ECG Quiz

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A one-year-old intact male Chihuahua weighting 2.0 kg was present to Small Animal Teaching Hospital, Chulalongkorn University, Bangkok, Thailand, with history of heart murmur. The dog had no remarkable clinical signs related to cardiovascular disease such as coughing, exercise intolerance or syncope. From physical examination, the heart rate and respiratory rate were 128 and 42 per minute, respectively. Blood test was within normal limits. The electrocardiograph was recorded as shown in Figure 1. The thoracic radiograph revealed cardiomegaly (VHS = 10.4) with an enlargement of main pulmonary artery. Mild interstitial pattern of caudal lung lobe was found.

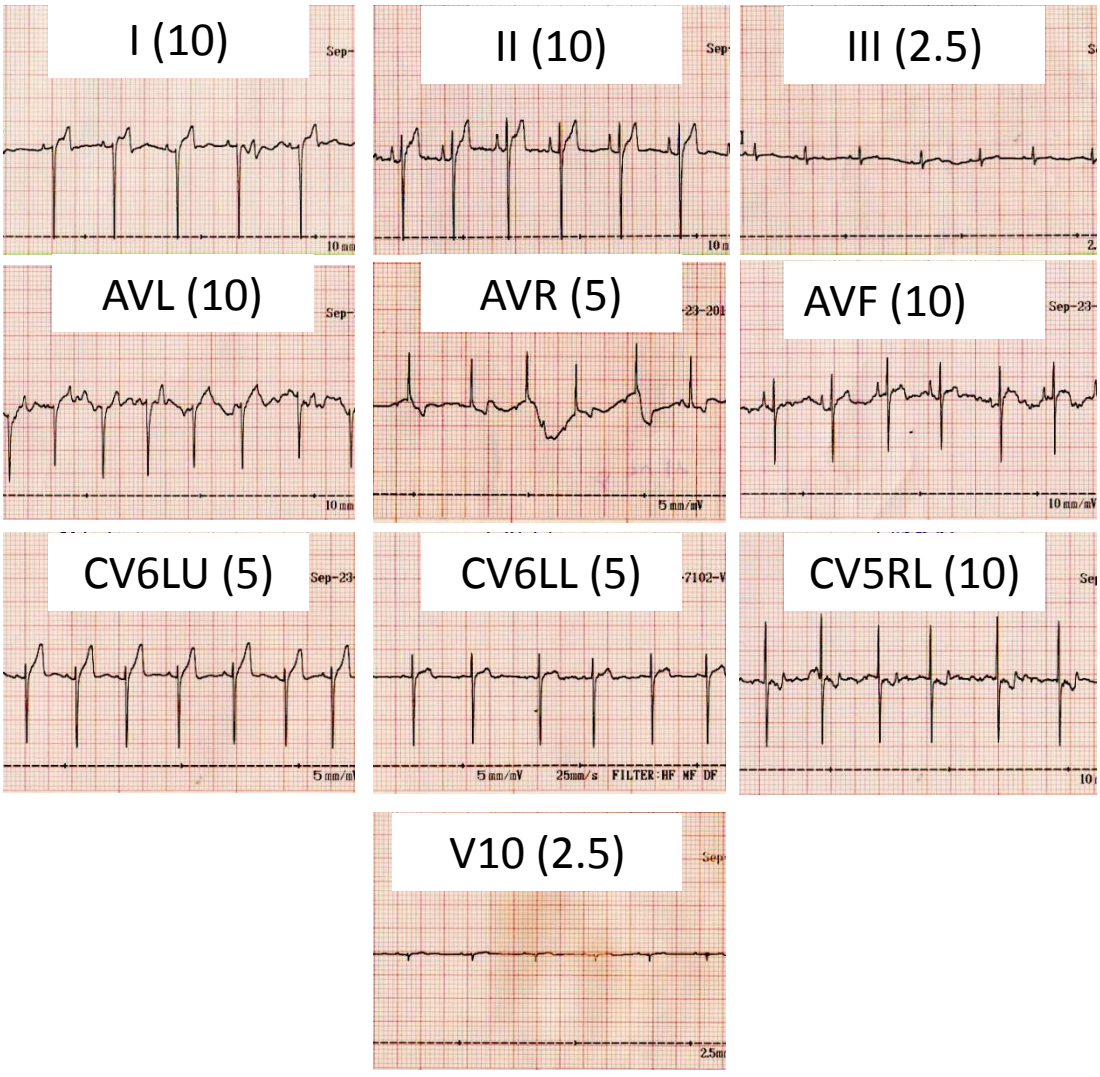

Figure 1 All ECG leads which were recorded from a dog with pulmonic stenosis. Numbers in the parenthesis indicate the sensitivity of recording (mm/mV)

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The echocardiography was performed and the diagnosis of pulmonic stenosis was established. The dog was sent to be further investigated for aberrant right coronary artery using CT scan. The anesthesia was performed and ECG recording was recorded continuously during the procedure as shown in Figure 2. The result showed no aberrant vessels and ballon valvuloplasty was performed with successful results.

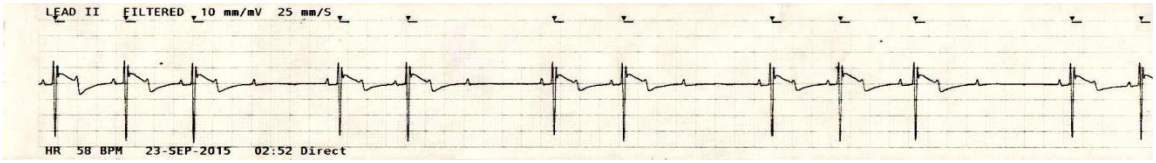

Figure 2 The lead II ECG recorded during anesthesia for computer tomography (CT)

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Interpretation

Figure 1 **Normal sinus rhythm with deep S-wave**
Figure 2 **Second degree atrioventricular block**

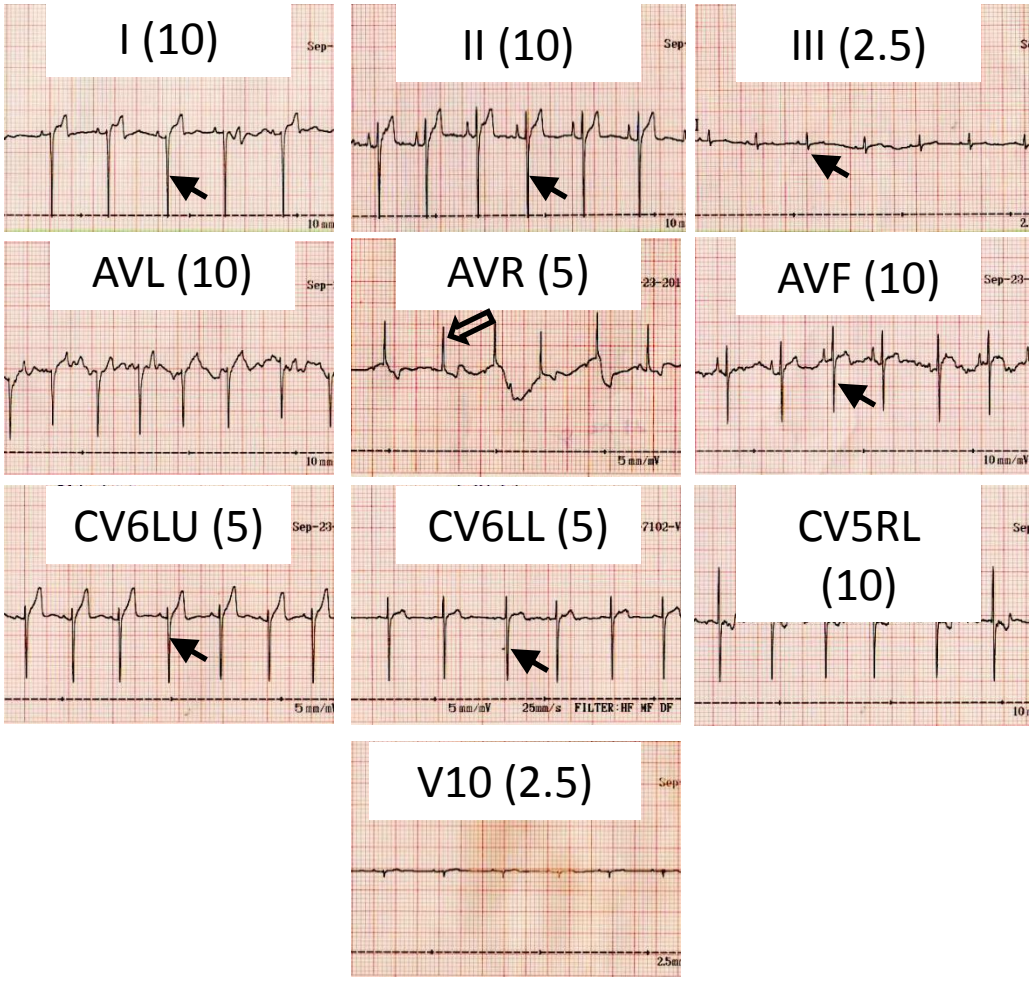

Figure 1

Figure 1 showed ECG in dog with congenital pulmonic stenosis. The right ventricular hypertrophy (RVH) was seen both from thoracic radiograph and echocardiography. The criteria of RVH were the negative deep S-waves in lead I, II, III and AVF (solid arrows). The mean electrical axis was -166° which indicated the right axis deviation in the upper right quadrant in frontal plane (normal range; 0-104°). The positive QR wave was seen in lead AVR (open arrow). The deep S wave was also seen in left precordial leads (CV6LL and CV6LU) (solid arrows). The shape of ECG in lead V10 was still normal since the cardiac vector was still downward toward the front of the chest as normally seen in normal dog. The right ventricular hypertrophy was seen in dog with pulmonic stenosis since the pressure at pulmonic valve will be abnormally high and the myocardium is remodeling for overcome the higher afterload. In this case, the pulmonary-ventricular gradient was >144 mmHg at the first time of examination. The treatment included the dilation of pulmonic valve which was performed using the balloon valvuloplasty under fluoroscope.

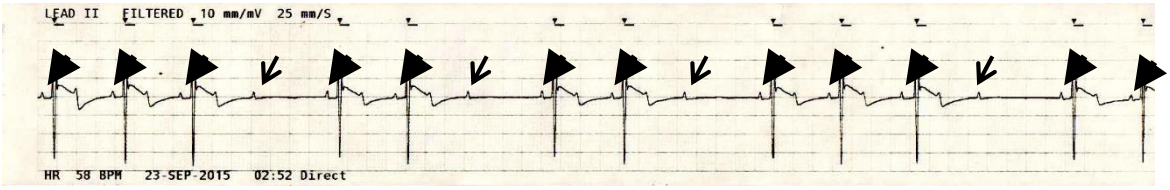

Figure 2

The dilation of balloon at pulmonic valve needs the verification of the existence of aberrant right coronary artery. This vessel stayed around the main pulmonary trunk and will be harmful for balloon dilation procedure. The vessel tear will be a cause of death due to bleeding. The CT scan was performed in this dog to verify the existence of this vessel. During anesthesia for CT scanning, the ECG was monitored and the ECG waveforms were shown in figure 2 with a periodic pause without QRS complexes. Some non-conduct P waves were seen (thin arrows) suggesting the second degree atrioventricular block. The conducted P wave (thick arrows) were followed by constant PR intervals. Thus, the AV block was not Mobitz type I. After recovery from anesthesia, the ECG waveforms were the same as seen in figure 1 without the AV block. The results of CT revealed no aberrant right coronary artery. Therefore, the balloon valvuloplasty was performed a week later. Beta-adrenergic blocking agent was prescribed in order to reduce the heart size. The dog showed more energetic with no other clinical signs after the procedure. The cardiac performance evaluated 1 month later after valvuloplasty was improved with reduction in right pulmonary ventricular pressure gradient (136.44 mmHg).