



# Av Node Disease AV block; AV reentry

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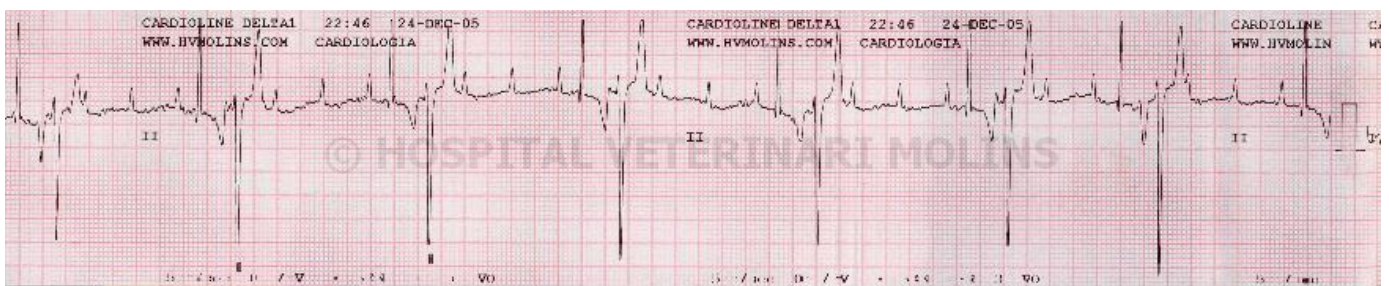
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## Introduction:

On the 24 of December 2004 PERLITA a 18 years old mixed breed bitch was presented at Hospital Veteriari Molins because of urinary problems. General examination was unremarkable except for a grade IV systolic murmur and bradycardia of 50 bpm.

The Internal Medicine department diagnosed an uncomplicated lower urinary infection with the specific diagnostic protocol and treatment.

Due to economic restriction the owner was not willing to purse the cause of the bradycardia. Despite of this a general ECG was performed.



## ECG examination:

What is the atrial frequency?



What is the ventricular frequency?

Are the P waves always followed by a QRS complex?

Has every QRS complex a P wave before?

What is the PR interval?

**Interpretation:**

The atrial frequency is of approximately 140 bpm. The ventricular frequency is of approximately 40 bpm. Not all P waves lead to a ventricular response with a QRS complex. All the QRS complexes have a P wave before. The PR interval is of approximately 25 ms. Not all QRS complexes are identical

This means that the atrium beats at a faster frequency than the ventricles so some of the atrial impulses are not conducted through the conduction pathways and are blocked. The normal impulse originates at the Sinus Node, transverse the atrial myocardium or the inter atrial conduction system, the Atrio-Ventricular Node, the Inter Septal Purkinje Fibers and then depolarizes the ventricular myocardium. The PR interval in the conducted P-QRS impulses has an increased duration and is of constant duration.

**Diagnosis:**

Second degree AV Block Tipo B

**ECG examination:**

Are all QRS complex identical?

**Interpretation:**

No, the QRS complexes exhibit 2 distinct morphologic patterns. ONE IS THE USUAL QRS COMPLEX AND THESE ARE ALWAYS FOLLOWED BY A P WAVE. THE OTHER ARE ABNORMAL QRS WAVES AND THESE DO NOT



HAVE A CONSISTENT P WAVE BEFORE. These QRS complexes are abnormal because they are not conducted through the normal conduction system. These can be of Ventricular origin but also from Supra-Ventricular origin. In case of Ventricular origin they can be generated anywhere in the ventricle. In case of Supra-Ventricular origin they are conducted anomaly through abnormal tissues like in the Wolf-Parkinson-White Syndrome or by diseased normal tissue Branch Blocks or infarcted myocardium.

**Hint:**

Measure the distance between the P wave the R wave (of the normal QRS complex) and The Negative and Positive waves (of the abnormal QRS complex).



**Interpretation:**

The distance is always the same!

This means that the P wave and the normal and abnormal QRS complexes are not independent. The fact that the P wave and the normal QRS complex are dependent we already know. What is the secret link between the P waves and the normal and abnormal QRS complexes?



### **Diagnosis:**

Atrio Ventricular node disease with second degree AV blocks, micro re-entry circuit, vertical dissociation and Ashman's phenomenon.

The abnormally functioning AV node blocks some of the impulses from the atrium to the ventricle (AV block), indeed the fact that the AV node is sick leads to a decrease in conduction velocity (increase P-R interval). When a P wave is conducted successfully through the AV node it does so at a reduced speed, this leads to a short circuit and the AV node automatically fires by itself a second time (micro re-entry). When this second impulse tries to reach the ventricles it encounters refractory conduction pathways because it arrived too early and the conduction tissues did not have time to recover (Ashman's phenomenon). Because of this these second impulses are conducted abnormally and originate to an abnormal QRS complex. Another possible localization for this micro re entry circuit would be at the level of the Purkinje fiber ramification but this would probably lead to a wider QRS complex.

### **Differential diagnosis:**

The differential diagnosis that lead to an AV Block are:

- Brachycephalic condition

- Sinus arrhythmia

- Increase vagal tone

- Idiopathic fibrosis

- Electrolytic disorders

- Any complication of myocardial disease- infectious, degenerative, infiltrative, neoplastic, paraneoplastic

- Drugs

- Congenital malformations



### **Conclusion:**

More specific diagnostic procedures are necessary to consider if Perlita is suitable for pacemaker implantation. The owner does not consider any therapeutic or diagnostic approach to the cardiovascular problem, since Perlita does not show any clinical signs.

### **Acknowledgements:**

“If I have seen farther than other man is because I stood in the shoulders of giants”

### **Bibliography**

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