# Laser-assisted extraction of a pacing lead with a supraclavicular course

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## Introduction

Extraction of intravascular implantable cardiac rhythm device leads can be challenging. This report details the extraction of a lead that had been implanted long ago via the supraclavicular approach.

## Case report

A 68-year-old man with a right-sided pacemaker originally implanted as a ventricular-only device more than 25 years before presentation and later upgraded to a dual-chamber device was admitted with a fever. Blood cultures grew methicillin-resistant *Staphylococcus aureus*. Transesophageal echocardiography revealed a vegetation on a pacing lead. The patient was not pacemaker dependent. Because of persistent gram-positive bacteremia, he was referred for extraction of the pacing system.

Chest radiography raised concern for an unusual course of the ventricular pacing lead (Figure 1). We suspected that the lead had been implanted via a supraclavicular approach.

At the time of the procedure, rotational fluoroscopy (Figure 2 and Online Supplemental Video) verified that the lead coursed over the clavicle, with likely vascular entry at the right internal jugular vein. Of note, the lead appeared to have a passive fixation mechanism. Given the passive fixation and the age of the lead, we anticipated the need for advanced extraction techniques, including laser sheath application and/or snaring.

The pacemaker pocket was entered and the generator removed. The active fixation atrial lead was removed with simple traction. We then undertook extraction of the ventricular lead. The lead was dissected from the extensively fibrotic pacemaker pocket. No model number or serial number could be identified on the lead. A small supraclavicular incision was made in the skin overlying the palpable lead (Figure 3A). In the search for any supraclavicular anchoring device (eg, suture and/or suture sleeve), the surrounding connective tissue was dissected away, but no such anchor was found. The lead was

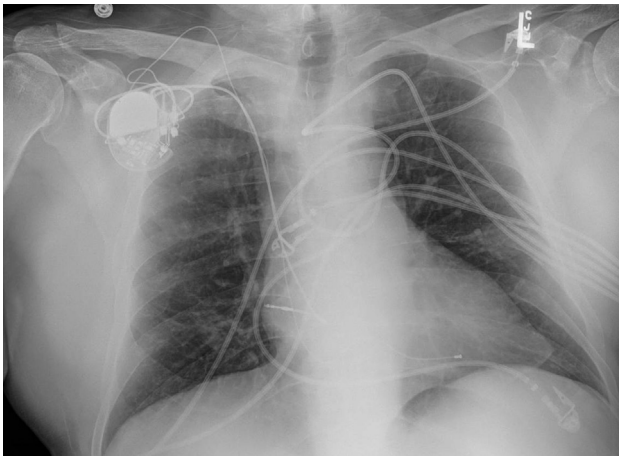

**Figure 1** Chest radiography suspicious for a supraclavicular course of the right ventricular lead.

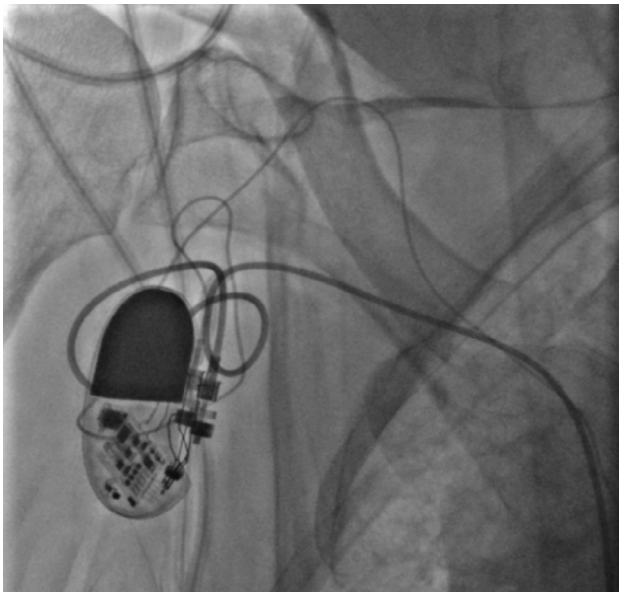

**Figure 2** Fluoroscopic evaluation (left anterior oblique projection) confirming the lead's supraclavicular course.

**KEYWORDS** Lead extraction; Supraclavicular; Pacemaker
**ABBREVIATIONS SVC** = superior vena cava
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## KEY TEACHING POINTS

- During procedural planning for lead extraction, it is important to consider the implantation technique that was used.
- Although infrequently encountered today, the internal jugular approach to cardiac lead implantation may complicate later device extraction.
- The ease and safety of extraction of leads with a supraclavicular/internal jugular course may be improved by straightening the extravascular portion of the lead.

transected proximal to the thick connector "boot." The remaining lead body was brought into the supraclavicular incision using blunt dissection and gentle traction.

Once the lead had been tunneled to the supraclavicular position, a lead locking device was deployed. The lead could not be extracted with simple traction. A 12Fr laser sheath (GlideLight; Spectranetics Inc, Colorado Springs, CO) was passed over the ventricular lead using a supraclavicular approach (Figures 3B and 4).

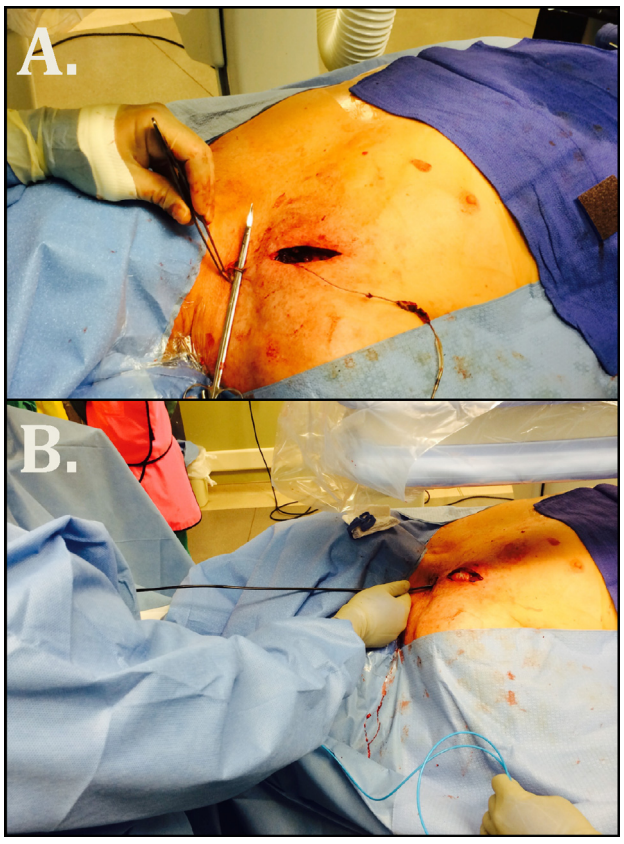


**Figure 3** **A:** A small supraclavicular incision was made, and the lead was tunneled to that position. **B:** A laser sheath was used for laser-assisted extraction of the supraclavicular pacing lead.

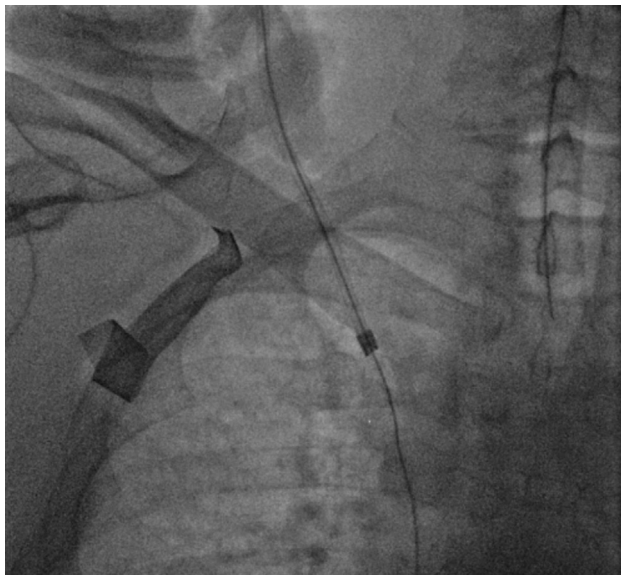

**Figure 4** Fluoroscopic image of a laser sheath passing over the supraclavicular lead.

Using traction/countertraction and short bursts of laser energy at a pulse rate of 40 Hz, the sheath was advanced to the tip of the lead, which was then extracted without incident.

## Discussion

This case demonstrates the importance of preoperative preparation before implantable cardiac electronic device extraction. Through recognition of the unusual course of this implanted lead, the operative approach was modified to facilitate uneventful extraction. The key aspect of this modification was the supraclavicular incision and superior deflection of the lead's free end, thereby allowing direct removal of the lead.

First introduced in 1965 by Yoffa, the supraclavicular approach to pacemaker lead insertion may be useful for overcoming subclavian vein obstruction during device upgrades or when infraclavicular access is otherwise difficult.[1–3] However, this technique may be associated with a higher rate of subsequent lead dislodgment and may require procedural modification when device extraction is required. In contemporary practice, the supraclavicular approach is now seen rarely, largely having been replaced by the infraclavicular approach to the axillary–subclavian system.

The angulated entry to the superior vena cava (SVC) is a common site of vascular injury during extraction from either side.[4] Because of the more acute angle at the junction of the subclavian/innominate vein and SVC, extraction of right-sided devices may be more difficult and/or hazardous than similar extractions from the left side. In our case, the lead's supraclavicular course may have made extraction actually safer than the usual subclavian trajectory, once the unusual course of the lead was recognized and addressed. Because the course from the SVC to the right ventricle is a straight line, the laser sheath could be passed more easily once the challenging angle was removed. Perhaps even a nonpowered extraction sheath would have sufficed. For this reason, some

authors advocate proactive conversion to the transjugular approach in challenging right-sided extractions.[5]

## Appendix

### Supplementary data

Supplementary material cited in this article is available online at http://dx.doi.org/10.1016/j.hrcr.2015.01.007.

## References

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