Intermittent Advanced Bachmann’s Bundle Block in a Boxer Dog

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ABSTRACT

Background: There is a lack of studies on the occurrence of spontaneous conduction disturbances at atrial level in small animals. Bachmann’s bundle block is a particular type of interatrial cardiac conduction disturbance that is characterized by a variable delay on electrical depolarization of both atria resulting in prolonged P waves duration on the electrocardiogram. It is currently classified as partial or advanced depending on the grade of severity of the conduction delay. In humans the advanced form of Bachmann’s bundle block has low prevalence but is clinically very important because predicts left atrial enlargement and arrhythmias. The objective of this paper was to report the electrocardiographic findings identified to as intermittent advanced Bachmann’s bundle block in a Boxer dog with clinical signs of congestive heart failure.

Materials, Methods & Results: An intact nine-year-old female Boxer dog was referred for evaluation because of clinical manifestation of a gradually progressive dyspnea, loss of stamina and abdominal enlargement. The cardiac rhythm was irregular, the mean heart rate was 140 beats per minute and the systolic blood pressure was 158 mmHg. The femoral pulse was strong and synchronous to the heart beats. Thoracic auscultation was unremarkable. A lateral chest radiography showed mild cardiomegaly. Routine blood laboratory tests did not revealed alterations. A transthoracic bidimensional echocardiogram was performed and showed an enlarged left atrium in wich a mass suggestive of neoplasia was seen. Abdominal ultrasound examination showed hepatic passive congestion and mild ascites. Electrocardiographic tracings showed sinus arrhythmia, the mean heart rate was 147 beats per minute and the mean QRS electrical axis was situated between +60 and +90 degrees. On the leads D2, D3 and aVF it was observed an irregular intermittency of prolonged P waves with a biphasic plus-minus morphology. The therapeutic management consisted of restriction of physical exercise, commercial dog food, oral benazepril and furosemide. The dog initially showed clinical improvement but subsequently the treatment was negleeted and the dog was found dead two months later.

Discussion: Partial interatrial electrical conduction delay, defined as broad and sometimes bifid P waves, is an electrocardiographic abnormality that is very frequent in humans with enlarged left atria as seen in rheumatic mitral valve disease, some congenital heart defects and cardiomyopathy. In dogs, broad and eventually bifid P waves can be found in cases of advanced mitral endocardiosis, dilated cardiomyopathy, and even in some congenital heart anomalies as patent ductus arteriosus and mitral valve dysplasia. The advanced form of interatrial conduction delay, also called third degree Bachman’s bundle block, however, has not yet been described in the current small animal veterinary literature. The particular abnormal morphology of the P waves observed in this case study was identical to that reported for the human with the advanced interatrial block and for dogs submitted to experimental surgical lesions in the Bachmann’s bundle. Although rare, as observed in this case report, the advanced Bachmann’s bundle block, when present, could be considered as a potentially non-invasive marker of dilated left atrium, especially if the patient has shown clinical signs of cardiac disease.

Keywords: Interatrial block, Bachmann’s bundle block, P wave, dog

Descritos: Bloqueio interatrial, bloqueio do feixe de Bachmann, onda P, cão
INTRODUCTION

Under normal conditions, cardiac electrical activity is systematically generated by the sinoatrial node (SN), the physiological mammalian heart pacemaker [7]. After SN depolarization electrical impulse propagates throughout the right atrium (RA), and mainly through Bachmann’s bundle (BB) to the left atrium (LA), stimulating the atrial myocardium to contract. The electrical activation of both atria is graphically expressed as the P-waves on the surface electrocardiogram [6].

Anatomic and electrophysiological studies have proved that the BB forms the largest anatomic and preferential interatrial electrical connection structure between both atria [2,3,5,11,13]. The role of this pathway is to ensure rapid interatrial conduction, leading to physiologic synchronous contraction of both atria. However, some induced or spontaneous injuries in the BB tract region can cause variable delay on the electrical interatrial conduction [2,3,13]. On the ECG, time is the duration of conduction, and excessive time or delay means block. So, interatrial block (IAB) has been defined as a delayed conduction between the right and left atria resulting in prolonged P-wave duration. In the human population advanced Bachmann’s bundle block (BBB) is uncommon and has been usually associated with LA dilatation, reduced atrial function and the patient is prone to develop atrial fibrillation and other arrhythmias [1,2,4,5].

Despite BBB has been experimentally proved in the dog model (3,13), no spontaneous natural cases of this condition have been reported in this species. The aim of the present report was to describe the typical electrocardiographic changes identified to as advanced Bachmann’s bundle block in a dog with congestive heart failure.

CASE REPORT

On December 2009, an intact nine-year-old female Boxer dog was referred for cardiology evaluation because of a recent history of progressive mild dyspnea, loss of stamina and abdominal enlargement. The general condition of the dog was regular. The mean resting heart rate was 140 beats per minute and the thoracic auscultation was unremarkable. The mucous membranes were not cyanotic and the femoral pulse was irregular, strong and synchronous to the heart beats. Measurement of the mean arterial systolic blood pressure by the Doppler method was 158 mmHg. Rectal temperature was 38.5°C. The complete blood-count, blood urea, creatinine and glucose all were within physiological limits. The dog was submitted to electrocardiography, lateral chest radiography and one week later was provided an ultrasound examination of the thorax and abdomen. The treatment consisted of restriction excessive physical activities, commercial dog food, oral benazepril hydrochloride (10 mg/day) and furosemide (40 mg/day). The dog initially had showed some clinical improvement but the treatment was neglected and nearly two months later he was found dead in the morning.

RESULTS

The dog had clinical signs of congestive heart failure. The transthoracic bidimensional echocardiographic examination revealed a very much enlarged left atrium, in which a mass suggestive of neoplasia was observed (Figure 1). However, it was not possible to confirm this suspicious because the dog couldn’t be submitted to necropsy. Mild ascites and hepatic venous congestion also were found on abdominal ultrasound examination. A latero-lateral chest radiography showed a round mild augmented cardiac silhouette. The resting electrocardiogram revealed sinus arrhythmia, the heart rate was 147 beats per minute and irregular intermittent wide P waves with biphasic plus-minus morphology were seen in leads D2, D3 and aVF. The negative phase of these P waves was more obvious than the positive and the angle between the initial and final vectors of the two components of P waves was obtuse (Figure 2).

DISCUSSION

The current accepted reference range for normal canine P wave duration is =<0.40 sec [6,8,12], but in giant breeds it can reaches 0.50 sec [10]. The duration of P waves above these limits may be observed in some cardiovascular disorders such as severe mitral valve disease, some congenital heart defects, myocardial diseases and usually indicates LA enlargement [6,8,10,12]. When the LA enlarges, electrical conduction from RA to LA is prolonged or disrupted producing wide and sometimes notched P waves [8]. So, based on these observations, partial interatrial conduction block seems to be common in dogs with such heart diseases.

Although interatrial block has been experimentally proved in the dog model (3,13), no spontaneous natural cases of this condition have been reported in this species. In the human, surface ECG diagnostic criteria for typical advanced IAB are: prolonged P waves with a negative terminal part of P-waves in leads II, III, aVF and an
open angle of more than 90 degrees between the vectors representatives of the two parts of P-loop [1,2,4,5]. Taking in mind such observations it is suggested that, in our case study, the RA was activated normally (giving the positive component of P wave in II, III, and aVF) but the electrical impulse was completely blocked in the zone of BB and could no longer cross it. Then, subsequent LA depolarization was conducted primarily in a retrograde fashion (caudad-cranial direction), producing the negative component of the P wave, as seen in figure 2.

To the best of our knowledge this peculiar electrocardiographic entity has not been previously recognized in the small animal veterinary literature.

CONCLUSION

Comparing with previous observations of advanced interatrial block in man and based on the results of experimental works in dogs it was conclude that the distinctive electrocardiographic abnormalities observed in our case report are consistent with the intermittent form of advanced IAB identified to as Bachmann’s bundle block.

SOURCES AND MANUFACTURERS

1 Parks Medical Doppler Unity 811-B Model®, USA.
2 Lotensin 10 mg®. Novartis. São Paulo, SP, Brasil.
3 Lasix 40 mg®, Sanofi Aventis Farmacêutica Ltda. Rio de Janeiro, RJ, Brasil.
4 Sonosite 180-Plus Model®, General Electric, USA.

REFERENCES


