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Ultrasound Diagnosis

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ULTRASOUND DIAGNOSIS

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History

An eleven-year-old, intact, female, domestic, short-haired cat was presented at Chulalongkorn University, Small Animal, Veterinary Teaching Hospital showing inappetance with a sudden onset respiratory distress, anorexia, and weakness over the past two days. Physical examination revealed pale mucous membranes, decreased respiratory sounds and muffled heart sounds. The cat rested in dog-sitting position with abdominal breathing. Thoracic radiographic examination demonstrated an extensive pleural effusion in the entire left hemithorax and the right caudal thorax. The diaphragmatic silhouette could not be seen. Ultrasonography was performed in order to evaluate the integrity of the diaphragm and to confirm the absence of a diaphragmatic hernia.

Ultrasonographic Findings

An ultrasonographic examination of the caudal thorax was performed using a real-time scanner with an 8-5 MHz, broadband, convex, phased array transducer. The hyperechoic, diaphragm-lung interface, scanned through the right transhepatic, subcostal approach, appeared as an intact echogenic line just cranial to the hepatic parenchyma (figures 1A and 2A). There was no evidence of abdominal structures within the thoracic cavity. Pleural fluid was identified as anechoic material surrounding the lung lobes. The aerated lung lobe apex, suspended in pleural fluid, appeared as a normal lung hyperechoic interface with a deep acoustic reverberation artifact. Pleural fluid was more apparent when scanned from the left transhepatic, subcostal approach (figures 2A and 2B).

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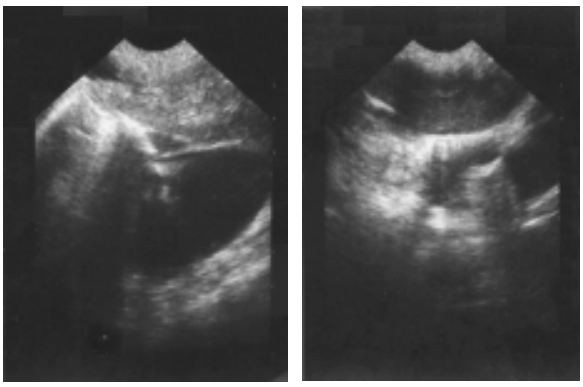

A B

Figure 1 Transhepatic, subcostal approach, ultrasonographs of the right (A) and left (B) hemithorax of an eleven-year-old, domestic, short-haired cat in an erect-standing position The thin echogenic line of the diaphragm was seen between the anechoic pleural fluid and the cranial surface of the hypoechoic liver parenchyma. Aerated lung margins were delineated from the adjacent pleural effusion by a hyperechoic interface with an acoustic reverberation artifact.

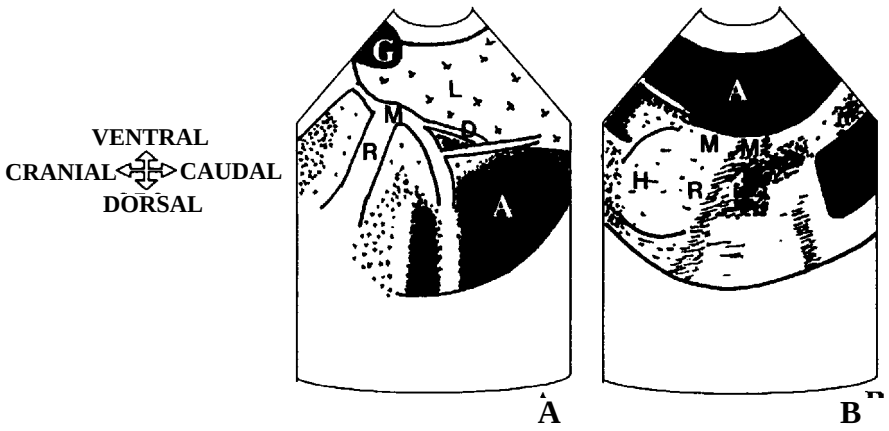

Figure 2 Schematics of the relative positions of the structures scanned in figure 1. D -echogenic diaphragm; A -anechoic pleural fluid; L -hypoechoic liver parenchyma; G -gall bladder; M -hyperechoic lung margin; R -acoustic reverberation artifact; H -heart.

Diagnosis

Ultrasonographic diagnosis — Pleural effusion

Comments

Ultrasonographic examination can provide a definitive diagnosis of a diaphragmatic defect when radiographic signs of diaphragmatic hernia are obscure, especially when pleural effusion is present (Reichle and Wisner, 2000). Diaphragmatic hernias may be ultrasonographically detected by imaging disruption of the normal curvilinear appearance of the diaphragm-lung interface through a transhepatic subcostal approach or via an intercostal window. If free pleural or peritoneal fluid is present, the diaphragm is distinctly seen as a thin echogenic line, separated from the lung surface or from the cranial surface of the liver. In this way, the diaphragm can be evaluated for signs of disruption. Pleural fluid appears as a hypoechoic or anechoic space between the thoracic wall or the diaphragm and the lung. Anechoic fluid is more likely associated with transudate while hypoechoic or complex echogenic fluid is more consistent with pyothorax or hemothorax (Stowater and Lamb, 1989). Fine needle aspiration and fluid analysis/cytology should be performed, to fully characterize the pleural effusion.

Sonographic examination of the intrathoracic structures is greatly enhanced by the presence of pleural effusion, because the effusion is an excellent medium for ultrasound beam transmission and causes displacement of the aerated lung lobes. However, thoracic radiography is always the initial tool of choice for cardiac, pulmonary and mediastinal disease, to both determine whether ultrasound is indicated and to provide information about patient positioning. Ultrasound-guided thoracocentesis and mass aspiration/biopsy, allows cytologic/histologic diagnosis of thoracic disease.

References

Reichle J.K. and Wisner E.R. 2000. Non-cardiac thoracic ultrasound in 75 feline and canine patients. Vet. Radiol. & Ultrasound. 41(2): 154-162.

Stowater J.L. and Lamb C.R. 1989. Ultrasonography of noncardiac thoracic diseases in small animals. J. Am. Vet. Med. Assoc. 195(4): 514-520.