ECG Quiz

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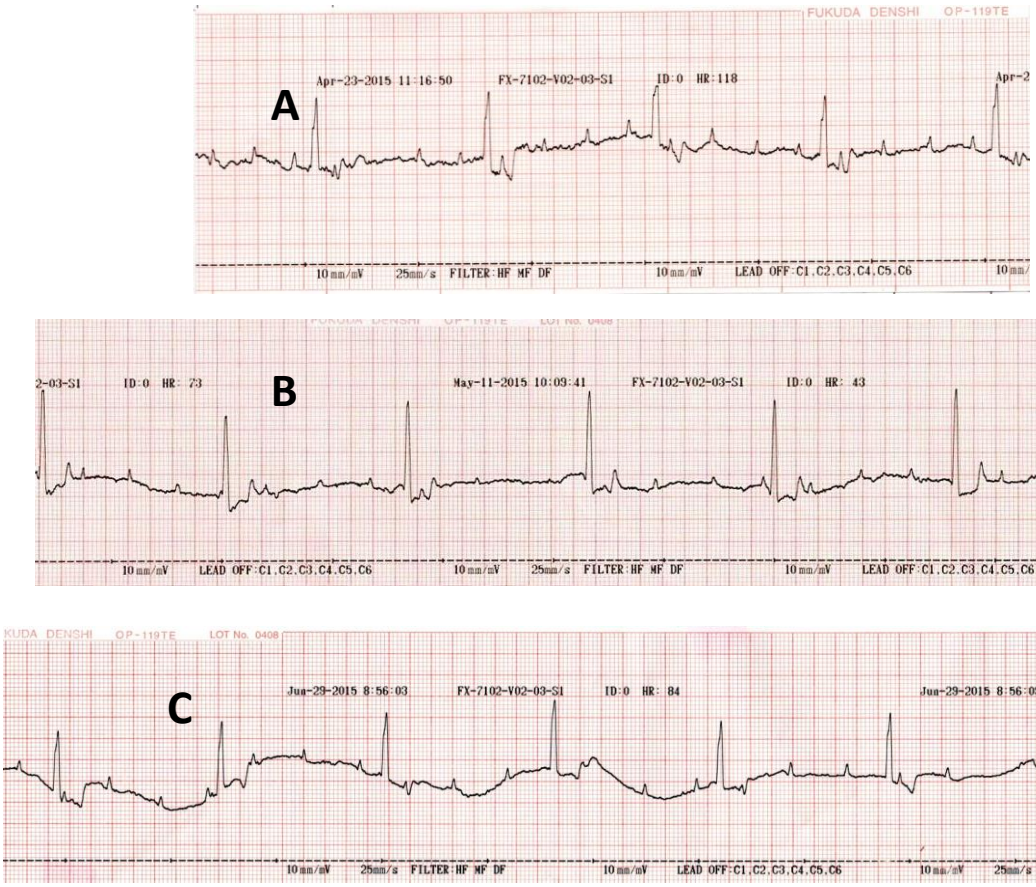

An eleven year old pug male dog, with a body weight of 10.2 kg, was taken to the Small Animal Teaching Hospital, Chulalongkorn University, Bangkok, Thailand, on April 2015 for his chronic coughing, panting, and exercise intolerance without anorexia. Physical examination, revealed that dog was easily excited with HR of approximately 118 bpm without murmur. The electrocardiogram was performed and shown in tracing A. The thoracic radiograph showed cardiomegaly with VHS 12.3, mild lung edema, tracheal collapse and multiple vertebral spondylosis. Blood test results were within normal limits except a slight increased in total white blood cell count. Bronchodilator, aminophilline with furosemide, enalapril and prednisone were prescribed.

However, one week later, the dog had vomiting and severe panting due to excitement. His systolic blood pressure was 170 mmHg. He also had hyperthermia and abdominal pain. The dog was admitted to correct the electrolyte imbalance and also mild azotemia along with oxygen and antibiotic therapy for 3 days with improvement.

The ECGs were recorded a week and one 1.5 month later after discharge as shown in tracing B and C, respectively. The dog's clinical signs were stable with medications. Further investigations such as echocardiography and planning for arrhythmia correction will be informed to the owner on the next visit.

Please answer before turning to the next page.

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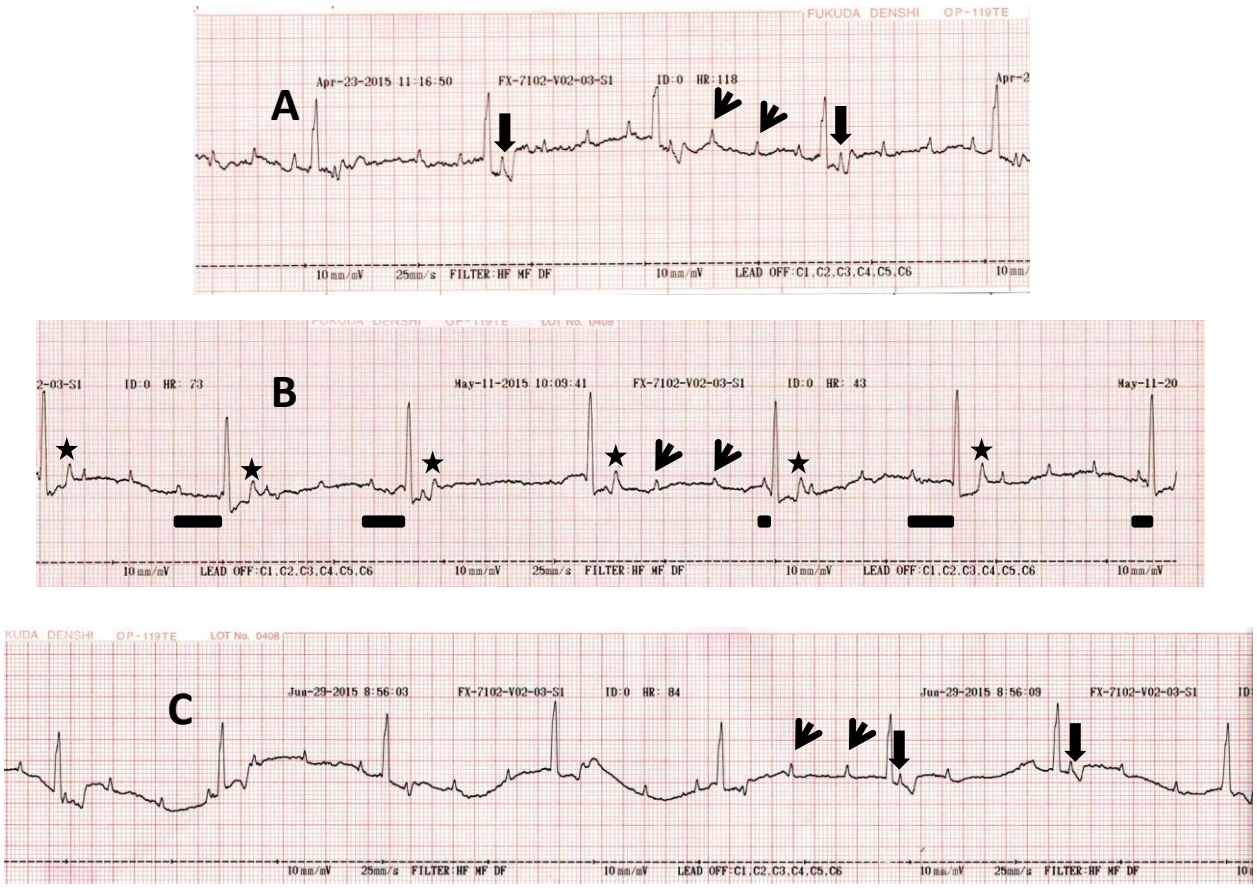
Interpretation

Tracing A, B and C Third degree atrio-ventricular block with junctional escape rhythm



The ECG recording in all tracings showed the multiple p-waves (small arrows) preceding the QRS complexes. This pattern was corresponding to the atrioventricular (AV) blockade. The QRS complexes showed a positive deflection with a shape resembling the normal QRS wave arisen from normal sequential depolarization inside the ventricle. The T-wave following QRS complexes in tracing B was seen (stars) even though they were superimposed with p-waves in tracing A and C (big arrows). However, tracing B showed inconsistent intervals between p-waves and QRS complexes (solid lines). Thus, the PR interval does not exist and ventricular depolarization was independent from atrial depolarization from SA node. Therefore, the impulses generated from normal sino-atrial node could not absolutely pass through the ventricle resulting in an independent contraction of atrium and ventricle with different rate. The atrial rate was approximately 120 beats per minute while ventricular rate was approximately 40 beats per minute. The complete AV blockade makes the term called "third degree AV block".

Since the shape of QRS complexes was similar to normal impulses travelling through the bundle of His, the ectopic pacemaker was at the AV node. The escape beats were seen with regular rhythm as they arise at the ectopic pacemaker between atrium and ventricle. Thus, the terminology of junctional escape rhythm was addressed.

Although the blood pressure was still maintained, the cardiac output may be abruptly changed after intense exercise. The most common clinical signs for AV dissociation are weakness and periodic collapse. If the AV node could not generate impulse, the ventricular tissue may become the ectopic pacemaker with even more lower rate.

The congestive lung signs should be evaluated along with heart function and body water status since signs of dehydration and azotemia were encountered after the dog receiving angiotensin converting enzyme inhibitor and diuretic. More further tests should be performed such as echocardiography to evaluate the organic heart function especially the force of cardiac contraction and the condition of all valves. If third degree AV block was still persisted, the atropine challenging test should be done to rule out the presence of vagal overactivity. The respiratory signs related to tracheal stenosis may be corrected with some bronchodilator and periodic supplement with anti-inflammatory agent such as steroid when needed. If the ventricular rate was slow down with progressive clinical signs, an attempt of artificial pacemaker implantation should be considered.