Percutaneous extraction of a 20-year-old Accufix pacemaker lead complicated by intraoperative protrusion of its J retention wire

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Introduction

The Telectronics Accufix active fixation pacing lead (Telectronics, Englewood, CO) was recalled in 1994 because of risk of J retention wire protrusion leading to deaths and injuries. We report a case of successful percutaneous extraction of a 20-year-old Accufix atrial lead complicated by protrusion of its J wire during the extraction.

Case report

A 75-year-old man presented with recurrent persistent *Staphylococcus* bacteremia from spinal osteomyelitis. He had a past medical history significant for complete heart block for which a pacemaker with an Accufix ventricular lead (model number 330-258) was placed in 1990 and then an Accufix right atrial (RA) lead (model unavailable) in 1995. The bacteremia persisted despite intravenous antibiotic treatment; therefore, to clear bacteremia, percutaneous removal of his pacemaker system was recommended.

In a hybrid operating room under general anesthesia the leads were dissected free from the subcutaneous adhesions and transected, and then locking stylets were passed down the inner lumen of each lead. A 14 F laser sheath (Spectranetics, Colorado Springs, CO) was passed over the atrial lead and laser energy was applied as needed, but because significant resistance was encountered at the superior vena cava and RA junction, it was upsized to a 16 F laser sheath. Again resistance was encountered at this junction, and significant binding between the RA and right ventricular (RV) leads was observed. The laser sheath was then placed over the RV lead, but resistance persisted at this same junction.

A 13 F mechanical dilating sheath (Evolution; Cook Medical, Bloomington, IN) was then introduced over the RA lead and, using a combination of mechanical and laser energy on both leads simultaneously, we were able to free the leads from that binding site.

At this point, we determined that the J retention wire on the RA lead had externalized and was protruding from the insulation, creating a type of fishhook that prevented further advancement of any sheath (Figure 1).

To minimize the risk of atrial laceration by this J wire, we advanced the 16 F laser sheath and carefully manipulated it over the J wire. By bending it forward, we were able to advance the laser sheath over the wire and toward the distal tip of the lead (Figure 2). With additional laser energy we were able to free the lead completely from its location in the RA appendage and the lead was fully extracted. Visual inspection revealed a protruding J retention wire (Figure 3).

The RV lead was then completely freed and extracted using additional laser and mechanical energy. All sheaths were removed, manual pressure was held to achieve hemostasis, and the wound was closed in the usual fashion. The patient remained stable throughout the entire procedure. He recovered uneventfully, received a single-chamber pacemaker (owing to permanent atrial fibrillation) the following month, and continues to do well 8 months post extraction.

Discussion

As indications for cardiac implantable electronic devices increase, so too does the need for lead extractions.[1] The most common indications for lead extraction are infection, venous occlusion, industry or US Food and Drug Administration advisories or recalls owing to lead malfunction, and mechanical failure.[2]

However, although performed with increasing safety and efficacy, lead extraction remains a procedure with significant

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Drs Schricker, Birgersdotter-Green, and Feld report no relevant conflicts related to this case report. Dr Pretorius reports being a consultant for and receiving speaker's honoraria from Spectranetics. **Address reprint requests and correspondence:** Dr Amir Schricker, Division of Cardiovascular Medicine, Sulpizio Cardiovascular Center, 9444 Medical Center Dr #7411, La Jolla, CA 92037. E-mail address: aschricker@ucsd.edu.

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KEY TEACHING POINTS

- Lead manufacturing and recall issues remain relevant for years after implantation, especially at the time of extraction.
- It is crucial to obtain detailed knowledge of leads prior to their safe and successful extraction.
- Very old leads can be extracted percutaneously if performed carefully, by experienced operators, and in the appropriate facilities (eg, hybrid operating room–catheterization lab.)

potential morbidity and mortality. When it is performed using a transvenous approach, there is a risk of life-threatening complications, including vascular or myocardial injuries requiring emergent thoracotomy. Older leads, extraction of implantable cardioverter-defibrillator leads, and the use of laser sheaths have been shown to be independent predictors of major complications. Fortunately, in experienced institutions, rates of major complication are $<2\%$ and in-hospital mortality is $<1\%$.[3,4]

Whereas several leads have been recalled in the past owing to high rates of mechanical or electrical failure,[5,6] the risks posed by the Accufix J lead are significantly different.[7] Though mechanical or electrical failure in some leads may render them nonfunctional, there is little or no risk in abandoning them in the body. In contrast, the Accufix lead poses an ongoing risk of perforation if abandoned, particularly if its J wire is already exposed. Complications caused by a protruding J retention wire may include pericardial effusion and tamponade from atrial perforation or laceration.[7] Furthermore, the J wire can detach and migrate or embolize to other structures, including the pulmonary vasculature,[8] bronchi,[9] and anterior mediastinum.[10]

The risks of spontaneous J retention wire fracture and protrusion decrease with time, with 5.6% per year at 5 years post implantion, 4.7% per year at 10 years post implantation,

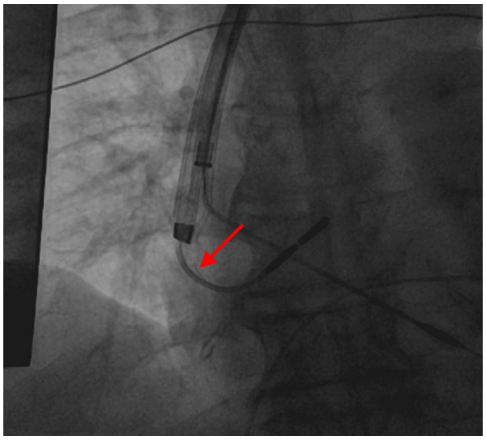

Figure 1 Externalization of the J retention wire (*arrow*) was noticed on the atrial lead. Because of the direction it was pointed, advancement of the laser sheath was not immediately possible.

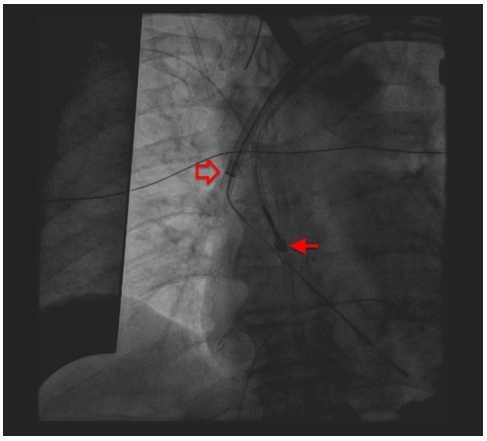

Figure 2 A 16 F laser sheath (*solid arrow*) was manipulated carefully over the J retention wire and bent it forward, enabling the sheath to be advanced to the distal tip of the lead; with additional laser energy, the atrial lead was freed completely from the appendage. Also seen is the mechanical sheath (*hollow arrow*) within its outer sheath, pulling traction on the right ventricular lead.

and 3.7% at 15 years post implantation.[7,11] As of November 2004 the risk of injury resulting from fractures and protrusions was 0.1% of implants, and the risk of death 0.05% of implants. The median time to injury is 35 months (range, 4–125 months).[11]

Although many Accufix leads have been extracted—almost 6000 extractions worldwide as of 2005 [11]—the procedures are associated with significant morbidity and mortality, even in leads that are relatively young. The risks of extraction increase every year that the lead has been implanted. Published extraction complication rates range from "minimal" in a Mayo series of 96 attempted extractions [12] to 0.4% fatal complication rate (16 of 4023) in the worldwide recall registry [7] to 14% in a series of 14 extractions.[13]

Extraction can be done either as an open surgical procedure or percutaneously, using such tools as mechanical workstations, laser sheaths, or snares. In one report, rigid bronchoscopy was used to extract a J retention wire that had penetrated the right lobar bronchus.

The risk of life-threatening or fatal complications during extraction increases with the duration of lead implantation, female sex, and protrusion of the J retention wire.[7] At 10 years post implant, the risk of fatal or life-threatening extraction is 2.9% for female patients and 1.1% for male patients.[11] However, with the increased use of safer extraction techniques such as laser sheaths, complication rates should likely decrease over time. Leads that have been implanted for greater than 1 year have also been associated with longer extraction times.[13]

This is the first reported case of a 20-year-old Accufix lead undergoing successful percutaneous extraction, complicated by intraoperative protrusion of its J retention wire. Although numerous cases of percutaneous lead extractions have been reported,[7] in addition to an isolated extraction of an externalized J wire,[14] to our knowledge none have documented the extraction of such an old lead with a protruding J wire.

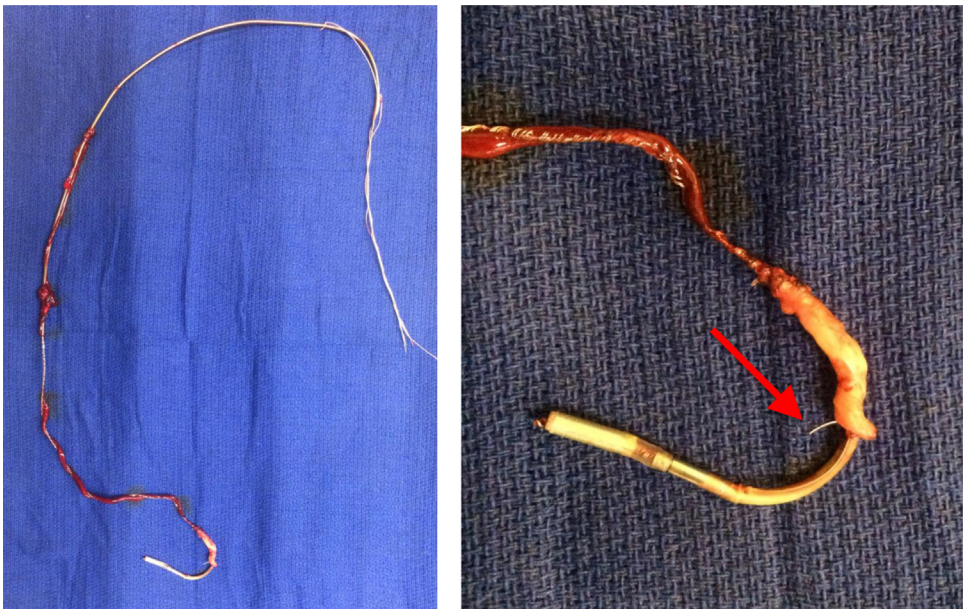

Figure 3 Visual inspection of the atrial lead revealed its protruding J retention wire (*arrow, right panel*).

Our case emphasizes the importance of becoming familiar with the leads planned for extraction, including the manufacturing details, potential mechanical weaknesses, past recalls, and any previous reports describing their extraction. This remains true not only for Accufix leads but for other leads under recall as well.

Finally, this case reinforces the value of a multidisciplinary team approach to performing complex procedures such as lead extractions, particularly in chronically implanted leads and leads prone to mechanical failure. The management of patients with Accufix leads must take into consideration lead age, probability of J wire defects, and probability of extraction complications.[15] Although lead extraction is associated with potentially fatal complications, it can be performed successfully and safely by experienced operators.

Conclusion

Accufix leads carry a high risk of J retention wire protrusion. However, with careful planning, percutaneous extraction is possible even for very old leads. This case demonstrates that awareness of the mechanism of failure of specific recalled leads, as it relates to their extraction, remains relevant for many years after original implantation.

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