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Case Report

Use of ECG-gated computed tomography, echocardiography and selective angiography in five dogs with pulmonic stenosis and one dog with pulmonic stenosis and aberrant coronary arteries

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Abstract Pulmonic stenosis (PS) is the most common congenital cardiac disease in dogs. Boxers and English bulldogs are among the most commonly affected breeds and also commonly associated with an aberrant coronary artery (CA). If an aberrant CA is suspected and balloon valvuloplasty indicated, an intra-operative angiography is recommended prior to the procedure. ECG-gated computed tomography (CT) can be used to screen for CA anomalies in a quick and minimally-invasive way (preventing side effects associated with selective catheter angiography) and allowing early planning of the procedure. The aim of this case series was to report CT findings associated with PS diagnosed by echocardiography. Our database was retrospectively searched for cases of dogs with PS diagnosed by echocardiography, where an ECG-gated CT was performed. A total of six cases were retrieved: all were diagnosed with severe PS. Four dogs had concurrent congenital defects: two dogs had a patent ductus arteriosus, one dog had a ventricular septal defect and an overriding aorta, one dog had an aberrant CA. Detailed CT findings of all cases were reported, including one case of a patent ductus arteriosus and an overriding aorta not identified by

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transthoracic echocardiography. In addition, an abnormal single left coronary ostium, with a pre-pulmonic right CA was described. In conclusion, despite echocardiography remaining the gold standard for diagnosis and assessment of PS, ECG-gated-CT angiography is a complementary diagnostic method that may provide additional relevant information, shorten surgery/anaesthesia time and reduce the amount of radiation to which the clinician is subjected.

Abbreviations

BVP	balloon valvuloplasty
CA	coronary artery
CT	computed tomography
CTA	computed tomography angiography
ECG	electrocardiogram
HR	heart rate
MPA	main pulmonary artery
PDA	patent ductus arteriosus
PG	pressure gradient
PS	pulmonic stenosis
PSD	post-stenotic dilatation (of the pulmonary trunk)
PV	pulmonic valve
PVa	pulmonic valve annulus
RV	right ventricle
RVOT	right ventricular outflow tract obstruction
TOE	trans-oesophageal echocardiography
TTE	trans-thoracic echocardiography
VSD	ventricular septal defect

Case 1

A 3-month-old female entire English bulldog was referred for investigation of an asymptomatic grade V/VI systolic, left-basilar murmur.

Echocardiography[a] revealed severe type A pulmonic stenosis (PS) and a perimembranous ventricular septal defect (VSD) with exclusively left-to-right shunting (confirmed on echocontrast study; Table 1-Supplementary-material).

A retrospective electrocardiogram (ECG)-gated-computer tomographic angiography (CTA)-coronary[b] was performed to screen for aberrant coronary arteries (CAs). The right and left CA (including its circumflex and paraconal interventricular branches) were normal. The computed tomography (CT) showed valvular PS, with severe post-stenotic dilation (PSD) of the main pulmonary artery (MPA; Fig. 1-Supplementary material), severe dilation of the right atrium (RA) and severe right ventricle (RV) hypertrophy. A VSD (approximately 10-mm defect) in the perimembranous region of the interventricular septum and an overriding aorta were also evident (Table 1, Table 2-Supplementary-material; Fig. 1).

Balloon valvuloplasty (BVP) was performed; RV pressure was directly measured initially at 103-mm Hg. An intra-operative right ventricular outflow tract (RVOT) angiogram confirmed the PS and PSD (Table 1). RV pressures post-BVP were 100-mm Hg, but due to the severity of arrhythmias associated with catheter manipulations in the heart, no more inflations were performed.

Serial echocardiographic assessments over the following 3 months showed consistently severe PS. When syncopal episodes were reported, a second BVP was recommended. The dog died from asystole during the procedure.

Case 2

A 7-month-old male entire French bulldog was referred for investigations of cough and a grade IV/VI left and right basilar, systolic murmur.

Doppler echocardiography showed severe type A PS (pulmonic flow velocity 7.7 m/s, pressure gradient (PG) 240 mm Hg) with evidence of dynamic RVOT obstruction (Table 1-Supplementary-material). Thoracic radiographs showed a mildly enlarged and globoid cardiac silhouette without any evidence of PSD.

A retrospective ECG-gated-CTA-coronary was performed. This showed two normal CA. There was valvular PS with thickened and dysplastic valve leaflets, mild PSD of the MPA and moderate RV hypertrophy (Table 1, Table 2-Supplementary-material; Fig. 2).

[a] Vivid 7 (General Electric Medical System, Wisconsin, USA).
[b] Toshiba Aquilion Prime (Toshiba Medical Systems, Japan).

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