J Vet Clin 25(3) : 187-191 (2008)

Journal of Veterinary Clinics
www.ksvc.or.kr

Spontaneously Occurring Chemodectoma in a Yorkshire Terrier Dog

Chul Park, Jong-Hyun Yoo*, Dae-Young Kim and Hee-Myung Park[1]*****

Department of Medicine and Epidemiology, School of Veterinary Medicine, University of California, Davis, Davis, California 95616, USA
**BK21 Program of Integrative Network Systems for Veterinarians in Basic Science, Industrial Animals and Preventive Medicines, Konkuk University, Seoul 143-701, Korea*
***Department of Veterinary Pathobiology, College of Veterinary Medicine, University of Missouri-Columbia, Missouri 65211, USA*
****Department of Veterinary Internal Medicine, College of Veterinary Medicine Konkuk University, Seoul 143-701, Korea*

(Accepted: June 5, 2008)

Abstract : A 7-year-old, intact female Yorkshire terrier dog was presented for coughing, anorexia, chest pain and dyspnea. Right lateral thoracic radiograph demonstrated a large mass shape on the heart base with decreased cardiac silhouette and severe right deviation of the trachea with the heart shifted to the left thoracic wall was observed on the ventrodorsal thoracic projection. Echocardiographic examination revealed a large rounded mass compressing left atrium around the heart base without signs of pericardial effusion. On computed tomographic (CT) findings, sagittal CT images depicted the possibility of cranial vena caval invasion and heart base involvement of the mass associated with biatrial compression. Dorsal CT image revealed the right deviation of trachea due to the heart base mass and markedly shrunk lung space was detected on the transverse CT image. Because the dog suddenly had died during the recovery from anesthesia after finishing CT scan, necropsy was performed. On gross findings, a large and lobulated mass was located at the base of the heart. A poorly-demarcated, infiltrative, multilobulated tumor composed of polyhedral cells in solid cellular sheets was confirmed based on histopathologic examination. This dog was diagnosed as a chemodectoma. This case report describes the clinical findings, diagnostic consistency of thoracic radiography, echocardiography and CT, and histopathologic confirmation in a spontaneously occurring chemodectoma with a Yorkshire terrier dog.

Key words : canine, chemodectoma, computed tomography, heart base tumor

Introduction

Even though tumors affecting the heart are infrequent in the dog and even more uncommon in the cat, they may occur in intracavitary, intramural, pericardial locations, or at the heart base. Aortic body tumors of them such as chemodectoma and paraganglioma are second most common primary heart tumor in the dog occurring on the heart base (7,18,19) and usually arise from chemoreceptor cells at the heart base. Other mesenchymal and epithelial tumors have been sporadically reported(1,3,16). Neoplasms of the aortic and carotid bodies in animals are not functional (i.e., they do not secrete excess hormone into the body circulation), however, as space occupying lesions they may result in a variety of clinical signs (evidence of dyspnea; coughing; vomiting; cyanosis; hydrothorax; pericardial effusion; ascites; edema of the subcutaneous tissue of the head, neck, and forelimbs; hepatic congestion). The tentative diagnosis is usually made based on clinical history, physical examination, radiographic findings, echocardiographic or computed tomographic examination. For the definitive diagnosis, ultimately, surgical biopsy and histopathologic confirmation are always required (12).

Therapy of the animals with cardiac tumors consists of treating existing arrhythmias and clinical signs of the heart failure, if present. Unfortunately, the hemodynamic consequences of the neoplastic cardiac mass often are refractory to medical management without effective antitumor treatment. Surgical resection may depend on the size and the location of the tumors. Therefore, surgical procedure may be indicated in a small number of primary cardiac tumors (20,21).

This case report describes the clinical findings, diagnostic consistency of thoracic radiography, echocardiography and computed tomography (CT), and diagnostic confirmation based on histopathologic examination in a spontaneously occurring chemodectoma of a Yorkshire terrier dog.

Case report

A 7-year-old, intact female Yorkshire terrier dog weighing 2.36 kg was presented with chronic progressive dry coughing, anorexia, chest pain and acute onset tachypnea. On physical examination, mild abdominal distension, tachypnea and dry coughing were observed. Bilateral patellar luxation

[1]Corresponding author.
E-mail : parkhee@konkuk.ac.kr

(Grade 2 of 3) also was checked and bilateral prescapular lymph node swelling (about 1 cm in diameter) was confirmed. Results of complete blood counts (CBC) showed mild neutrophilic leukocytosis with shift to the left (26.8×10^3/μl; reference range, 6-17×10^3/μl) and regenerative anemia with packed cell volume of 30% (reference range, 37-55%). Serum biochemistry revealed elevated alanine aminotransferase (ALT = 85 U/L; reference range, 3 to 50 U/L), alkaline phosphatase (ALP = 968 U/L; reference range, 47 to 333 U/L) and aspartate aminotransferase (AST = 614 U/L; reference range, 17 to 44 U/L). Lactic acid dehydrogenase (LDH = 267 U/L; reference range, 20 to 109 U/L) and total bilirubin (0.9 mg/dl; reference range, 0.1-0.5 mg/dl) were mildly increased. The dog's plasma cardiac troponin I (cTnI) level was elevated (1.558 ng/ml) compared with the reference range (median cTnI is 0.03 ng/ml with a range of 0.01 to 0.15 ng/ml) (13). Blood pressure measurement (Cardell®#9402, CAS Medical Systems, Brantford, CT, USA) revealed mildly hypotensive condition. The dog's mean systolic blood pressure was 117 mmHg (reference range: 121±12 mmHg in Yorkshire terrier) and mean diastolic blood pressure was 52 mmHg (reference range: 69±13 mmHg in Yorkshire terrier).

Right lateral thoracic radiograph demonstrated a large mass shape on the heart base with decreased cardiac silhouette (Fig 1A). Trachea was severely deviated to the right and the heart was shifted to the left thoracic wall on the ventrodorsal thoracic radiographic findings (Fig 1B). Electrocardiography (Cardiofax GEM ECG, Nihon Kohden, Tokyo, Japan) revealed sinus tachycardia with normal R waves (240-260 beats per minute) (reference range: 70-180 beats per minute). Abdominal radiography and ultrasonography showed gas traped stomach and bowels. Echocardiographic examination (Logiq 400 Pro Series, GE Healthcare, Stamford, CT, USA) revealed a large rounded mass (3.74 cm×4.0 cm in size) compressing left atrium around the heart base (Fig 1C and D). The mass had heterogenous echotexture with relatively hypoechoeic center. However, there was no evidence of pericardial effusion and valvular disease on echocardiographic examination. Left ventricular function also was normal.

Plain computed tomography (CT) was performed to confirm the accurate location, affected extent and invasion to near organs of the mass (4.3 cm×5.2 cm×3.8 cm in size). Sagittal CT images depicted the possibility of cranial vena caval invasion and heart base involvement of the mass associated with biatrial compression (Fig 2A and B). However, cranial vena cava syndrome (edema of the head, neck, and forelimbs due to tumor compression on the cranial vena cava) was not observed with this dog. Dorsal CT image

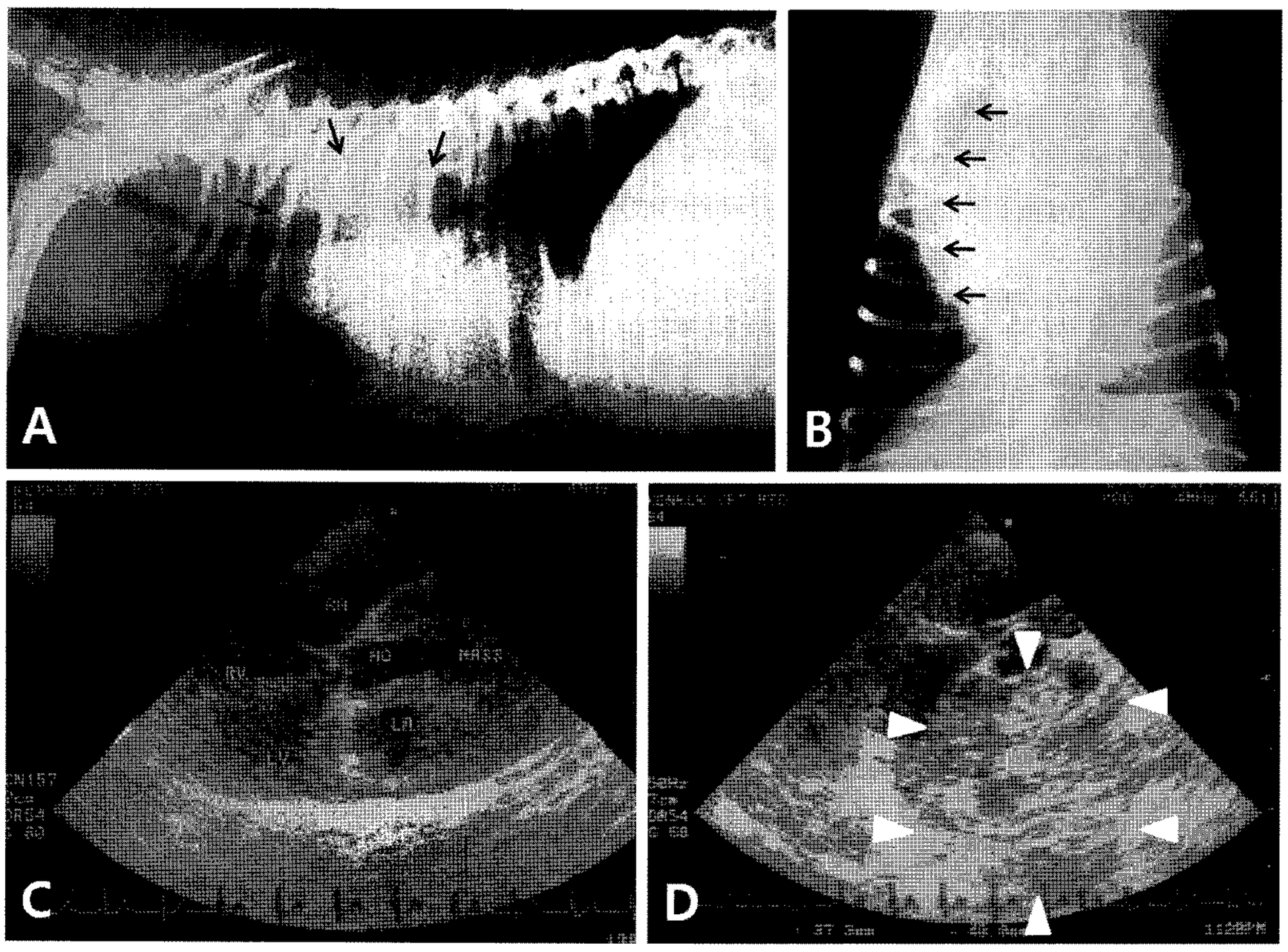

Fig 1. Characteristics of thoracic radiography and echocardiography of the dog. (A) Left lateral thoracic radiograph shows a large and soft tissue mass with decreased cardiac silhouette on the heart base region (arrows). (B) Trachea is severely deviated to the right (arrows) and the heart is shifted to the left thoracic wall on the ventrodorsal thoracic radiographic findings. (C) The mass is adjacent to the aorta and left atrium on the two-dimensional echocardiography obtained from the right parasternal position in the dog. (D) Echocardiographic examination reveals a large rounded heterogenous mass (3.73 cm×4.0 cm in size) compressing left atrium and aorta around the heart base (arrow heads).

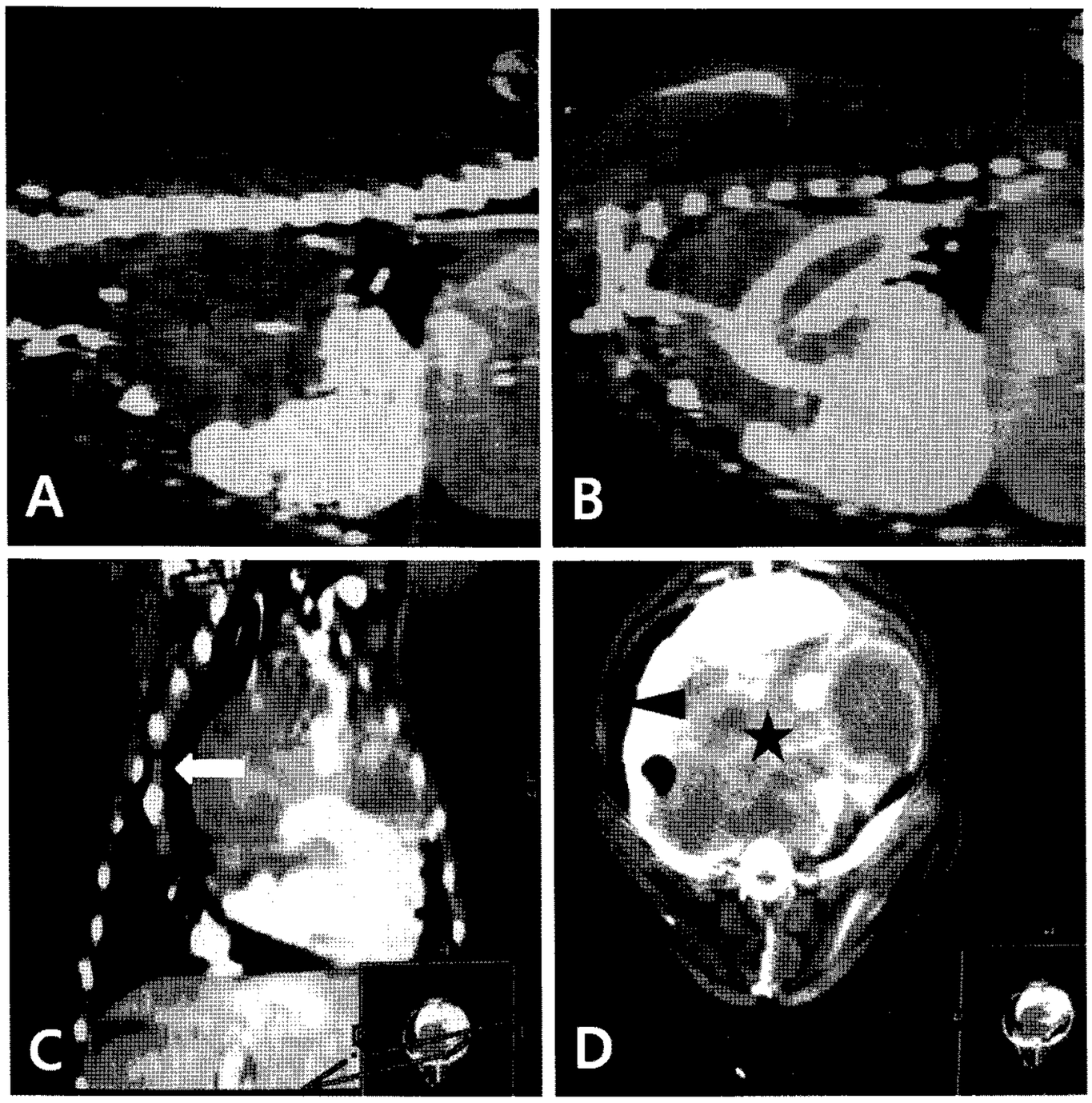

Fig 2. Plain computed tomographic (CT) images of the thorax from the dog with a heart base mass. (A) A large mass compressing biatria (asterisk) is observed on a sagittal view of CT scan. (B) Heart base as well as aortic body region involvement is also confirmed on another sagittal view. (C) Dorsal CT image reveals the right deviation of the trachea due to the heart base mass (white arrow). (D) Markedly shrunk lung space (arrow head) due to aortic body mass (asterisk) is detected on the transverse CT image at the level of 6th rib.

revealed the right deviation of the trachea due to the heart base mass (Fig 2C) and markedly shrunk lung space was detected on the transverse CT image at the level of 6th rib (Fig 2D). The dog died during the recovery from anesthesia after accomplishing CT scan.

Necropsy was performed immediately to confirm the definitive diagnosis after death. On gross findings, a large multi-nodulated mass (4.24 cm×5.3 cm×3.92 cm in size) was observed at the base of the heart including ascending aorta (Fig 3A). Cranial vena cava was invaded with this mass and biatria were compressed by the mass (Fig 3B). The lesion sample was 10% phosphate buffered formalin-fixed, embedded in paraffin, and stained with hematoxylin and eosin (H&E). On histopathologic examination, the lobules were further subdivided by multiple small packets which are surrounded by a fine fibrous stroma and capillaries (Fig 3D). The tumor cells had moderate nuclear pleomorphism and uncommon mitoses. The cytoplasm was eosinophilic, granular or vacuolated without distinct cell borders. Then, there were multifocal areas of necrosis and hemorrhage within the tumor (Fig 3C). This dog was definitely diagnosed as a chemodectoma.

Discussion

Chemodectomas arising from the aortic body are the most commonly reported chemoreceptor tumors in the dogs(4,6,22). This case shared common features with previously reported canine chemodectomas located in the aortic body. Although it has been suggested that chronic hypoxia may stimulate development of chemoreceptor tumors in both dogs and human(8,15), there was no evidence to cause hypoxia, including brachycephalic breed or airway diseases in this case. Especially, no other tumors or metastases were found and no clinical signs due to abnormal chemoreceptor function were observed in this dog. The clinical presentation of this case was relatively typical respiratory signs without congestive heart failure. According to the diagnostic findings, space-occupying large extra-cardiac mass caused compressed heart chambers, deviated trachea, cardiac deviation, and remarkable lung collapse. However, there was no congestive heart failure due to probably partial compression on the heart chambers by this extra-cardiac neoplasia. Reports of aortic body tumors in dogs have most frequently involved brachycephalic breeds, including Boxers, Boston Terriers,

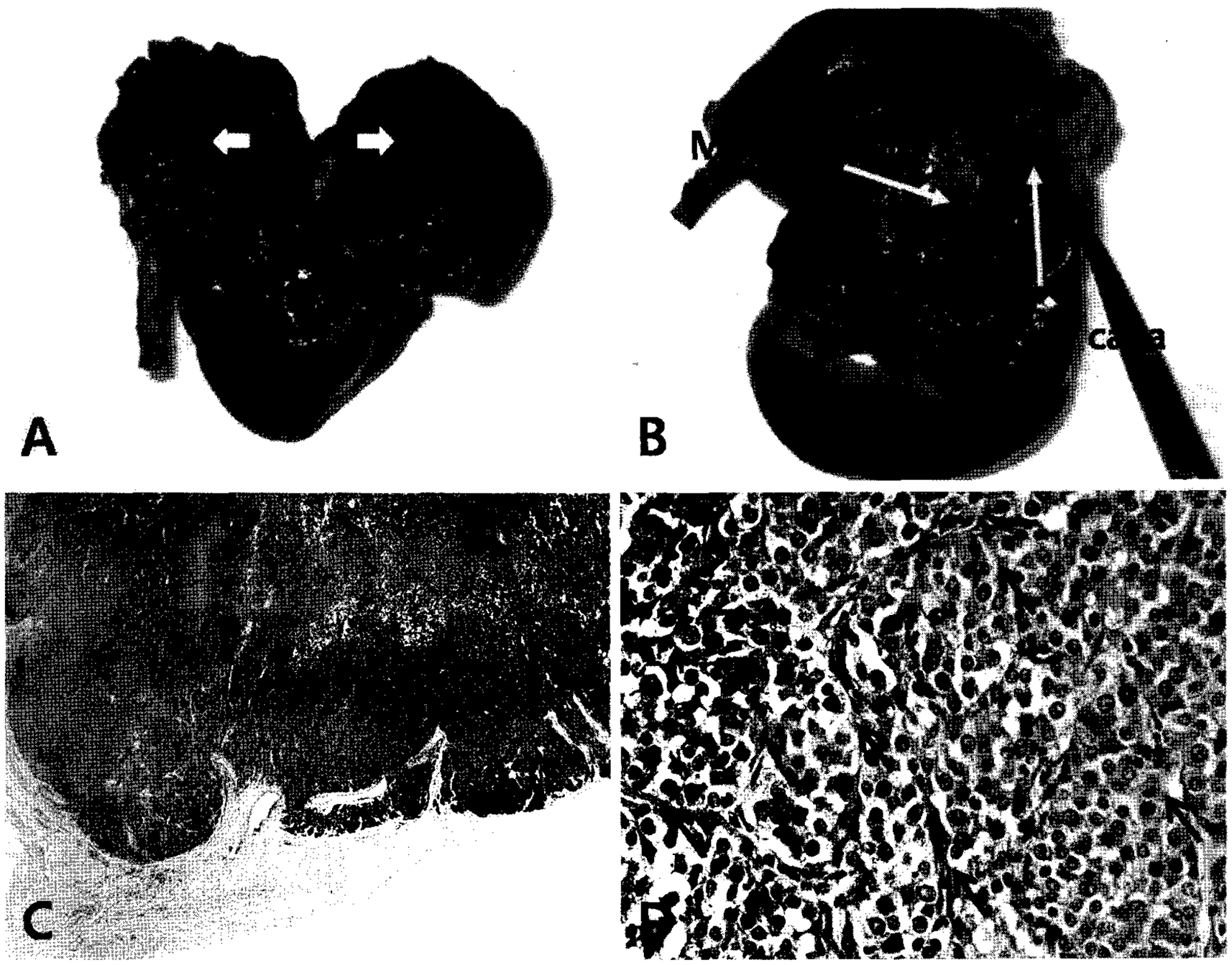

Fig 3. The gross finding at the necropsy and light microscopic examination findings with H&E staining. (A) On gross findings, a large multi-nodulated mass (4.24 cm×5.3 cm×3.92 cm in size) was observed at the base of the heart including ascending aorta. (B) Cranial vena cava is invaded with this mass. (C) There are multifocal areas of necrosis (black arrow) and hemorrhage within the tumor (×20). (D) The heart has a poorly-demarcated, infiltrative, multi-lobulated tumor composed of polyhedral cells in solid cellular sheets (typical pattern of a neuroendocrine tumor) (black arrows). The lobules are further subdivided by multiple small packets which are surrounded by a fine fibrous stroma and capillaries. The tumor cells have moderate nuclear pleomorphism and uncommon mitoses. The cytoplasm is eosinophilic, granular or vacuolated without distinct cell borders (×400).

and Bulldogs(5,12). The dog of the present case, however, was not brachycephalic dog.

Thoracic radiography was not able to explain the extra-cardiac location of the mass and the presence of the thoracic mass was just noticed in this case. According to the information of the chest films, we usually observe the presence of the mass and associated thoracic condition (e.g., heart deviation, tracheal condition, evidence of congestive heart failure, heart chamber status, etc.). The present case showed tracheal and cardiac deviation without congestive heart failure on thoracic radiographic examination. Concerning the evaluation of metastasis and invasion to the near organs, radiography is not accurate. This is the disadvantage of the thoracic radiography when we diagnose the heart base mass. However, thoracic radiography supported the important clue about the presence of the mass and associated pulmonary lesion with the present dog.

In this case, echocardiography was the initial method used to differentiate heart base mass from other intra-cardiac tumors, especially tumors of the right atrium and pericardium. The mass was seen at the level of the aorta and pulmonary artery through the long-axis and transverse views. Usually, two-dimensional echocardiography, performed systemically and using multiple imaging planes, allows accurate detection and localization of cardiac and pericardial masses in dogs(17).

The CT scan was conducted to depict more accurate mass size and anatomical involvement with the present case. The CT is more advanced imaging technique in veterinary medicine and is very helpful in evaluating the extent of disease. The vessels and heart wall through CT scan are imaged in slice form allowing better anatomical assessment of the tumor. Thus, it has been used to better define the location of the primary tumor, determine the extent of mediastinal and lymph node involvement and detect pulmonary metastases prior to further intervention such as surgery, radiation, or chemotherapy(9-11). It was enough to lead to a failure of recovery from anesthesia after CT scan because of a marked loss of lung space.

Diagnosis of chemodectoma in this case was made based on

the light microscopic examination of histologic features without immunohistochemical staining and electron microscopic examination. This case shared common histologic features of previously reported canine heart base chemodectoma(2,8,23). However, the evidence of blood vessels invasion and neoplastic emboli was not observed in this case. Although there are two case reports already published concerning aortic body tumors in Korea(14,23), this case report explained compared CT description with conventional radiographic and echocardiographic examination by measuring the mass size, involved adjacent organs, and the exactly affected extent.

In conclusion, the dog had a history of chronic respiratory signs and anorexia with chest pain and showed dry coughing, chest pain and acute onset tachypnea on the physical examination. The presence of a heart base mass was diagnosed based on thoracic radiography, CT, and echocardiography. Although these three diagnostic imagings revealed the consistency of the approximate size and location of the thoracic mass, the decision of intra-or extra-cardiac location of the neoplasia was performed by CT and echocardiography. However, results of this case indicated that CT was more accurate than radiography and echocardiography for assessing exact mass size and adjacent organs invasion in this dog with a heart base mass. The definitive diagnosis of a chemodectoma was confirmed with the histopathologic examination.

Acknowledgements

This work was supported by the Korea Research Foundation Grant Funded by the Korean Government (MOEHRD) (KRF-2005-E00413).

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