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Diaphragmatic deformity in a cat mimicking a cardiac mass

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Abstract : A four-month-old intact femlae Abyssinian cat was present for routine health evaluation, because her littermate was recently died of ventricular septal defect. Diagnostic imaging studies showed a large caudal paracardiac mass in thoracic radiography and homogenous mass adjacent to heart in the echocardiography. Further echographic study revealed that the mass was liver and the diaphragmatic line was intact. The positive contrast celiogram revealed that no extravasation of the contrast media across the diaphragm and the prolapse of diaphragm into the pleural cavity. Based on our diagnostic imaging studies, the case was diagnosed as diaphragmatic deformity in a cat mimicking a cardiac mass.

Keywords : cardiac mass, cat, celiogram, diaphragmatic eventration

Introduction

Diaphragmatic deformity encompasses all kinds of diaphragmatic defects including several types of diaphragmatic hernias and eventrations. Diaphragmatic eventration is a thinning of the diaphragmatic tissue causing abnormal elevation of the diaphragm and is often occurred with/without hiatal hernia [1, 18]. Diaphragmatic hernia is a condition that partial or complete protrusion of abdominal organ through the diaphragm into the thoracic cavity [3, 7, 17, 20]. Diagnosis of diaphragmatic hernia is almost always based on routine radiography with/without the aid of contrast media such as barium or iohexol. However, in case with severe pleural effusion, radiographic diagnosis is alone sometimes difficult to identify diagnostic signs. For this case, other diagnostic methods such as contrast studies and ultrasonography may be helpful to identify diagnostic findings associated with diaphragmatic hernias [2, 10, 16]. Characteristic diagnostic signs include loss of the diaphragmatic line, displacement or loss of the cardiac silhouette, lung lobe collapse, pleural effusion and abdominal gas shadow in thorax and wasp-shaped abdomen are characteristic radiographic findings in diaphragmatic hernias, which are well described in veterinary literature [3, 5, 7, 17, 20]. Peritoneopericardial diaphragmatic hernias (PPDH) are the most common congenital defect of the diaphragm in cats [15] and are usually an incidental finding often found in necropsy. However, most PPDH can cause gastrointestinal or respiratory signs [12]. If the herniation is severe enough to interfere cardiac diastolic function, the clinical signs associated with right-sided heart failure (distended jugular vein, ascites or pleural effusions) can be observed [8]. Although concurrent umbilical and cranioventral abdominal hernias and sternal defects are often noticed in dogs with PPDH [8], sternal defects are the only reported concurrent problem in cats [12].

Case history

A four-month-old intact female Abyssinian cat was present for cardiac examination, because her littermate was recently died of ventricular septal defect. The cat was regularly dewormed and vaccinated. The cat had no particular medical history. Physical examination was unremarkable. Phonocardiogram found no particular murmurs were detected in the right and left chest. Complete blood cell counts and serum biochemistry found no particular abnormalities. Electrocardiogram found sinus rhythm (195 beats per minutes) with normal QRS axis (90°). However, thoracic radiography found a large size soft-tissue density intrathoracic mass

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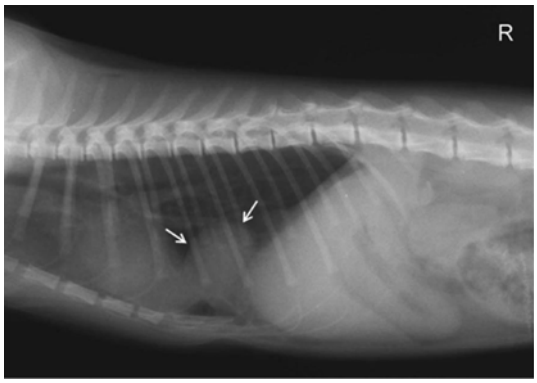

Fig. 1. Lateral thoracic radiography revealed a large size soft-tissue density intrathoracic mass near the left ventricle (arrow). The diaphragmatic line appeared to be intact and clearly delineated the diaphragm and liver.

near the left ventricle, the intact diaphragmatic line and clear demarcation between the diaphragm and liver (Fig. 1). The size of cardiac silhouette was within normal range (vertebral heart score 7.1; range for normal cats 6.6 to 8.0 vertebrae) [13].

Echography revealed homogenous paracardiac mass next to the left ventricle (Fig. 2A), although diaphragmatic line was intact (Fig. 2B). The further echography revealed that the liver was likely to be protruded into the pleural cavity, because the homogenous paracardiac mass had the same echo intensity to the liver (Fig. 2C). Echocardiography found no particular abnormalities. She had a normal systolic diastolic function in echocardiographical measurement of the heart.

The differential diagnoses for paracardiac mass included lymphosarcoma, hemangiosarcoma, other type of benign intrapulmonary tumor, PPDH and pleuroperitoneal diaphragmatic hernia. However, ultrasound guided-fine needle aspiration biopsy (FNA) for the mass revealed the identity of the paracardiac mass was normal hepatic tissue. Therefore, intrathoracic tumors were ruled out.

To identify the communication between peritoneum and pleura (or pericardium), the positive contrast celiogram with iohexol (Omnipaque; Amersham, USA) was performed. The celiogram revealed no communication between peritoneum and pleura (Figs. 3A and B). However, there was a large diaphragmatic protrusion into the pleural cavity (Figs. 3A and B). The paracardiac mass was a hepatic lobe encapsulated with protruded diaphragm (Figs. 3A and B).

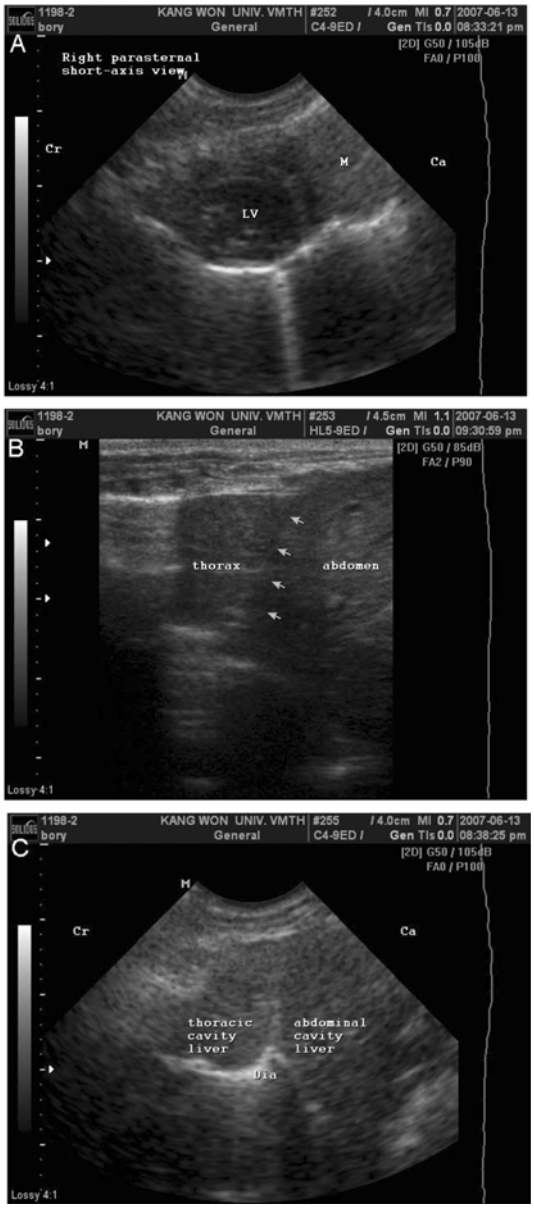

Fig. 2. Echography revealed homogenous paracardiac mass next to the left ventricle (A), although diaphragmatic line was intact (B). The further echography revealed that the liver was likely to be protruded into the pleural cavity, because the homogenous paracardiac mass had the same echo intensity to the liver (C).

Based on findings from diagnostic imaging studies, the case was diagnosed as diaphragmatic deformity mimicking cardiac mass. Surgical repair for this deformity was not done, because the cat was clinically normal. The cat was then released with recommendation of

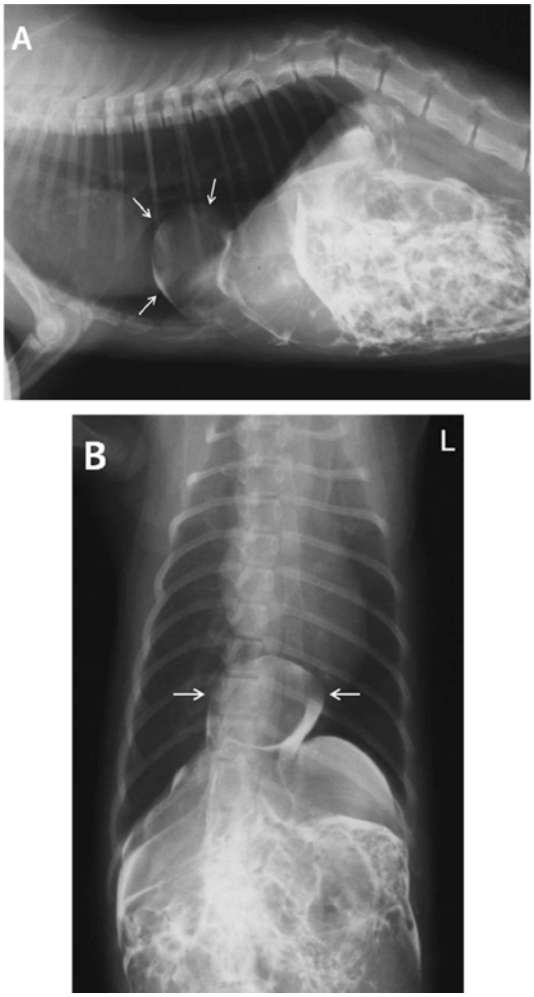

Fig. 3. Lateral (A) and ventro-dorsal (B) positive contrast celiogram revealed no communication between peritoneum and pleura. A large diaphragmatic protrusion into the pleural cavity (paracardiac mass) was found to be hepatic tissues in the fine needle biopsy performed afterward.

monthly check, because the cat had no clinical signs associated with this diaphragmatic deformity. Although the cat is being monthly checked, the cat is still very healthy and had no clinical signs associated with this deformity, to date.

Discussion

Diagnosis of this case was problematic because our contrast studies revealed this cat had intact diaphragm, although it appeared to protrude into pleural cavity with mimicking paracardiac mass. Therefore, our initial differential diagnosis was PPDH, diaphragmatic eventration and paracardiac mass, because the soft-tissue density mass found to be connected to pericardium and there was a bulging of diaphragm on the thoracic radiography. The clear demarcation between diaphragmatic line and the mass mimicked a paracardiac mass. One recent case study found the diaphragmatic hernia often mimicked with intrapleural mass [19]. However, the cat in this case had normal intact diaphragmaticolumbar recess and intact diaphragmatic line on the lateral radiography. There was no cranial displacement of abdominal organs. The liver and stomach shadow on the radiography was seemed to be normal in location and dimension. The paracardiac mass appeared to be separated from the diaphragm on the radiography. Furthermore, the cat was only 4 months old and clinically normal, solitary intrathoracic tumors (e.g. lymphosarcoma, hemangiosarcoma) might not be the cause. Therefore PPDH and diaphragmatic eventration were more suspected in this case, considering the age and clinical presentation.

Diaphragmatic eventration has been rarely reported in animals, although it has been often reported in human primarily with congenital defect and secondarily with trauma [1, 9, 18]. In small animals, congenital diaphragmatic eventration has been reported but that case was also occurred with hiatal hernia [4]. Differential diagnosis from congenital diaphragmatic eventration was not easy, because our case has intact diaphragmatic line. However, because this cat had neither the elevation of the diaphragm nor concurrent hiatal hernia, diaphragmatic eventration might be inappropriate for our case, although the medical definition for these two diseases has not been clearly demarcated in veterinary literatures.

Although loss of the diaphragmatic line is a major radiographic sign for diaphragmatic hernia, this sign is not always reliable, because the line of diaphragm can be invisible and interpretable for evaluating its integrity, in case that the diaphragm merged with the liver or other thoracic tissues, if the lung is displaced away from the diaphragm due to pleural effusion [11].

Our diagnostic imaging studies could not also clearly rule out the possibility of omental and fibrous adhensions between the ruptured diaphragm and the protruded tissues (liver in this case), although the diaphragmatic line appeared to be intact in the contrast studies. It was hard to persuade the owner to request

surgery for clarifying the presence of omental and/or fibrous adhensions.

Our ultrasonographic studies with FNA found the liver was located at the next to the left ventricle. Our positive contrast celiogram found no communication between peritoneum and pericardium in this case. Therefore the presence of diaphragmatic rupture was unlikely in our case, although the diaphragmatic line might be intact and no pleural effusion might exist if the protruded liver was adhered with fibrous tissues or omentum in spite of diaphragmatic rupture. Therefore, we concluded this case could be placed into diaphragmatic deformity.

Surgical repair is recommended for all diaphragmatic hernias [6, 14]. Several surgical options for surgical closure of diaphragmatic hernias have been well described in veterinary literature [6, 14]. Because of the potential for additional organ displacement over time and sequelae that result from incarceration of liver or intestines, surgical repair is necessary for all type of diaphragmatic hernia [6, 14]. In literatures, PPDH causing intrapericardial cysts could develop vascular and lymphatic congestion and fluid retention secondary to constriction of the incarcerated liver lobe [3, 12]. However, mild case with incarceration of hepatic lobe was not induced any clinical signs, although left untreated [3], although other case reported was associated with respiratory distress and right sided heart failure [8, 12]. Because the cat was young and clinically normal, we decided to observe clinical progression. Our recommendation to the owner was regular health check and optional surgery, if the cat has clinical signs or diagnostic findings associated with diaphragmatic hernia or hepatic incarceration.

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