

## Scientific Report

# Temporary atrial standstill in a crossbred dog associated with bladder outlet obstruction

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## Summary

A 6-year-old male crossbred dog was referred to the Veterinary Medical Teaching Hospital of Islamic Azad University of Karaj with the history of abdominal distention, rectal tenesmus and stranguria. Abdominal radiographs and ultrasonography indicated large distended urinary bladder and prostatic enlargement. ECG showed temporary episodes of atrial standstill. The only abnormalities detected by serum biochemical analysis were mild uraemia and hyperkalaemia. The cause of hyperkalaemia and mild uraemia was postrenal azotaemia which was occurred as a consequence of bladder outlet obstruction secondary to prostatic enlargement. There was a good response to castration as a choice of treatment. Gradual improvement in the signs of rectal tenesmus and stranguria was observed over a period of three weeks following castration. Furthermore, ECG records during post-surgical period were normal.

**Key words:** Atrial standstill, Dog, Bladder outlet obstruction, Hyperkalaemia

## Introduction

Atrial standstill is a rare rhythm disorder characterized by the absence of atrial activity on the surface and intracavity electrograms, the absence of atrial mechanical activity, and inability to electrically stimulate the atria (Talwar *et al.*, 1991). The condition has been documented in human, dog and cat (Gavaghan *et al.*, 1999; Macaulay, 2002; Demiralp *et al.*, 2005). This report describes temporary episodes of atrial standstill in association with hyperkalaemia and bladder outlet obstruction due to prostatic enlargement in a crossbred male dog.

## Case history

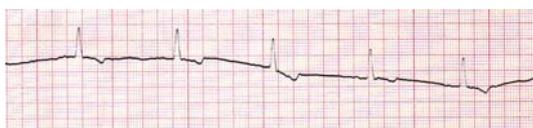
A 6-year-old male crossbred dog was referred to the Veterinary Medical Teaching Hospital of Islamic Azad University of

Karaj with a history of abdominal distention, rectal tenesmus and stranguria. On physical examination, a large firm mass was detected in the abdominal palpation. Rectal examination demonstrated symmetrical painless prostatic enlargement. Clinical observation revealed that the prepuce was moist, and small drops of fluid dripped from it. The penis easily exposed by pulling the prepuce caudally over the bulbus glandis. The extruded penis was examined for the presence of inflammation, foreign bodies, or masses. There was no history of recent injury, fighting and mating trauma. Retraction of the prepuce showed that penile mucosa was pinkish-white, and there was no pain during palpation. Abdominal radiographs demonstrated large distended urinary bladder and prostatic enlargement. Abdominal ultrasonography was also performed for differentiating the prostate from other abdominal masses. For

ultrasonography of the prostate gland, the patient was placed in dorsal recumbency. In the abdominal ultrasonography, the bladder was distended to umbilical area. The transducer was placed to the side of prepuce and angled towards the pelvis to image the prostate caudal to the urinary bladder. The result of the prostatic ultrasonography was consistent with a diagnosis of prostatic enlargement (Fig. 1). Temporary episodes of atrial standstill were present in an earlier electrocardiography (ECG) of the dog (Fig. 2). Presence of this arrhythmia was confirmed by two other ECG records on the day of admission. Results of a CBC and urinalysis were within normal limits of our laboratory. The only abnormalities detected by serum biochemical analysis were uraemia (90 mg/dl) and hyperkalaemia (7 mEq/L). Fluid therapy by 0.9% sodium chloride was started to dilute the serum potassium concentration. The bladder pressure was relieved by catheterization. Approximately 1000 ml of fluid was removed from the



**Fig. 1: Ultrasound scan of the prostate showing symmetrical enlargement of prostate. Thin echogenic capsule margins were clearly defined ventrally and dorsally (large arrows). Some degree of inhomogeneity was noticed; and many intraparenchymal small cysts with slightly irregular shape and discernible wall were seen (small arrows). Dilated prostatic urethra could be seen at the middle of prostate**



**Fig. 2: Lead II electrocardiogram shows absence of P waves. Paper speed, 50 mm/s; 1 cm = 1mV**

bladder.

Bladder outlet obstruction due to benign prostatic hyperplasia (BPH) was considered as a possible cause of rectal tenesmus, stranguria and bladder distention. The animal was castrated. There was a good response to this therapy over a period of three weeks and gradual improvement observed in the signs of rectal tenesmus and stranguria. During this period urine was collected through a urinary catheter every other day. Results of serial electrocardiograms on the next days after admission revealed no abnormality, and serum BUN and potassium concentration returned to the normal limits.

## Discussion

The P wave is the first deflection on the ECG after isoelectric diastole. The first half of the P wave represents the right atrial and the second half is related to the left atrial activation (Ettinger, 2000). Atrial standstill is the rhythm diagnosed when no P waves are visible on the ECG and atrial fibrillation is not evident (Kittleson and Kienle, 1998). This arrhythmia is defined as a total absence of depolarization of the atria, despite normal sinoatrial (SA) node impulse formation. Without depolarizing the atria, the sinus impulse is nevertheless properly conducted to the AV node, and the ventricular depolarization is normal (Ettinger, 2000). It may be temporary, terminal, or persistent. Temporary atrial standstill occurs with digitalis toxicity and hyperkalaemia (Tilley, 1992) as the atrial myocardium is particularly sensitive to the potassium ion (Ettinger, 2000). Abnormalities on an electrocardiogram may be the first indication of hyperkalaemia in some patients. Because of the life-threatening effects of hyperkalaemia, prompt diagnosis based on the ECG findings may be life-saving. Hyperkalaemia can be responsible for a wide spectrum of electrocardiographic abnormalities. Mild hyperkalaemia (i.e., 5.6-6.5 mEq/L) is associated with increased T wave amplitude and bradycardia. The P wave-flattening develops as potassium concentration increases further. Marked hyperkalaemia commonly causes atrial standstill and loss of visible P waves (Lathan

and Tyler, 2005). Absence of the P waves has also been confirmed during the experimental hyperkalaemia in dogs (Porter *et al.*, 2001). Causes of hyperkalaemia in veterinary patients include hypoadrenocorticism, acute oliguric renal failure, ruptured bladder, heatstroke, urethral obstruction and iatrogenic (Macintire, 1997). In the present study, stranguria was reported as a chief complaint of the patient. Several disorders may result in dysuria and/or stranguria in the dog, including urolithiasis, neoplasia of the bladder and urethra, urethritis, urethral stricture/trauma, bladder displacement/entrapment and prostatic diseases (Diaz Espineira *et al.*, 1998). In this case based on the radiographic and ultrasonographic examination, severe bladder distention and prostatic enlargement were the most important findings. It is well documented that any type of prostatic disease in dogs may cause an outflow tract obstruction. Older male dogs with BPH may show stranguria due to urinary outflow obstruction. Urinary outflow obstruction can cause large distended bladder (Nelson and Couto, 2003). The cause of hyperkalaemia and uraemia in this dog was postrenal azotaemia as a consequence of bladder outlet obstruction secondary to BPH. Castration is considered as the treatment of choice for the BPH. The prostate gland decreases in volume by 50% within 3 weeks and by 70 to 75% within 9 weeks of surgery (Johnston *et al.*, 2001). Observation during the post-surgical period in our case revealed that stranguria and rectal tenesmus resolved following castration.

Cardiac arrhythmias occur for many reasons. Although some kinds of arrhythmias have no clinical consequences, others cause serious haemodynamic compromise. Electrolyte imbalances are frequently encountered in clinical practice and can induce different types of cardiac dysrhythmias in the affected animals. Treatment of these arrhythmias should be directed to recognition of the primary underlying diseases which are responsible for the development of electrolyte imbalances. In this case, BPH was the primary cause of urinary outflow obstruction which was leading to postrenal uraemia,

hyperkalaemia and atrial standstill.

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