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Transvenous extraction of an abandoned endocardial pacemaker lead in a dog☆

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Abstract A 6-year-old male castrated labrador retriever presented with endocardial pacemaker infection following migration and subsequent repositioning of the pulse generator. An epicardial lead and pulse generator were surgically implanted and the endocardial lead could not be removed with manual traction. The endocardial lead was severed, anchored, and abandoned at the thoracic inlet. The patient presented 4 months later with endocardial lead migration, bacteremia, and suspected glomerulonephritis. The endocardial pacemaker lead was transvenously extracted using a mechanical dilator sheath and locking stylet. This report of transvenous pacemaker lead extraction in a dog addresses the challenges and describes recent advances in extraction devices.

A 2-year-old male castrated Labrador retriever originally presented to the cardiology service at Oregon State University, College of Veterinary Medicine in 2008 for transvenous pacemaker implantation to address symptomatic third degree atrioventricular (AV) block. A passive fixation single lead, atrial triggered, ventricular inhibited (VDD) endocardial lead and pulse generator were implanted via the right jugular vein without incident. Over the next 4 years, the patient was routinely re-evaluated at 6—8 month intervals with thoracic radiographs, pacemaker interrogation, electrocardiography, and echocardiography.

In 2012, the patient presented with the complaint of pulse generator migration. There were no

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Abbreviations

AV	atrioventricular
CT	chordae tendineae
Fr	French
MPA	main pulmonary artery
PCR	polymerase chain reaction
RA	right atrium
RV	right ventricle
UPC	urine protein:creatinine ratio
VDD	single lead, atrial triggered, ventricular inhibited

antecedent event or physical examination findings suggesting trauma to the region. Radiographs confirmed pulse generator migration from the caudodorsal cervical region to the right ventrolateral neck. The pacemaker lead position remained unchanged while pacing and sensing were appropriate. Stabilization and repositioning of the pulse generator was advised; the following week the patient was anesthetized and the pulse generator repositioned. The pulse generator was enclosed in a fibrous capsule containing a small amount of tan-colored fluid. Peri-operative antibiotics were administered (cefazolin 22 mg/kg IV q90min) and the patient was discharged on a 14-day course of oral cephalexin (25 mg/kg PO q12h).

The patient presented 3 weeks later with septic cellulitis at the pulse generator site. The owners elected conservative management at the time, and the patient was discharged with oral amoxicillin/clavulanic acid (14 mg/kg PO q12h), marbofloxacin (2.5 mg/kg PO q24h), and carprofen (1.9 mg/kg PO q12h). An open draining tract developed 10 days later; the owners consented to removal of the endocardial pacing system and placement of an epicardial lead with an abdominal pulse generator. After the epicardial lead system was placed, the pulse generator in the neck was removed but the endocardial lead could not be extirpated with manual traction. The pacemaker lead was subsequently severed 1.5 cm cranial to the thoracic inlet and transfixed to the right jugular vein. Post-operative thoracic radiographs were obtained to document hardware location (Fig. 1A). The explanted hardware was submitted for aerobic and anaerobic culture and sensitivity; no growth was obtained from either culture. The surgery service elected to discontinue the marbofloxacin and continue amoxicillin/clavulanic acid (14 mg/kg PO q12h) for 2 weeks post-operatively.

Four months following epicardial pacemaker implantation, the dog presented for a scheduled re-examination. The owners reported normal appetite, activity, and demeanor with the exception of one episode of possible exercise fatigue. A new grade 2/6 left basilar systolic ejection murmur was ausculted. Systolic blood pressure, measured via Doppler, was increased (170 mmHg). Thoracic radiographs indicated that the abandoned transvenous pacemaker lead had dislodged from the right jugular vein and was looped into the main pulmonary artery (MPA) (Fig. 1B). Echocardiography showed moderate pulmonic insufficiency and mildly increased trans-pulmonic flow velocity (2.1 m/s). The pacemaker lead could be visualized both in the right ventricle (RV) and the

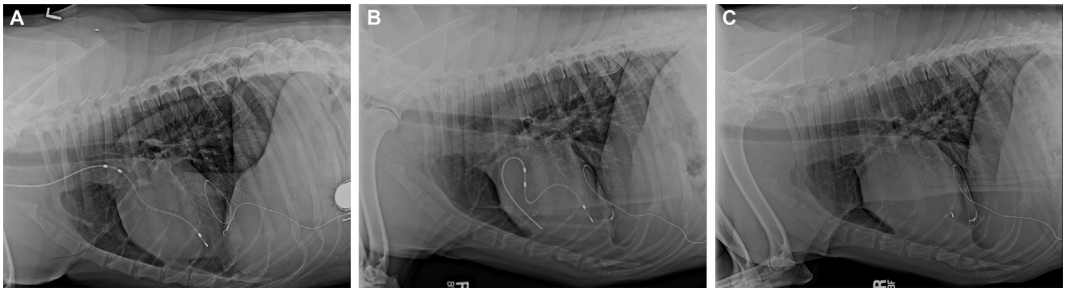

Figure 1 Lateral thoracic radiographs following epicardial pacemaker implantation, endocardial lead migration, and endocardial pacemaker lead extraction. (A) Left lateral thoracic radiograph taken one day after epicardial pacemaker implantation and endocardial pulse generator removal. The endocardial pacemaker lead has been sutured to the right jugular vein in the region of thoracic inlet. The epicardial pacemaker lead, implanted in the left ventricle, crosses the diaphragm and connects to the pulse generator, which is partially visible. Resolving pneumothorax, pneumomediastinum, and pneumoperitoneum are also noted from surgery the day prior. (B) Right lateral thoracic radiograph 4 months after epicardial pacemaker implantation. The severed end of the endocardial pacemaker lead has dislodged and prolapsed to form a loop in the main pulmonary artery. The free end of the endocardial lead appears within the right ventricle. (C) Right lateral thoracic radiograph obtained one day after the lead extraction procedure. The majority of the endocardial lead has been removed. The distal tip of the endocardial lead remains embedded in the apex of the right ventricle. The epicardial pacemaker lead is unchanged compared to previous radiographs.