Successful retrieval of an active fixation leadless pacemaker in a 74-year-old woman 506 days post-implant

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Leadless cardiac pacemakers are becoming common alternatives to conventional transvenous pacemakers for patients with an indication for single-chamber ventricular pacing. Two devices from two different manufacturers are currently in use. However, given their recent introduction, manufacturers make no clear recommendations for extracting leadless pacemakers in humans medium- to long-time post-implant.

Case study

A 74-year-old woman was referred for the upgrade to a cardiac resynchronization therapy (CRT) device because of deterioration of the left ventricular systolic function due to permanent VVI pacing. The patient had received a leadless pacemaker with a screw-in fixation mechanism (Nanostim™; St Jude Medical) for bradyarrhythmias 506 days previously. The retrieval decision was based on concern about potential mechanical interference with the CRT system. The device was successfully retrieved using the manufacturer's pre-designed catheter and single-loop snare system. The procedure was performed with cardiac surgery on stand-by in case of an unlikely perforation. The catheter was used to position the snare and to grasp the docking button on the device. After docking, a protective sleeve was advanced half-way over the device and rotated counterclockwise to unscrew the device from the endocardium (see Supplementary material online, *videos*). A moderate degree of fibrosis was present on the proximal docking knob but did not interfere with the procedure.

The retrieved device had an intact helix, suggesting atraumatic removal from the endocardium (*Figure 1F*). There were no procedure-related adverse events.

Discussion

This case represents the first published extraction of a leadless pacemaker in a human patient at a time point >1 year after implant. The device was removed successfully after 506 days *in situ*. Despite a moderate degree of fibrosis, the retrieval procedure was uneventful.

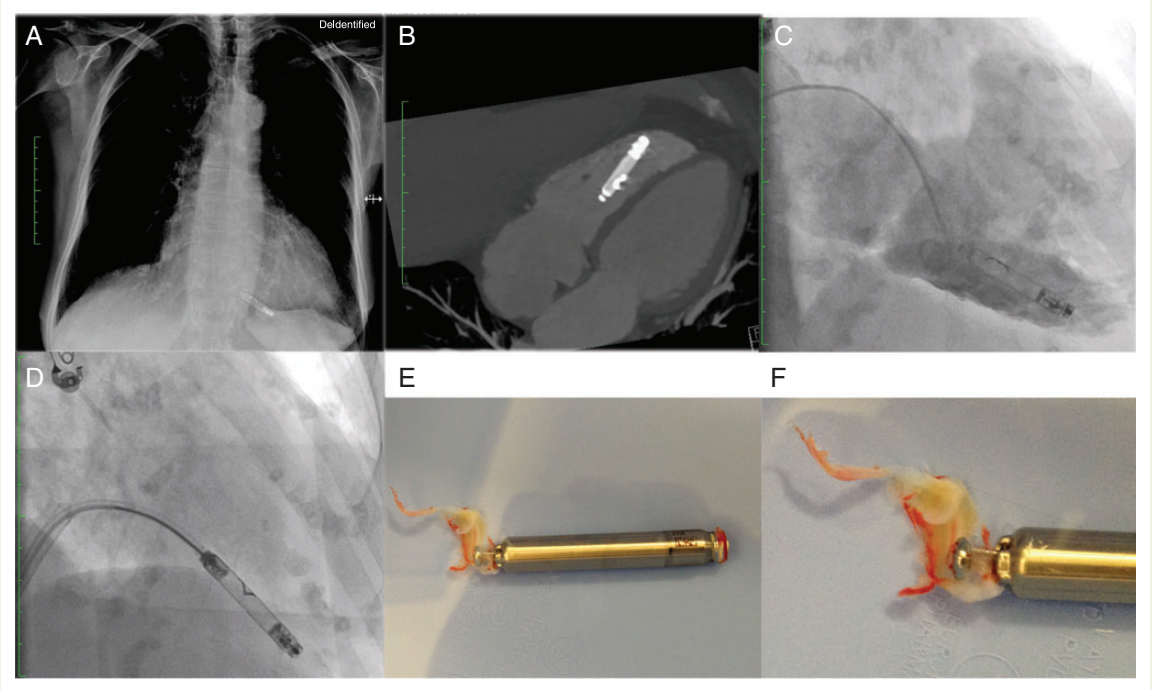

Figure 1 (*A*) X-ray and (*B*) computer tomography image showing device in place before procedure; (*C*) right ventricular angiography prior to snaring the device; (*D*) snare docked with the device; (*E*) extracted device; (*F*) fibrosis around docking knob.

Post-mortem histological evaluations have indicated partial, on-going myofibrocellular encapsulation of leadless pacemakers 19 months post-implant, raising concerns about the feasibility of removal of the device in the intermediate term after implant.[1] In animal models retrieval has been shown to be possible at least up to 2.5 years post-implant, but no such data are available in humans.[2] The successful procedure reported here indicates that leadless pacemaker retrieval can be performed with a reasonable safety profile 1–2 years post-implant.

A number of caveats apply: this was a single case and individual operator skills and patient characteristics may not be representative of the average conditions. As a case study, the results may not be relevant to other types of leadless pacemakers. The time horizon from implant to retrieval remains too short to allow conclusions around routine explants at the end of device life spans (after 4–10 years).[3] Further data from other operators and longer time periods post-implant will be necessary to determine the most appropriate strategy for leadless pacemaker management (retrieval or abandonment) once the battery has been depleted.

Supplementary material is available at *Europace* online.

Conflict of interest: W.J. received speaker and consultancy fees from the following companies: St. Jude Medical, Medtronic, Boston Scientific, Biotronik.

References

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