

Extraction of a 4-year-old leadless pacemaker with a tine-based fixation



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Introduction

The Micra transcatheter pacing system (Medtronic, Fridley, MN) has been implanted successfully in more than 2500 patients in clinical trials.^{1,2} Data on retrievals of these devices have been mainly limited to early retrievals. Afzal and colleagues³ reported on techniques of retrieval of 29 Micra devices. Eleven of those retrievals occurred during the implant procedure while 18 were removed a median of 46 days postimplantation (range, 1–95 days).³ Grubman and colleagues⁴ reported on 3 retrievals (9–406 days) postimplantation. Some autopsy reports have shown the potential for complete encapsulation of long-indwelling Micra devices.^{5,6} This has raised some concerns over the extractability of longer-indwelling Micras. In this case we report on the extraction of a Micra pacemaker implanted 4 years prior.

Case report

A 78-year-old man with history of coronary artery bypass graft in 1991 and permanent atrial fibrillation presented in March 2015 with complete heart block and junctional escape rhythm at 35–40 beats per minute.

He was enrolled in the Micra IDE study and received a Micra pacemaker on April 2, 2015. He did well for 3 years despite a decline in his ejection fraction from 50% to 40%–45%. In November 2018 he had a myocardial infarction and received a percutaneous coronary intervention to his right coronary artery. A follow-up echocardiogram (3 months post myocardial infarction) showed an ejection fraction of 25%–30%. The patient was then referred for a cardiac resynchronization therapy defibrillator (CRT-D) implantation.

The patient and treatment team engaged in a shared decision-making process, including a comprehensive discussion about disabling therapies from the Micra and

KEY TEACHING POINTS

- Extraction of long-indwelling Micra devices (Medtronic, Fridley, MN) is feasible via femoral snaring.
- The degree of Micra encapsulation is unpredictable.
- Intracardiac echocardiography might guide extraction of leadless devices.

implantation to CRT-D vs extraction of his Micra and implantation of the CRT-D system. The patient's strong preference was to have no abandoned hardware and to have his Micra extracted.

On March 14 he was brought to the electrophysiology lab, where both femoral veins were accessed. The left femoral vein access site was used to insert an intracardiac echocardiogram (ICE) catheter in the right ventricle (RV) and a quadripolar diagnostic catheter to provide temporary pacing. The right femoral vein was dilated serially to accommodate the Micra delivery system, as described previously.⁷ The delivery system was advanced to the right atrium over a stiff wire. A large-curve steerable sheath (in this case an Agilis, St. Jude Medical, Abbott Vascular, Santa Clara, CA) was introduced through a 12 French sheath that was placed in the Micra introducer system (to prevent back bleeding owing to the difference in diameter between the steerable sheath and the introducer system). A 20 mm One snare (Merit Medical Systems, Jordan, UT) was introduced through the steerable sheath. The Micra was clearly visualized using ICE (Figure 1). The steerable sheath was curved into the RV across the tricuspid valve; the snare was then maneuvered around the device and slowly pulled back to snare the proximal retrieval knob under fluoroscopic (Video 1A) and ICE guidance (Video 1B). Once the proximal knob was snared, traction with the snare and back-support with the steerable sheath extracted the Micra with relative ease (Video 2). We noted a tissue “cast” left in place on ICE (Video 3), but the device itself did not appear to be encapsulated when removed (Figure 2). We hypothesize that the “cast” seen on

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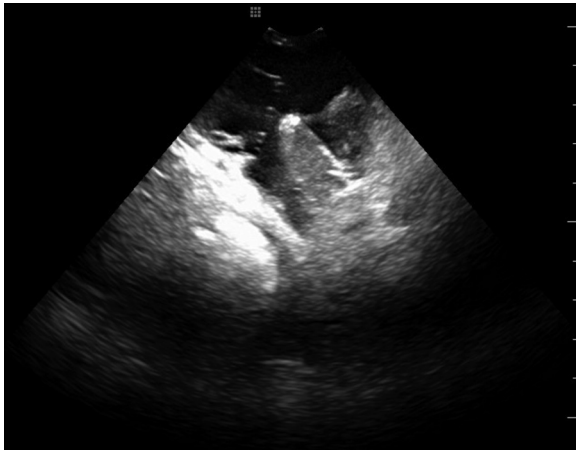


Figure 1 Intracardiac echocardiogram appearance of Micra transcatheter pacing system (Medtronic, Fridley, MN).

echocardiogram was the capsule covering the device and that the Micra was extracted, leaving the capsule behind (Figure 2). We cannot rule out that this “cast” was rather a torn ventricular muscle. Procedure time was 40 minutes and total fluoroscopy time was 11 minutes.

Discussion

Retrieval and extraction of Micra leadless pacemakers can be performed using 2 different approaches. A 7 mm snare can be introduced into the Micra delivery system and used to snare the device. Once the device is snared, the retrieval cup can be used to recapture the device. The advantage of this technique is the ability to provide real counter-traction with the delivery system. But a major disadvantage is that the delivery system has a diameter of 0.05 inches (1.27 mm) or 3.8F, which accommodates a small snare (maximal diameter = 7 mm and 3.2F). In our experience snaring of the device with this small-diameter snare is challenging and time consuming. Risk of injury to the RV by the “cup” of the retrieval system is also a possibility.

The second approach is the one used in this case. A steerable sheath can be used to cross the tricuspid valve and a 20 mm snare is used to snare the device. The advantage of this approach is the ease of snaring the Micra with a larger snare, while the disadvantage is the inability to provide adequate counter-traction. This could potentially result in injury to the myocardium.

In addition, it is important to note that the degree of encapsulation of Micra devices is variable and unpredictable. Unfortunately, we were unable to predict the degree of encapsulation with ICE. Further research is needed to determine if any imaging studies will help detect device encapsulation.

One should be aware of all the potential complications that could be caused by femoral extraction of these devices, such as perforation, tricuspid valve damage, or embolization of the



Figure 2 Extracted Micra transcatheter pacing system (Medtronic, Fridley, MN).

device. This patient has had prior sternotomy, which is protective against perforation.

Surgical removal of the Micra is also an option when absolutely indicated and when percutaneous retrieval is not possible.

Conclusion

In this report we describe the extraction of a ~4-year-old Micra device that was achieved with relative ease. This report might have implications for the ability to extract long-indwelling Micras. Further investigation in this regard is required.

Appendix

Supplementary data

Supplementary data associated with this article can be found in the online version at <https://doi.org/10.1016/j.hrcr.2019.05.002>.

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