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Case Report

Conversion of atrial dissociation with lidocaine in a dog

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Received 10 August 2016; received in revised form 12 March 2017; accepted 18 March 2017

KEYWORDS

Supraventricular;
Arrhythmia;
Canine;
Anesthesia

Abstract A 3-year-old healthy dog was presented for abdominal surgery following ingestion of razor blades. An electrocardiogram revealed a regular sinus bradycardia with normal P waves at a heart rate of 45 bpm. In addition, low-amplitude positive deflections (p' waves) were visualized at a regular interval and rapid rate of 250 bpm, dissociated from the normal sinus P waves. A tentative diagnosis of atrial dissociation was proposed. Administration of lidocaine abolished the p' waves. This case describes atrial dissociation observed following premedication that was successfully terminated using lidocaine in a healthy dog.

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A 3-year-old, 35 kg male-castrated Golden retriever was presented to the Matthew J. Ryan Veterinary Hospital of University of Pennsylvania emergency service after the owners suspected he had ingested a 2-blade disposable razor the previous evening. No vomiting nor ptyalism was observed by the owners overnight. The dog was otherwise healthy and up to date on vaccination, deworming, and heartworm preventives. On presentation, the dog was bright alert and responsive,

and vital parameters were within the normal limits. The mucosal membranes were pink and moist, the capillary refill time was less than 2 s and pulses were strong. Cardiopulmonary auscultation revealed no murmur or arrhythmia and lung sounds were normal. Heart rate was 120 bpm, breath sounds were normal but the dog was panting and uncomfortable on cranial abdominal palpation.

An abbreviated chemistry panel, packed cell volume, and total solids were obtained, and all values were within reference range. The dog was sedated for abdominal radiographs with butorphanol (0.2 mg/kg IV) and dexmedetomidine

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Figure 1 Atrial dissociation in sedated dog. Lead II electrocardiogram (ECG) of a 3-year-old castrated male Golden retriever following administration of methadone (0.2 mg/kg) before general anesthesia. The ECG showed sinus bradycardia with a heart rate of 46 bpm with consistent P waves preceding each QRS (white arrows). There are also low-amplitude positive deflections visualized at a regular interval and rate (250 bpm) consistent with p' waves (black arrows). None of these p' waves conduct to the ventricle, and their morphology is different from that of the normal sinus P waves. The first labeled P wave is of greater amplitude than the others, and likely represents a fusion of P and p' waves. Sensitivity: 0.5 cm/mV, paper speed: 25 mm/s.

(3 µg/kg IV). The abdominal radiographs revealed the presence of three metallic objects and large amounts of food in the stomach. Sedation was antagonized with antisedan (1.05-mg total dose IM), and this was repeated 25 min later. Four hours after abdominal radiographs, the dog was pre-medicated for general anesthesia with methadone (0.2 mg/kg IV) and was monitored with lead II ECG and pulse oximetry using a multi-parameter and anesthetic agent monitor^a. At this time, the heart rate was 46 bpm and an abnormal ECG (Fig. 1) was noted. This rhythm was observed for 10 min and a presumptive diagnosis of atrial fibrillation was made. Lidocaine (1 mg/kg IV) was administered to treat presumed atrial fibrillation before induction. Following lidocaine administration, the ECG returned to sinus bradycardia, anesthesia was induced with propofol (2.6 mg/kg IV), and the foreign body was successfully removed. The dog recovered from anesthesia without any further complications.

On further review of the ECG rhythm obtained shortly after the administration of methadone (Fig. 1), a regular sinus bradycardia with normal P waves controlling the ventricular rate at a heart rate of 45 bpm was identified, not atrial fibrillation. In addition, there were low-amplitude positive deflections at regular intervals with a rapid rate (250 bpm), occurring before, during, and after the normal P waves, suggestive of p' waves. None of the p' waves conducted to the ventricle, and their morphology was very different from that of the much slower, normal P waves. We concluded the most likely rhythm diagnosis was atrial dissociation. Additional differential diagnoses included atrial parasystole and recording artifacts.

Discussion

Atrial dissociation is a condition in which depolarization of an isolated area of atrial myocardium occurs from an ectopic atrial focus which exhibits both entrance and exit block [1–4]. Entrance block is required to protect the ectopic atrial focus, which allows concurrent sinus-generated depolarization of the atria (P waves) and the depolarization of the isolated area of atrial myocardium from the ectopic atrial focus (p' waves). If entrance block were not present, each sinus impulse could depolarize the entire atrial myocardium preventing the ectopic depolarization. Exit block is also required so that only the isolated area of atrial myocardium is depolarized due to the ectopic atrial focus and not the entire atrial myocardium. Classical ECG features of atrial dissociation include a p' wave with differing morphology from sinus-generated P waves, the p' waves occur regularly and are typically faster than the sinus rate, lack of conduction of p' waves to the ventricles, and an unperturbed sinus rhythm [1–4]. Recording artifacts due to patient movement, muscle activity, respiration, and electromagnetic interference from appliances may mimic p' waves [1–10]. One report describes pseudoatrial dissociation on an ambulatory ECG recording where apparent p' waves were in fact P waves from a prior patient that had been incompletely erased before reuse [10]. While artifact cannot entirely be ruled out in the patient of the present report, it is considered less likely given that the p' waves were consistently present, exhibited identical morphology, and clearly abolished after the administration of lidocaine without any change in the patient's respiration, or configuration of the ECG electrodes (Fig. 2). While non-physiologic sources of artifact such as fluid pumps and patient warmers were abundant, the patient

^a Model S/5 Compact, Datex Ohmeda; GE Health Care.

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