**NOTE** ***Internal Medicine***

# Double-Chambered Right Ventricle in a Dog

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ABSTRACT. A 32-month-old spayed female Pug was referred for an MRI study due to convulsions. The MRI examination indicated encephalitis. However, echocardiography and pathological examinations revealed that this case had a ventricular septal defect and double chambered right ventricle which is a rare congenital heart disease in the dog. An anomalous muscle bundle crossed the right ventricular outflow tract, dividing the right ventricle into 2 chambers.—KEY WORDS: canine, DCRV, VSD.

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Double chambered right ventricle (DCRV) is a rare congenital heart disease humans and dogs, where an anomalous muscle bundle divides the right ventricle into two chambers. This paper describes a case of DCRV in a dog. A 32-month-old, spayed female Pug was referred to the Nihon University Animal Medical Center (ANMEC) for a magnetic resonance imaging (MRI) study due to convulsions which had persisted over two-month period. The dog was being treated with prednisolone (2 mg/kg BID), chloramphenicol (50 mg/kg BID), phenobarbital (2 mg/kg BID), and enalapril (0.55 mg/kg BID).

Clinical examination revealed that the heart rate was 140 beats/min with a heart murmur (5/6 Levine) on the left side of the sternum in the region of pulmonary arterial valve. Hemogram and serum biochemistries were within normal values. Electrocardiography, thoracic radiography and echocardiography were done before the anesthetic procedure for the MRI. On the electrocardiogram, there was a right axis deviation (120°) and prominent P waves in II lead (0.5 mV). In a lateral radiograph of the thorax, an enlargement of the right ventricle was observed, and an enlargement of the right and left ventricles was indicated in the D-V view. During the echocardiographic examination, abnormal blood flow in the right ventricle was observed, indicating a ventricular septal defect (VSD). At the right ventricle outflow tract (RVOT) level, blood reflux was observed (0.6 m/s, pressure gradient 1.44 mmHg), suggesting pulmonary valve regurgitation, and a valve like structure located below the pulmonary valve was also detected (Fig. 1). From these findings, it was supposed that the right ventricle was divided by an anomalous muscle bundle and the hypertrophy of the right ventricle had been caused by anomalous muscle bundle.

The MRI examination indicated encephalitis in the

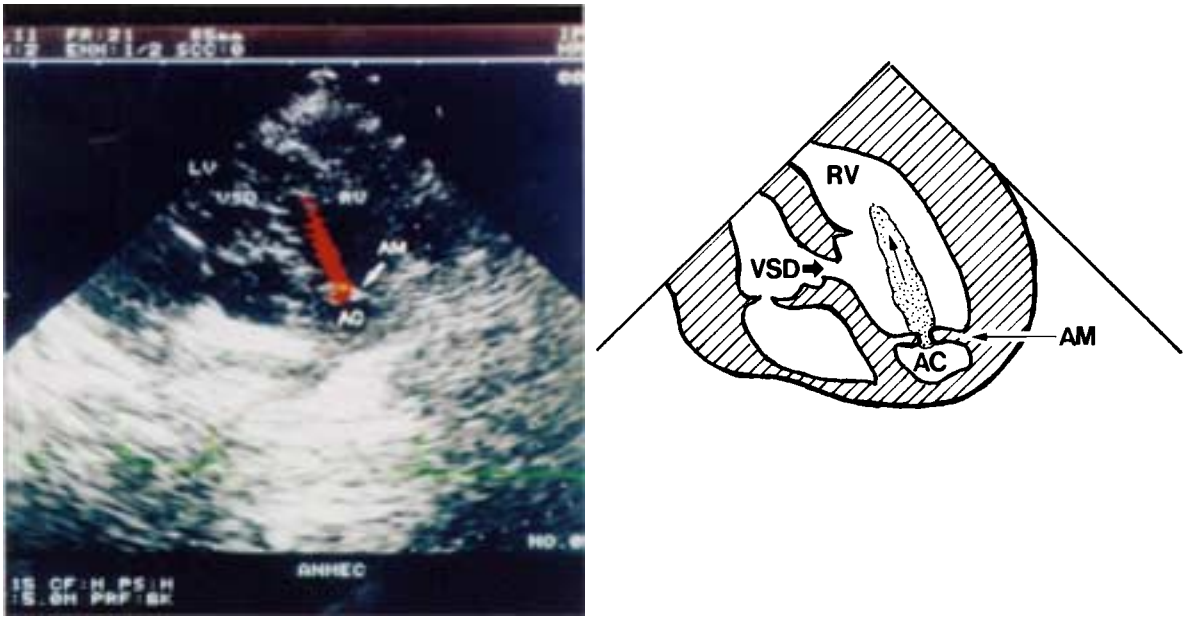


Fig. 1. Echocardiography (regurgitation). This color-flow doppler shows regurgitation across the anomalous muscle bundle (AM). AC: accessory chamber, RV: right ventricle, LV: left ventricle, VSD: ventricular septal defect.

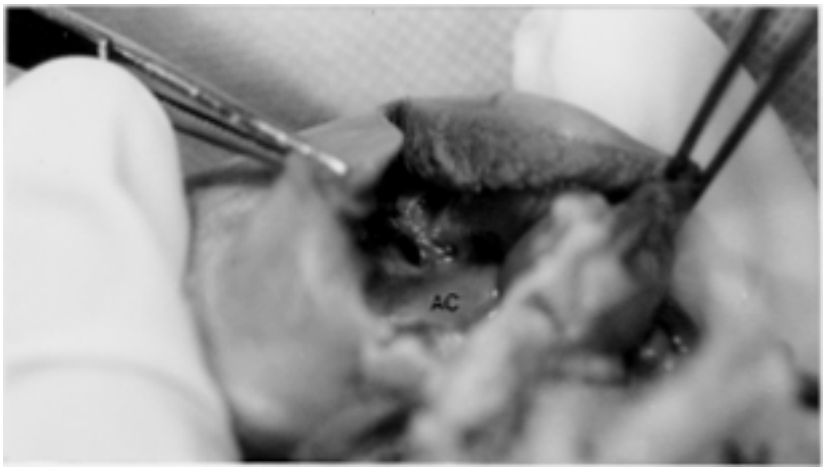


Fig. 2. Necropsy (DCRV). Anomalous muscle bundle observed from the pulmonary artery side. The orifice in the anomalous muscle bundle has 1X3 mm in diameter. AC: accessory chamber.


Fig. 3. Hypertrophic right ventricle (arrowhead). RV: Right Ventricle.

parietal and temporal lobes and enlargement of the ventricles. The dog was euthanasiated 40 days after the MRI examination because its convulsions had worsened. At necropsy, anomalous muscle bundle was found in the right ventricle. This anomalous muscle bundle had an orifice which was 1 mm × 3 mm in diameter (Fig. 2). Hypertrophy of the right ventricle (Fig. 3) and a 5 mm × 6 mm orifice of VSD were confirmed.

DCRV is a rare congenital heart disease in humans, dogs and cats. DCRV is associated with VSD in 73–90% of cases [1, 2, 4, 9]. However, it is often associated with other cardiac anomalies, such as pulmonic stenosis [2, 9], tetralogy of Fallot [2], atrial septal defect (ASD), cor triatriatum and dextrocardia [1, 3]. In humans, obstruction of RVOT usually occurs as infundibular pulmonary stenosis or pulmonic valve stenosis. Anomalous muscle bundle occurs less frequently [1], dividing the right ventricle into two chambers. One is an inflow high-pressure chamber that localizes at RVOT and the other is an outflow low-pressure chamber distal to the muscular bands (Fig. 4) [5]. Progressive obstruction caused by an anomalous muscle bundle causes a high-pressure gradient in the right ventricle [3, 9]. For example, in the case of VSD, blood flow from the orifice could make the anomalous muscle bundle in the right ventricle wall. This progressive obstruction can be observed with serial catheterization [3, 6, 9].

It is important to differentiate the DCRV from other causes of obstruction of the right ventricular outflow tract (i.e. pulmonic stenosis) [11]. The accurate diagnosis of DCRV is necessary due to possible surgical implications. Surgical intervention based on false diagnosis can cause death of the patient [1, 3]. There are no pathognomonic clinical features, but the most common clinical features are cardiac murmur that is found at the left side sternum. There

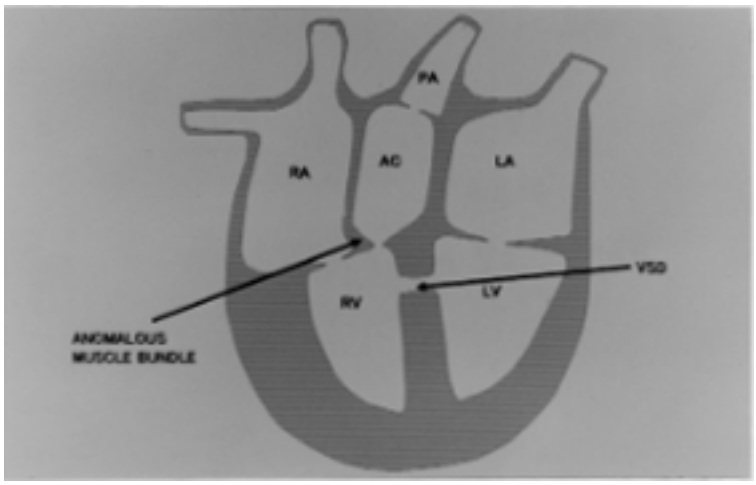


Fig. 4. Illustration of DCRV. AC: Accessory Chamber, RA: Right Atrium.

is a systolic thrill at the same place [5]. This case had murmur and thrill at same position as this report. Angiocardiography is considered as the ideal technique to diagnose low infundibular stenosis of the right ventricle [5]. It should be performed in two planes, because the stenosis may not always be seen in one plane [5]. In this case we could not have a chance to perform the Angiocardiography. Two-dimensional echocardiography can provide accurate and detailed findings about the anatomic features of the obstructing muscle band in the right ventricle cavity [4]. Using different planes, one can recognize the number, size, and position of the muscle bundles [4]. Color flow echocardiography can define the position of the intraventricular flow, and Doppler echocardiography will allow an accurate hemodinamic evaluation of degree of obstruction [4]. Similar findings to the reports of these echocardiographies were seen as for this case. Therefore, this case was diagnosed as the double-chambered right ventricle. It seemed that the antemortem diagnosis of DCRV could be diagnosed by doing the echocardiography. After the surgery, the patient can develop complete or incomplete cardiac bundle branch block or cardiac arrhythmia. In human the surgery is curative and has an excellent prognosis.

Because of progressive convulsion, the owner chose euthanasia in this case. Therefore, we could not follow this case to observe if the dog would develop some clinical features, if the obstruction progressed. Histopathological examination of the brain indicated a focal encephalomalacia, suggesting that the convulsion in this case might be due to encephalitis not to DCRV.

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