Aberrant Branch of the Bronchoesophageal Artery Resembling Patent Ductus Arteriosus in a Dog

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ABSTRACT. An anomalous shunt between the bronchoesophageal artery and pulmonary artery was diagnosed in a 1-year-old, 3.5 kg female Miniature Dachshund by selective contrast angiography. A cardiac murmur had been observed in the dog during examination at another hospital. The machinery murmur was auscultated at the left side of the base of the heart. Although thoracic radiography revealed mild cardiomegaly, the characteristic findings of patent ductus arteriosus (PDA), including as aortic arch enlargement and pulmonary artery enlargement were not observed. Echocardiography demonstrated shunting of blood flow presumably from the arterial duct at the pulmonary artery carina. Based on the above findings the case was diagnosed as PDA. Angiocardiography was performed to confirm the diagnosis in preparation for surgical treatment, but later we confirmed that the shunt vessel was not PDA, but apparently a branch of the bronchoesophageal artery. The shunt vessel was branching in a complicated manner and shunted to the pulmonary artery.

KEY WORDS: bronchoesophageal artery, canine, PDA.

Anomalies of the blood vessels of the heart have been reported in dogs. These anomalies include patent ductus arteriosus (PDA), vascular ring anomalies and anomalies of the aorta [5]. Among these, PDA is the most common congenital cardiovascular abnormality in dogs [5, 7]. PDA can be diagnosed by demonstrating several characteristics, including machinery murmur, heard best over the left cranial thorax, left atrial enlargement, dilation of the aortic arch and main pulmonary artery on radiography and shunt blood flow inside the pulmonary artery on echocardiography [2, 7]. But anomalies of the blood vessels that resembled on inspection view of PDA have been reported in a dog [12]. In that case, the shunt existed between the bronchoesophageal artery and the pulmonary artery. It is difficult to diagnose with noninvasion examinations, because it is similar to PDA in terms of hemodynamics. Such a case is very rare but differential diagnosis by cardiac catheterization is required prior to surgical correction.

The present case was diagnosed as PDA on noninvasion examinations, but on cardiac catheterization the aberrant vessels were demonstrated thought to be a branch of the bronchoesophageal artery connected to the main pulmonary artery.

A 12-month old, 3.5 kg female Miniature Dachshund was presented for evaluation of cardiac murmur. The dog was referred to the Azabu University Veterinary Teaching Hospital for further examination and treatment.

Physical and biochemical examinations yielded normal findings, except a grade III/VI machinery murmur heard on the left side of the base of the heart. Electrocardiography revealed the presence of P pulmonale (Fig. 1). Phonocardiography showed a continuous murmur heard loudest at the time of the second heart sound (Fig. 2). Thoracic radio-
signs of the disorder were observed. Furthermore, thoracic radiographs (VHS: 10.2\%, CTR: 72.6\%) and echocardiographs (FS: 36.5\%, EF: 69.9\%) taken 1 year later did not reveal any reduction in cardiac function.

Examination of the angiocardiogram and echocardiogram and measurement of blood gases revealed a left-to-right shunt between the artery and pulmonary artery in the dog, but the shunt vessel was not diagnosed as a PDA based on anatomical evaluation; it appeared most likely to be an aberrant branch of the bronchoesophageal artery. The bronchoesophageal artery usually arises from the right fifth dorsal intercostal artery and plays a role in supplying nutrients to the trachea and esophagus [3], but sometimes congenital diseases such as pulmonary hypoplasia, pulmonary atresia and acquired diseases such as heartworm and pulmonary infarction which cause the bronchoesophageal artery to develop and shunt into the pulmonary artery [6, 10, 11, 14]. In this case, although pulmonary hypoplasia and pulmonary stenosis were not observed during either the radiographic or the echocardiographic examination, the possibility of congenital left-right shunt could not be ruled out. Moreover, the presence of microfilaria was not confirmed and no pulmonary lesion was observed. An organic substance may be present in the lung, because of the apparent development of the bronchoesophageal artery.

In any event, shunting of anomalous vessels clinically resembling PDA is very rare. A very similar vascular anomaly has been reported in two other dogs. In one case, postmortem examination confirmed that the bronchoesophageal artery was shunting into the main pulmonary artery. The abnormal shunt observed was similar to the one observed in the present case [4]. In another case, a PDA was diagnosed in a dog based on physical examination and echocardiography with thoracotomy, but instead of the PDA the anomalous development of a vessel was observed, that appeared to be a bronchoesophageal artery shunting into the main pulmonary artery. The abnormal blood vessel was ligated, the resultant postoperative recovery was uneventful and the cardiac murmur disappeared [12]. The abnormal vessel shunt in the present case appeared to be the bronchoesophageal artery with highly complicated branches. Ligation of all the shunting vessels appeared to be too difficult to perform.
Moreover, ligation of the main shunting vessel could have led to compensation by the other branches so that thoracotomy was not conducted in the present case.

With rare exceptions, diagnosis of PDA can be made by physical examination, radiography and echocardiography without resorting to angiocardiography. Nevertheless, in this case, although auscultation, phonocardiography and echocardiography suggested PDA, a shunting blood vessel different from the arterial duct was confirmed. A continuous murmur sometimes is also observed in other conditions such as aortopulmonary window, coronary artery fistula and coarctation of the aorta [13]. Furthermore, reports indicate that aortopulmonary window and coronary artery fistula exhibited clinical sings similar to those observed in PDA [1, 8, 9]. It is also difficult to demonstrate the arterial duct by means of two-dimensional echocardiography.

Fig. 3. Thoracic radiographs showing mild cardiomegaly (VHS: 10.6v CTR: 73.3%). (a) Lateral view (b) Ventral-Dorsal view.

Fig. 4. Two-dimensional and Doppler echocardiography confirming shunt flow in the pulmonary artery.

Fig. 5. (a) Angiocardiography was performed with a catheter inserted into the left carotid artery reaching almost to the aortic valve. The bronchoesophageal artery and other blood vessels with complicated branches were shunting into the pulmonary artery. (b) Close up image.
Therefore, most of the case are diagnosed as PDA by confirmation of the shunt blood flow view inside the pulmonary artery, but it is impossible that the shunt flow in the pulmonary artery as in the present case and PDA flow are distinguished by two-dimensional echocardiography. Surgical correction should therefore be preceded by cardiac catheterization to confirm the presence of PDA.

REFERENCES