CARDIOLOGY

AN ASYMPTOMATIC DOG WITH POTENTIALLY SEVERE HEART DISEASE.

WHAT IS YOUR DIAGNOSIS?

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HISTORY
A 2 year old, totally asymptomatic, intact male Boxer dog was presented for an annual vaccination, after having received previous vaccinations another veterinary clinic. His appetite and activity levels were reportedly normal. Physical examination revealed a perfectly normal looking, highly viable dog, of a normal body weight for dog’s size and breed. Mucous membranes were moist and pink with a normal capillary refill time. Femoral arterial pulses were regular, strong and full, with a heart rate of 132/min. The respiratory rate was 26/min and his rectal temperature is 38.7°C. Respiratory sounds were normal (“broncho-vesicular”) over all lung lobes and a Grade IV/VI systolic murmur was auscultated. The murmur was of the “diamond-shaped” type (also termed crescendo-decrescendo), indicating that it first gets louder and then becomes softer throughout each systolic event). The murmur was auscultated over the left hemi-thorax with the point of maximal intensity over the left heart-base.

An electrocardiogram (ECG) tracing was recorded from this patient while in right lateral recumbency, under no chemical sedation, using a 10 mm/mV calibration and a sweep-speed of 50 mm/sec. How can the ECG tracing assist you in narrowing down this list, or even making a definitive diagnosis?

ECG tracing (10 mm/mV calibration and a sweep-speed of 50 mm/sec)

Lead I:

Lead II:

Lead III:

Lead aVR:

Lead aVL:

Lead aVF:

For the diagnosis and interpretation turn to Page 35
The relatively young age and the patient’s breed are both compatible with a congenital heart disease.

The murmur’s description and location are both consistent with either a) subaortic stenosis, or c) pulmonic stenosis, because both of these disease entities involve an obstructive stricture at or near one of the two semi-lunar valves, both of which are located at the left heart base level. Any of these stenoses, if only severe enough, may make it necessary for the corresponding ventricle to contract very forcefully so as to overcome the increased resistance (afterload) to its emptying. Such a forceful contraction generates a high systolic pressure-gradient across the stricture, which translates into a high-velocity and a highly turbulent (rather than laminar) jet. This results in a loud systolic murmur. The murmur intensity increases during the early phase of systole when intra-ventricular pressure is building up very steeply, and then decreases during the later phase of that same systole, as ventricular contraction gradually ceases and an equilibrium is gradually generated between that ventricle and the major artery that is leaving it.

A 3rd differential diagnosis may be a “peri-membranotic” (i.e. located high at the inter-ventricular septum, near its membranous rather than its muscular component) ventricular septal defect (VSD). Its high-velocity turbulent systolic jet would be coming from the left ventricle across the cranio-dorsal aspect of the septum, into the right ventricular outflow tract, which is, too, located at the left heart base. However, another murmur is typically generated by this type of congenital heart defect and is best heard over the cranio-ventral right hemithorax rather than the left base. Because this is not included in the physical examination findings, a VSD is the least probable differential diagnosis in this specific case.

The ECG demonstrates regular sinus rhythm (there is a P-wave before each QRS-complex and a QRS-complex following each P-wave) with a constant PR-interval in each cardiac cycle, suggestive of a causative relationship between the P and the QRS. Measurable intervals in Lead-II (P, PR, QRS, and QT) and amplitudes (P and R) are within normal range for this lead. There is also a subtle, cyclic change in the P-wave amplitude throughout most leads, consistent with the so-called “wondering pacemaker” phenomenon, which is a perfectly normal finding and, in fact, has nothing to do with any “wondering” process of the sino-atrial node. Rather it is the result of cyclic changes in the angle between the positive electrodes in any of the bipolar ECG leads, and the physiologically changing location of the heart apex throughout the respiratory cycle.

The only true abnormality that can be noted has to do with QRS heart apex throughout the respiratory cycle. ECG leads, and the physiologically changing location of the sino-atrial node. Rather it is the result of cyclic changes in the angle between the positive electrodes in any of the bipolar ECG leads, and the physiologically changing location of the heart apex throughout the respiratory cycle.

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such as pulmonic stenosis, which can be life-threatening on the one hand, but also amenable to low-risk and effective palliation on the other hand.

REFERENCES
3. Modification from Sisson D. and Oysma M.

FIGURES

Figure 1:
The tracing on ECG paper represents electrophysiological events occurring through time, in a direction that is in right angles to the imaginary line connecting the two electrodes of each lead. Positive deflections represent propagation towards the positive electrode and negative deflections reflect propagation away from it.

Figure 2:
Lead I configuration in the “frontal” plane, which is analogue to the ventro-dorsal plane traditionally used in radiography; RA, Right “Arm”; LA, Left “Arm”; L, Left Leg.

Figure 3:
Lead aVR (Augmented-Unipolar-Right) configuration in the “frontal” plane, which is analogue to the ventro-dorsal plane traditionally used in radiography. RA, Right “Arm”; LA, Left “Arm”; L, Left Leg.