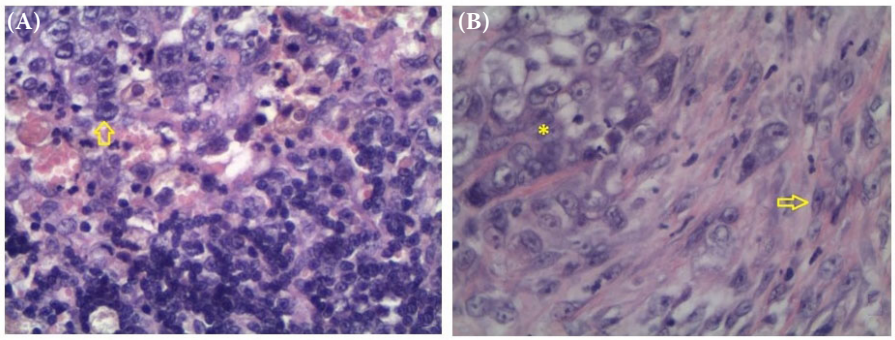

Figure 3. Biphasic mesothelioma in a cat (HE), × 40. (**A**) Epithelial malignant component (arrow) and (**B**.) mesenchymal neoplastic cells (*)

The presence of isles of epithelial cells surrounded by fibrous tissue suggests a more aggressive variant of this neoplasia (Head et al. 2002). In this case, the diagnosis was supported by immunohistochemistry with vimentin and cytokeratin confirming the mixed origin of the tumour, classified as a biphasic mesothelioma. However, Bacci et al. (2006) detected co-expression of these markers in other histological types of feline mesotheliomas. Recently, Al-Dissi and Philibert (2011) reported a case of a cat with biphasic mesothelioma with osseous and chondromatous differentiation on pleura, pericardium, and the diaphragm. These authors observed areas of cartilaginous metaplasia, osteoid deposition, and mineralisation. Such observations were not made in the present report.

The respiratory signs were a consequence of pleural and thoracic effusions, as well as hardening of these membranes. A diagnosis based on cytological examination of this fluid would have been inconclusive given that reactive mesothelial cells might be similar in appearance to neoplastic cells (Garret 2013). Due to the advanced stage of the neoplasia, the patient died while the complementary diagnostic tests were being performed.

Necropsy also revealed metastasis in the mediastinal lymph node, which expressed the same markers as the primary tumour. Metastasis originating from mesotheliomas is considered rare and may be found more frequently in adjacent tissues such as lungs and regional lymph nodes (Weiss et al. 2012). In cats, there is only one report in the sci-

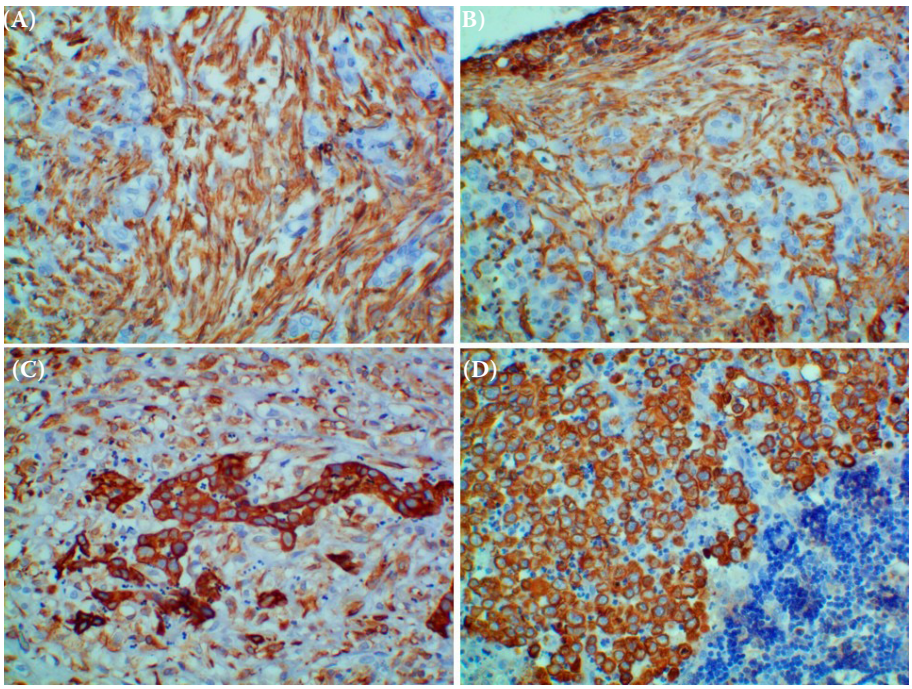

Figure 4. Biphasic mesothelioma in a cat. A and B immunohistochemical reaction to vimentin (VIM, Santa Cruz) in the primary tumour (**A**) and lymph node (**B**). C and D immunohistochemical reaction to pancytokeratin (AE1/AE3, Santa Cruz) in the primary tumour (**C**) and lymph node (**D**). Immunohistochemistry, DAB, counterstaining with Mayer's haematoxylin, × 40

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entific literature of metastasis found distant from the primary tumour (Piacenti et al. 2014).

Managing cats with thoracic mesothelioma is challenging. Mesothelioma is an aggressive neoplasia for which a definitive diagnosis is usually obtained after the clinical condition of the animal becomes critical, or after death. In general, early diagnosis is difficult and non-invasive diagnostic methods such as cytology effusion are frequently inconclusive (Garret 2013). Additionally, there is no effective treatment for mesotheliomas. Surgical excision is considered only when nodules are small and isolated. Chemotherapy, such as intracavitary carboplatin treatment, is frequently ineffective in mesothelioma cases, as is employed as palliation only (Sparkes et al. 2005).

Pleural and pericardial effusions should be considered as a potential sign of mesothelioma. In the present report, immunohistochemical results supported the diagnosis that had been obtained based on clinical signs, histopathological examination, and the echocardiogram.

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