Successful correction of pulmonic stenosis in a Bulldog with aberrant right coronary artery

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Introduction

Pulmonic stenosis (PS) is one of the most common congenital cardiac diseases in dogs (8,10). Based on the location of stenosis, the PS is classified as supravalvular, valvular and subvalvular PS (9). It is also classified based on the severity as mild, moderate and severe type according to pulmonary pressure gradient (3). The good choice of treatment is performing balloon valvuloplasty (BV) which is proved to extend the longevity (4, 6). An aberrant coronary artery with left coronary arising from the single right one can cause stenosis by circling around pulmonic valve. Although the fatal correction using balloon valvuloplasty were reported (7), the procedure is still necessary in some cases.

Case History

A one-year old, intact male, Bulldog weighing 23.5 kg with cardiac cachexia was presented to the Small Animal Teaching Hospital, Faculty of Veterinary Science, Chulalongkorn University, Bangkok, Thailand, due to a history of murmur heart sound, frequent ascite, anorexia, depress, and exercise intolerance. Further physical examination revealed left heart base systolic murmur grade 3/6 with HR 80 bpm, increased inspiratory effort with normal lung sound with respiratory rate of 32 breath per minute. The abdominal distension was not found due to prior abdominocentesis (Figure 1). Electrocardiography (ECG) indicated respiratory sinus arrhythmia with deep S wave. Echocardiography showed type A pulmonic stenosis (pulmonic pressure gradient = 135.44 mm Hg and pulmonic flow velocity = 5.82 m/s) with severe right atrial enlargement and thickening of right ventricular wall. Due to a chance of an aberrant coronary artery in Bulldog breed, a cardiac ECG-gated computed tomography (CT) was performed, and the results showed pulmonic valve stenosis and dilated main pulmonary artery and branches (Figure 2). A single left coronary system and a pre-pulmonic right coronary artery, a rare type of an aberrant coronary artery (11), was also revealed (Figure 3). One month later, the dog lost more weight and developed atrial fibrillation with suspected some blood clot within right atrium from echocardiography. Blood test revealed normal complete blood count. The kidney and liver panels were within normal limits, but plasma albumin was low (2.5 g/dl). The dog showed sign of peripheral edema.

Assessment

The PS correction by fluoroscopic guided-balloon valvuloplasty was performed at the Small Animal Teaching Hospital, Faculty of Veterinary Science, Chulalongkorn University. The methods of anesthesia and recovery were followed the standard procedure as previously described (2). A 10 mm diameter balloon catheter was used. The procedure was successful by elimination of balloon waist at stenotic area (Figure 4).
The pulmonic pressure gradient was significantly reduced to 77.75 mm Hg and pulmonic flow velocity = 4.4 m/s, without clinical complication.

Figure 3 Imaging of heart obtained from cardiac ECG-gated computed tomography showed the aberrant right coronary artery which courses around pulmonic trunk (arrow).

On the next day, dog was discharged with angiotensin converting enzyme inhibitor, diuretic, and anti-platelet aggregation medications. Abdominocenteses with 500-1400 ml of serosanguinous fluid were performed weekly in the first month after procedure. Increased protein intake was recommended resulting in increased plasma albumin (3.0 -3.3 g%). Five months after the procedure, the pulmonic pressure gradient was improved to 68.02 mmHg and pulmonic flow velocity was reduced to 4.12 m/s. Digoxin was prescribed to slow ventricular rate. The abdominocentesis was not further required.

Figure 4 The fluoroscopic imaging showed the balloon presented at the area of pulmonic valve before (A) and after valvuloplasty (B)

Discussion
This is the first report of performing BV in dogs with an aberrant coronary artery in Thailand. Reports of various breeds of PS were found (3). However, in some breeds especially in Bulldog, the risk of performing BV is high since most of them had left coronary originating from a single right coronary artery which constricted the right ventricular outflow tract (RVOT) in a band-like fashion at the level of pulmonic valve (1) or at subvalvular level. The right side congestive heart failure was developed in this dog with signs of congestion, and abdominocentesis was required. However, falling in serum albumin made the dog more ascites and BV could not be avoided. The caution was made on valve to balloon ratio due to an aberrant coronary artery. A previous report showed that BV could cause sudden death in this breed due to tearing of the coronary artery (7). Balloon-to-valve hinge-point diameter ratio was carefully selected to be approximately 1.0 instead of a usual size of 1.5, to reduce the risk of the coronary artery avulsion during the balloon valvuloplasty. Because the procedure is quite difficult to perform and the high risk of death during the procedure, it is unlikely to perform the BV in Bulldog with aberrant coronary artery. Only 4 cases were achieved with minor reduction of pulmonary velocities (5). However, the procedure herein is successful with dramatic reductions in pressure gradient and clinical signs without complication. Moreover, the clot in the right atrium was disappeared at 2 weeks after procedure and abdominocentesis was not further required after 5 months later. The dog’s weight was improved. At present, the dog has good quality of life while maintained on cardiac drugs and high dietary protein intake.

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