ECG of the Month

This monthly feature is being sponsored by the Academy of Veterinary Cardiology. Readers of the *JAVMA* are invited to submit contributions. Contributions should include: (1) a brief description of the case (150 words); (2) good contrast glossy photographs (5 in by 7 in) of tracings, with ECG lead, voltage calibration scale, and paper speed indicated; and (3) a discussion of the abnormality.

Send comments and tracings to Dr. Gilbert J. Jacobs, Department of Small Animal Medicine, College of Veterinary Medicine, University of Georgia, Athens, GA 30602, or Dr. Christopher Lombard, Department of Small Animal Clinical Sciences, Box J-126, JHMHC, University of Florida, Gainesville, FL 32610.

A 14-year-old 13-kg castrated Terrier cross was referred because of severe lethargy, incoordination, pale mucous membranes, and a cardiac arrhythmia. For the preceding 2 years, the dog had received monthly SC injections of triamcinolone (2 mg) for treatment of allergic dermatitis. Six months earlier, the dog developed seizures and was being treated with phenobarbital and phenytoin (dose unknown) at time of referral.

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Auscultation revealed a grade III/VI systolic murmur loudest over the left apex and an irregular heart rate. An ECG was recorded (Fig 1). Radiography revealed hepatomegaly and generalized cardiomegaly with moderate left atrial enlargement. Results of echocardiography were compatible with mild mitral regurgitation. The dog had mild hypoglycemia (68 mg/dl). Serum electrolyte concentrations and ACTH stimulation test results were normal. Our examination revealed that the seizures were actually episodes of syncope and were attributable to the cardiac arrhythmia. A temporary pacemaker was placed the same day and treatment with digoxin (0.1 mg, PO, q 12 h) was initiated. Two days later, a permanent pacemaker[a] at a rate of 70 beats/min was implanted via the left jugular vein. The dog was doing well after surgery and during the 2 months of follow-up.

ECG Interpretation

Electrocardiography revealed junctional complexes with inverted P waves at a rate of 72 beats/min, followed by paroxysmal supraventricular tachycardia at 204 beats/min. The QRS complexes were of different configuration than normal during the tachycardia, and the configuration was attributed to rate-dependent conduction aberrancy (Fig 1, top).

[a]Medtronic 8423 unipolar, Serial No. HN 2053238H.

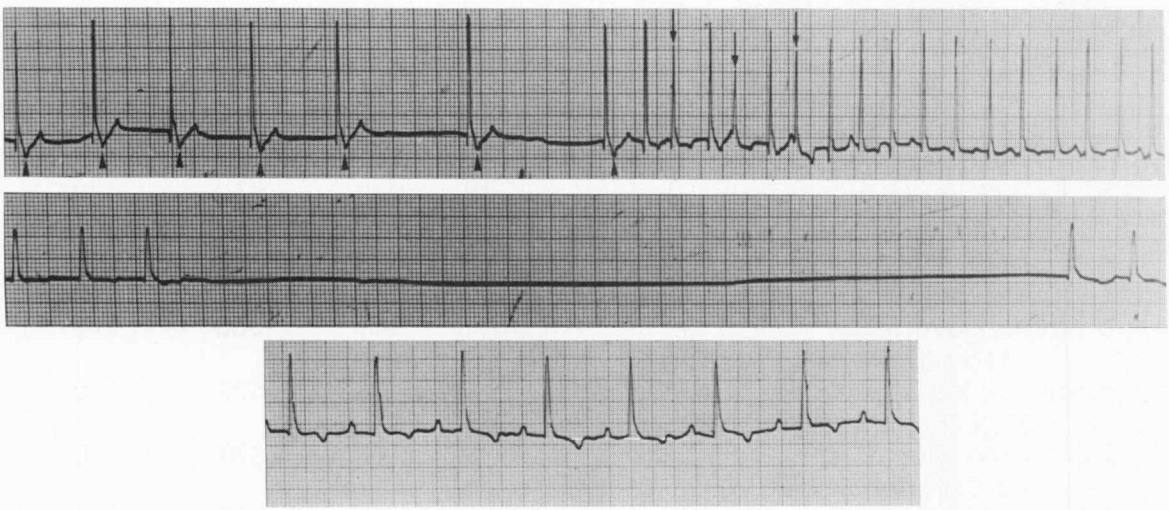

Figure 1—Lead-II ECG recorded from a 14-year-old dog with lethargy, incoordination, and pale mucous membranes. Top) Junctional rhythm, with inverted P waves (arrowheads) indicating retrograde atrial conduction, is followed by a paroxysmal supraventricular tachycardia; QRS complexes of different configuration than normal were attributed to rate-dependent aberrant conduction (arrows). Paper speed, 25 mm/s; 10 mm = 1 mV. Middle) Junctional tachycardia followed by 4 seconds of sinus arrest and ventricular asystole. Paper speed, 50 mm/s; 20mm = 1mV. Bottom) Normal spontaneous sinus rhythm. Paper speed, 50 mm/s; 10 mm = 1 mV.

Periods of sinus arrests and ventricular asystole often followed periods of tachycardia (Fig 1, middle) and periods of normal sinus rhythm would sometimes occur (Fig 1, bottom). On the basis of electrocardiography, sick sinus syndrome was diagnosed.

Discussion

The term sick sinus syndrome was used by Lown[1] to characterize the various clinical subgroups of sinus node dysfunction.[1-3] This syndrome encompasses a number of sinus nodal abnormalities associated with generalized disorder of the conduction system of the heart[1] including (1) persistent spontaneous sinus bradycardia not caused by drugs or excessive training, (2) sinus arrest or sinoatrial (SA) exit block with or without escape beats, (3) a combination of SA and atrioventricular (AV) conduction disturbances, and (4) paroxysms of rapid regular or irregular atrial tachyarrythmias, alternating with periods of slow atrial and ventricular rates (ie, the bradycardia-tachycardia syndrome).[1-8] More than one of these abnormalities can be observed in the same animal at different times,[2] as in the dog of this report.

This condition has been reported in many breeds; however, female Miniature Schnauzers appear to be more susceptible than dogs of other breeds.[4,6,7] Sick sinus syndrome is rare in cats.[4,7] Weakness, stumbling, and confusion may be observed in affected animals.[2,4,5] The dog may or may not have syncope, which can be accompanied by a brief seizure.[2,6,7] Further questioning with our client revealed that the seizures were syncopal episodes.

A number of etiologic factors have been implicated in arrhythmias associated with sinus node dysfunction. In human beings, the most frequent anatomic changes are arthrosclerosis of the SA node artery, atrial amyloidosis, and diffuse fibrosis of the sinus node.[1] A variety of illnesses (myocarditis, pericarditis, hyperkalemia, hypothermia, thyrotoxicosis) and drugs (digitalis, quinidine sulfate, lidocaine hydrochloride, salicylate) may induce transient sinus node dysfunction.[3] Arrhythmias also have been associated with inflammatory or degenerative changes of the nerves or ganglia surrounding the sinus node or any disease affecting the SA node artery.[2,4] Anomalies of the autonomic regulation can result in abnormal sinus node function.[5] Excessive training can increase vagal tone to such an extent that syncope related to sinus bradycardia can be induced in an otherwise normal animal.[2] Therefore, evaluation of the sinus node function after administration of atropine and β-blockade has been recommended.[5]

In human beings, methods for evaluating sinus node function include ocular or carotid sinus massage, administration of atropine, evaluation of SA node recovery time after atrial overdrive pacing, and SA conduction time, telemetry, exercise testing, and continuous Holter monitoring.[1-4,7,8] Sinoatrial node recovery time appears to be the most sensitive method of detecting sinus node dysfunction but may not be practical in most cases.[3,8]

In human beings and dogs, the response to medical treatment is extremely variable.[2,3,6-8] Pacemaker therapy is the treatment most used if the animal is without clinical signs.[2,3,7,8] Supplemental antiarrhythmic therapy may be necessary to control the tachyarrhythmias in the bradycardia-tachycardia type of sick sinus syndrome.[2,7,8]

References

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