Transvenous Extraction of 30-year-old Pacemaker Leads in a Patient with Eisenmenger Syndrome

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ABSTRACT

Extraction of old pacemaker leads is particularly challenging owing to the high level of adherence to adjacent tissue. We report a case of transvenous extraction of 30-year-old pacemaker leads by conventional traction and counter-traction techniques, combined with a snaring method. A 42-year-old man presented with erythema and purulent discharge from a pacemaker scar. He had undergone DDD (dual chamber pacing, dual chamber sensing, dual function) pacemaker implantation 30 years previously for complete atrioventricular block after incomplete atrioventricular septal defect repair. Following diagnosis of pacemaker infection, we extracted the pacemaker leads transvenously using locking stylets, telescoping dilator sheaths, and a snare catheter.

Key Words: ■ extraction ■ infection ■ lead ■ pacemaker

Introduction

With increasing rates of pacemaker implantation, pacemaker infection rates have risen in parallel.\(^1\) In cases of infection, pacemaker removal and lead extraction are necessary,\(^2\) though the difficulty of extraction increases in line with pacemaker age. We report a case of transvenous extraction of 30-year-old pacemaker leads via the subclavian vein using conventional traction and counter-traction techniques, and via the femoral vein using a snaring technique.

Case

A 42-year-old man presented with erythema and purulent discharge from a pacemaker pocket site in the left pectoral area (Figure 1). Symptoms had arisen 1 week previously. The patient had been diagnosed with incomplete atrioventricular (AV) septal defect at the age of 12, and had undergone surgical repair. Complete AV block had subsequently occurred, and a DDD pacemaker (unknown manufacturer) was implanted with a screw-type unipolar atrial lead and a tined unipolar ventricular lead (unknown manufacturer). At the age of 20, the patient was fitted with a new VDD (ventricular pacing, dual chamber sensing, dual function) pacemaker (Thera VDD, Medtronic, Minneapolis, MN, USA) in the right pectoral area, due to pacing failure of the DDD
At that time, the DDD generator was removed, but the atrial and ventricular leads were left in place. On the first day of the current admission, the patient’s blood pressure was 110/82 mmHg and his body temperature was 37.2°C. Laboratory analysis revealed a white blood cell count of 13,600/μL, a neutrophil count of 89.6%, and C-reactive protein levels of 15.3 mg/L. A chest radiograph showed cardiomegaly, the VDD pacemaker in the right pectoral area, and the atrial and ventricular leads in the left pectoral area (Figure 2). Echocardiography revealed residual interatrial shunt, severe pulmonary hypertension, severe tricuspid regurgitation, and no vegetation. These findings were consistent with Eisenmenger syndrome. Cefazolin 1 g three times a day was administered intravenously. Attending physicians and surgeons recommended repeat open heart surgery for repair of the AV septal defect and tricuspid valve, and for pacemaker lead extraction. At that time, the DDD generator was removed, but the atrial and ventricular leads were left in place.
Although blood cultures were negative, clinical and laboratory findings were consistent with pacemaker pocket infection. We therefore decided to extract the pacemaker leads transvenously on the 2nd day of hospitalization. A skin incision was made under general anesthesia, and a sample of discharge was collected from the inside of the pacemaker pocket for bacterial culture. Following dissection of surrounding soft tissue, atrial and ventricular pacemaker leads were exposed. Two locking stylets (Liberator Beacon Tip Locking Stylet, Cook Vascular Inc., Vandergrift, PN, USA) were inserted into each hole of the atrial and ventricular leads and locked. Traction force was gently applied to the locking stylets, and two 12 Fr polypropylene telescoping dilator sheaths (Byrd Dilator Sheath, Cook Vascular Inc.) were inserted and advanced over the atrial and ventricular leads (Figure 3). Counter-traction force was gently applied to the dilator sheaths and soft extraction, though the patient refused surgery.
tissue surrounding the leads was dissected away. The atrial lead was extracted successfully (Figure 4A); the ventricular lead was cut at the level of the superior vena cava during extraction. A snare catheter (PFM Medical, Nonnweiler, Germany) was inserted into the right ventricle, via the right femoral vein, to retrieve the remaining section of the ventricular lead (Figure 4B). The lead was cut at the level of the right ventricle, and the middle portion removed, though a distal 4–cm section was left in place (Figure 5). The wound was sutured, and the procedure was completed with no acute complications. No evidence of infection was observed during outpatient follow-up.

Discussion

We have presented a case of transvenous extraction of old unipolar pacemaker leads via the subclavian vein using conventional traction and counter-traction techniques, and via the femoral vein, using a snaring method.

Pacemaker or implantable cardioverter-deﬁbrillator lead extraction is generally considered to be a difﬁcult and high-risk procedure. The main source of risk is adhesion of the pacemaker leads to a major vein, the right atrium or ventricle, or the tricuspid valve. The most common sites of severe adhesion are the subclavian vein, the superior vena cava, and the apex of the right ventricle. Major complication rates following pacemaker lead extraction are approximately 2%. Major complications include cardiac avulsion, vascular laceration, hemopericardium, hemothorax, and acute tricuspid regurgitation. Complication rates are especially high in patients with pacemaker infection, cerebrovascular disease, low ejection fraction, low platelet count, prolonged prothrombin time, and mechanical or powered sheaths. During the pacemaker lead extraction procedure, adhesiolysis around the leads is critical. Many new kinds of lead extraction device are emerging, including laser sheaths. However, traction and counter-traction techniques, using locking stylets and telescoping dilator sheaths, are most commonly employed in Korea.6,7 Locking stylets supply traction force to the pacemaker lead tip and decrease the risk of severing the lead. Telescoping dilator sheaths can be used to supply counter-traction force and adhesiolysis around the pacemaker lead; they additionally decrease the risk of cardiac avulsion. The snaring technique via a femoral approach can be used for rescue purposes, in cases where the pacemaker lead is cut during extraction. The femoral approach can additionally provide an alternative vector of traction force.

Because adherence of pacemaker leads to adjacent tissue increases dramatically with age, extraction of old pacemaker leads is particularly challenging. Furthermore, old unipolar leads are easily severed because there is no supporting core in the lead body. Although the distal part of the ventricular lead was left in place in this case, no further evidence of infection was observed during follow-up. Consequently, open heart surgery for complete removal was not considered necessary.

We are aware of only one previous report describing extraction of pacemaker leads over 30 years old, published in the USA. Although the extraction in our case was not entirely successful, we believe the pacemaker leads in this study were the oldest to be extracted in Korea. We have demonstrated that extraction of pacemaker leads over 30 years old is feasible, but meticulous and gentle manual technique is essential.
References


