ECG Quiz

Chollada Buranakarl[1*] Anusak Kijtawornrat[1]

Sirilak Disatian Surachetpong[2] Pakit Boonpala[3]

A ten-year-old spayed female schnauzer weight 7.6 kg was referred to the Small Animal Teaching Hospital, Chulalongkorn University, Bangkok, Thailand, with arrhythmia and history of periodic syncope several times a day. Physical examination revealed that the dog was well-hydrated with pink mucus membrane and CRT was less than 2 sec. From cardiac auscultation, the dog had systolic murmur with bradycardia (heart rate was 48 beats/minute). Blood test was within normal limits. Echocardiography revealed that the dog had moderate left atrial and ventricular enlargement with fractional shortening of 31%. The LA/Ao was 2.18. The degenerative mitral valve disease was diagnosed with moderate mitral regurgitation. The left ventricular systolic function was still normal. However, the arrhythmia with several long pauses were found during the examination.

The continuous 24 hour ECG recording was performed using the holter device and some parts of ECGs were shown in Figure 1 and 2

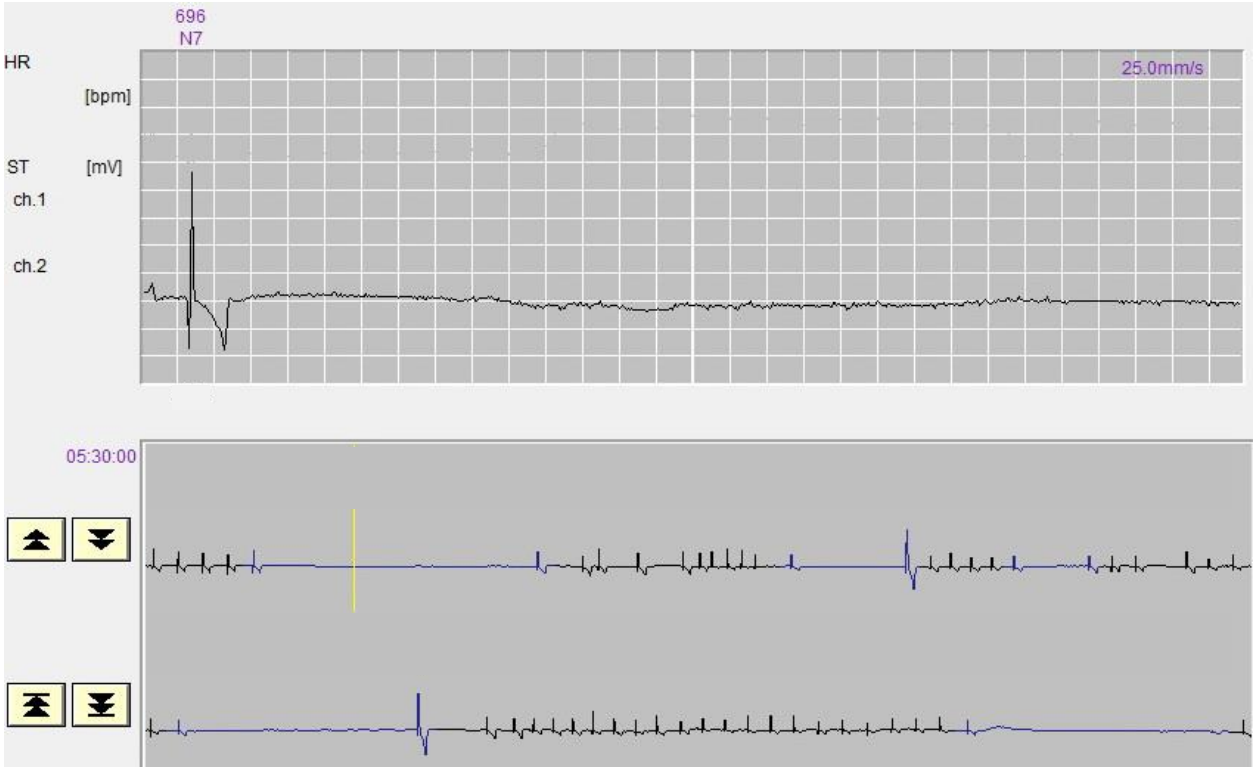

Figure 1 One ECG complex obtained from holter device (upper) at the point of marker line shown during continuous recoding (lower)

[1]*Department of Veterinary Physiology,* [2]*Department of Veterinary Medicine,* [3]*Small Animal Teaching Hospital, Faculty of Veterinary Science, Chulalongkorn University*

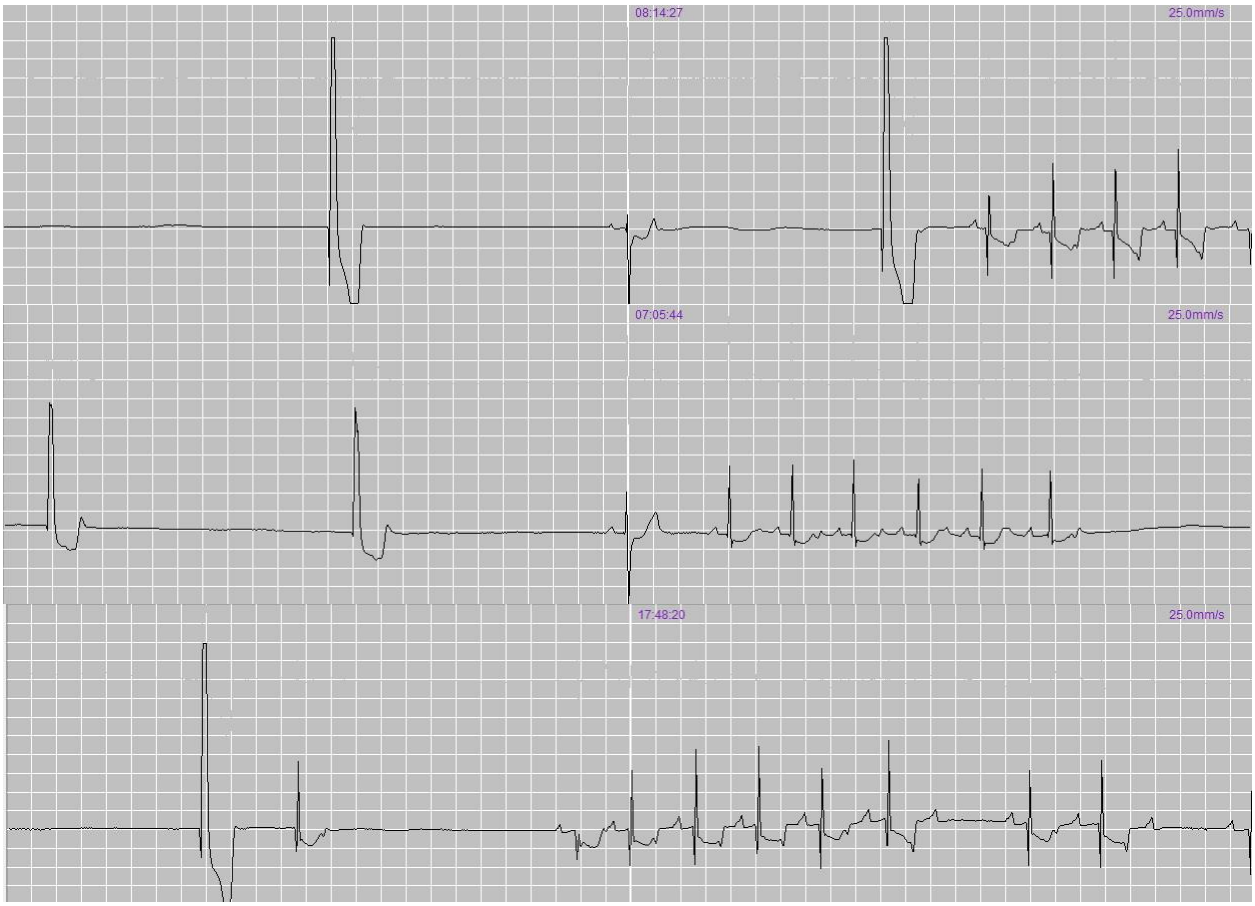

Figure 2 Some ECG recordings obtained from 24 hr holter device

Please answer before turning to the next page.

Interpretation

Figure 1 **Sinoatrial pause**
Figure 2 **Sinoatrial pause with ventricular escape beats and periodic second degree atrioventricular block**

ECG from holter device revealed the dog had bradycardia with the average heart rate of 58 beats/min within 24 hour period. The lowest heart rate was 34 while the maximal was 113 beats/min. The longest pause was 7.7 seconds. From Figure 1, the P-QRS complex was followed by a long pause. Several pauses were found within short time period. The pause was at the level of SA node since the P wave was not seen prior to the pause. Figure 2 revealed the big complexes originated from ventricle (big arrows). The duration between ectopic beats was 2.4 seconds which made the ventricular rate of 25 beats/min. One complex with the shape different from the complexes originated from ventricular and sinus in origin was found (small arrow). This complex had P-wave with negative deflection of Q-wave that may be corresponding to the periodic right bundle branch block. Moreover, the non-conducted P-waves were seen at the end of tracing (stars). Thus, the periodic second degree atrioventricular block was also encountered in this dog. The frequency of ventricular escape beats was 7,485 beats/24 hr suggesting that SA node stopped pacing more numerous times during the day. The holter device could record 8948 pauses with duration ≥ 2 seconds. Long pause will cause low blood pressure follows by syncope or loss of consciousness due to poor perfusion to the brain. In this case, the choice of treatment is cardiac pacemaker implantation. The cardiac pacemaker was implanted 3 days after admission. The operation went well without complication and the dog recovered within a few days. The syncope was resolved and the dog was more energetic and alert. The ECG was re-recorded on the fifth and on the 34th days after pacemaker implantation as shown in Figure below. Please notice the several ventricular ectopic beats (triangles). The duration of 2 consecutive ventricular ectopic beats (R-R interval) is 1 second corresponding to the rate of 60 beats/min that was set up and paced by pacemaker generator. The shape of the pacing complexes will be similar to the ventricular ectopic beats since the end of electrical lead was fixed into the endocardial wall of the right ventricle. In this case, the type of pacemaker generaotor was VVI which set the rate to be 60 beats per minute while the impulses will be discharged if its sense a long pause from ventricle more than 1 second. On the bottom tracing, one ectopic beat was preceded with positive P-wave which originated by SA node but the impulse may not be conducted throughout the ventricle since it fell into the refractory period of pacing impulse (dot). Moreover, some negative P-waves were found (arrows) following the ventricular ectopic beats generated from the pacemaker that may be a result of re-entry. In this case, successful treatment with pacemaker implantation can correct life- threatening situation due to SA node malfunction.


c-9-2015 11:45:07
FX-7102-V02-03-S1
ID:0 HR: 99
Dec-9-2015 11:45:13
FX-
mm/mV 25mm/s FILTER:HF MF DF
10 mm/mV
LEAD OFF:C1,C2,C3,C4,C5,C6
10 mm/mV
25mm/s FILTER:HF
Jan-12-2016 12:14:42
FX-7102-V02-03-S1
ID:0 HR: 75
Jan-12-2016 12:14:
C3,C4,C5,C6
10 mm/mV
25mm/s FILTER:HF MF DF
10 mm/mV
LEAD OFF:C1,C2,C3,C4,C5,C6
10 mm/mV
25mm/s