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Case Report

Percutaneous removal of transvenous pacemaker leads using an extraction device

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leads have been developed which have made lead extraction easier and safer. We report our experience of using interlocking stylets for percutaneously removing an infected dual chamber pacemaker and its leads.

Case report

A 37-year-old male patient was diagnosed to have sick sinus syndrome when he presented in Sep 2008 with recurrent episodes of non-exertional syncope and was noted to have significant sinus pauses on Holter study. A dual chamber (DDDR Medtronic Sigma SDR 303, Medtronic Minneapolis, MN, USA) permanent pacemaker with tined leads in the right ventricle and right atrial appendage was implanted through the left subclavian vein with pulse generator (PG) in the subcutaneous plane of the left pectoral region (Fig. 1). Four months subsequent to the implantation he developed swelling over the PG site suggestive of a pacemaker pocket infection. In view of pacemaker pocket infection a decision of extraction of the pacemaker along with the pacing leads was taken. It was proposed to reimplant the pacemaker through the right subclavian vein following the control of infection and during the intervening period the patient would be kept on temporary pacemaker.

Introduction

Permanent pacemaker implantation (PPI) is routinely performed at specialized cardiology centers. Though, pacemaker device and lead extraction may be necessary due to pacemaker pocket infection, infective endocarditis, or lead fracture it is an infrequently performed procedure because of the associated morbidity and mortality. Though surgical lead extraction requiring a median sternotomy and cardiopulmonary bypass is also an accepted procedure it is reserved for large vegetations or failed attempts at percutaneous removal. Newer and innovative devices for percutaneous removal of

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Pacemaker extraction was performed under local anesthesia and light sedation. A 6F temporary pacing lead (St. Jude Medical Inc, St. Paul, MN, USA) was placed in the right ventricular apex through the right Internal jugular vein.

The pacemaker pocket was opened and the PG disconnected from the leads. The leads were then dissected toward the subclavian vein and the insertion pins clipped using a Lead Clipper (Cook Vascular Inc., Vandergrift, PN, USA). The patency of the lead lumen was ascertained using a straight stylet. Next, a locking stylet (Cook Vascular Inc., Vandergrift, PN, USA) was advanced upto the tip of the electrode in the right ventricular lead and deployed. The integrity of the lead-locking stylet assembly was ascertained by gentle traction. The adhesion at the axillary vein insertion site was dilated using 8.5 Regular Telescoping PTFE dilator (Cook Vascular Inc., Vandergrift, PN, USA). Mild traction force was applied to the locking stylet to straighten the alignment of the lead and the dilating sheath. The dilator sheath was advanced with bidirectional (clockwise and counter-clockwise) rotation using a Soft-Grip Hemostat (Cook Vascular Inc., Vandergrift, PN, USA) to dissect adhesive fibrous bands formed around the pacemaker lead. With firm steady traction the lead could be mobilized from the right ventricular apex and removed.

The same procedure was employed for the right atrial appendage lead, but the lead could not be mobilized. Considering firm adhesion and calcification between the lead and the vein a 9.0F Evolution Shortie Mechanical Dilator Sheath (Cook Vascular Inc., Vandergrift, PN, USA) was used to shear the lead from the vessel wall. Despite this the lead could not be mobilized. Stronger traction caused the lead to break at the lead–electrode junction leaving a segment of the insulation and core wire inside. Failing this a new locking stylet had to be introduced and a 8F Renal Double Curve (Merit Medical, South Jordan, UT, USA) was introduced. Using graded traction–countertraction the lead was delivered without the terminal electrode which remained adherent to the atrial wall.

The patient was kept on a TPI for 2 weeks with injectable antibiotics, after which a DDDR (Medtronic Relia REDR01 Medtronic, Minneapolis, MN, USA), was placed in the right

sub-pectoral pocket with adequate positioning of the pacing leads on right atrial appendage and right ventricular apex (Fig. 2). He had an uneventful post implant course in hospital and was discharged subsequently.

Discussion

The American Heart Association recommends, complete device and lead removal for all patients with cardiovascular implantable electronic device (CIED) pocket infection as evidenced by abscess formation, device erosion, skin adherence, or chronic draining sinus without clinically evident involvement of the transvenous portion of the lead system.¹

Despite advances in techniques for percutaneous lead extraction, it remains a high risk procedure, with upto 11% associated morbidity and mortality. Procedural complications include injuries to the major veins, the right atrial or the ventricular wall, damage to cardiac valves, and lead tip fractures necessitating surgical intervention.^{2–6}

Graded mechanical traction remains the mainstay for lead extractions, and the various extraction devices assist in the transmission of this force to the distal terminal of the leads. The cutting devices available (using laser or mechanical blade) help in freeing the adhesions around the lead for easy mobilization. Though laser assisted devices have been used, the conventional traction and countertraction using locking stylet and dilating sheath system is the one most extensively used with proven efficacy and safety.

The success of percutaneous lead extraction has been over 90% with less than 5% patients needing a surgical removal. Though successful lead extraction is dependant on the physician's experience and extraction hardware availability it is especially dependent on implant duration. Byrd et al reported that the risk of failure or partial removal doubled for every 3 years of implant duration.⁷

The Heart Rhythm Society expert consensus for transvenous lead extraction defines complete success of the procedure as the removal of all targeted leads and all lead

Fig. 1 – Chest radiograph postero-anterior view showing the pulse generator in the left sub-pectoral region with pacing leads prior to extraction.

Fig. 2 – Chest radiograph postero-anterior view showing the reimplemented pulse generator in the right sub-pectoral region with pacing leads.

material from the vascular space without occurrence of any permanently disabling complication or procedure-related death. Clinical success was defined as the removal of all targeted leads and lead material from the vascular space or retention of a small portion of the lead (<4 cm) when the residual part did not increase the risk of perforation, embolic events, or perpetuation of infection, in the absence of complications. Our patient would lie in this group. Failure of the procedure was defined as the inability to achieve either complete procedural or clinical success, or the occurrence of any permanently disabling complication or procedure-related death.⁸

Conclusion

With the rise in the number of CIEP there has been an increase in the incidence of leads and pocket infections. Complete removal of the infected leads is mandatory, whether done surgically or percutaneously.⁹ Though percutaneous removal is a high risk procedure availability of better hardware has improved the rate of success. It is recommended that all efforts using specialized extraction devices should be made before abandoning the leads or sending the patient for surgery.

Conflicts of interest

All authors have none to declare.

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