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Visualization of Cardiac Perforation During Micra Transcatheter Leadless Pacemaker Implantation

— A Lesson From Cadaver Training —

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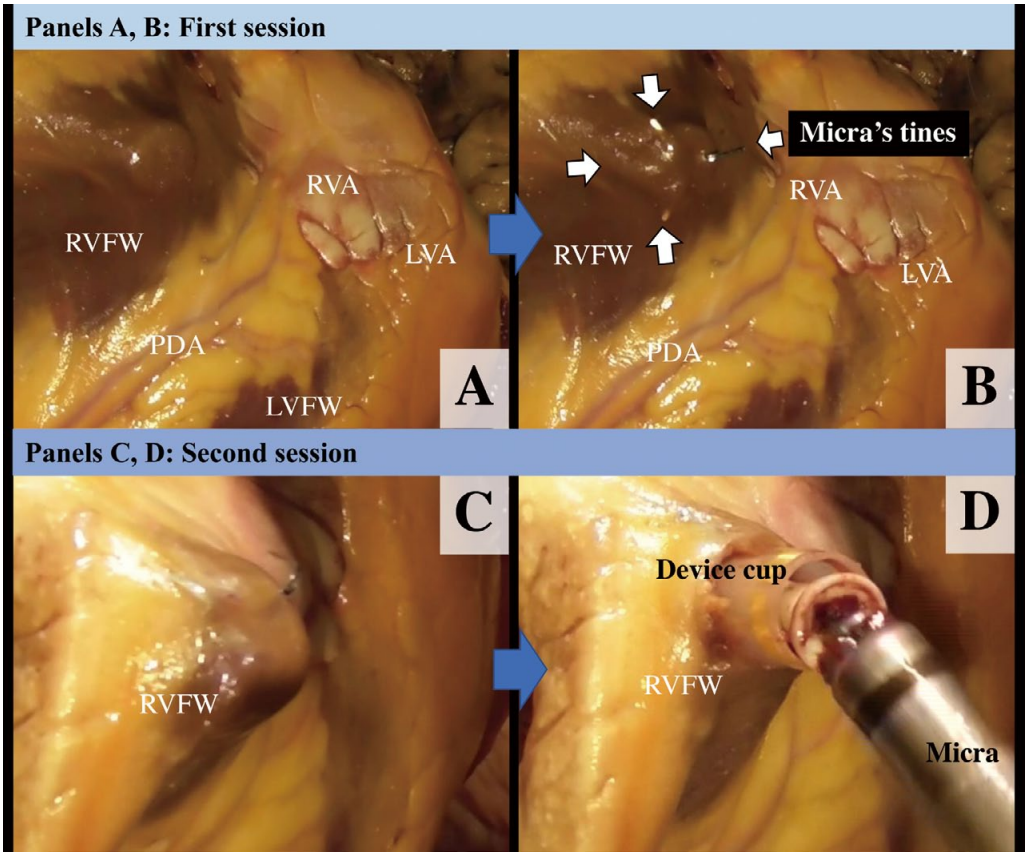

Figure. Cadaver training for Micra implantation. (**A**,**B**) First session of Micra implantation. All 4 tines penetrated through the right ventricular (RV) apical endocardium (white arrows). (**C**,**D**) Second session of Micra implantation. The Micra burst from the RV apical wall and popped out. LVA, left ventricular apex; LVFW, left ventricular free wall; PDA, posterior descending artery; RVA, RV apex; RVFW, RV free wall.

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Recent studies have demonstrated the safety and efficacy of the novel leadless Micra Transcatheter Pacing System (Medtronic). However, cardiac death due to cardiac perforation during the procedure has been also reported. Two possible causes have been proposed for the cardiac deaths following Micra implantation: (1) the larger size of the device compared with the conventional pacemaker lead; and (2) the effect of a learning curve for new procedures. Thus, in order to understand how this fatal complication occurs during the procedure, we aimed to visualize cardiac perforation by the Micra system by cadaver training.

Well-trained cardiologists implanted the Micra in the right ventricular (RV) apex according to the manufacturer's instructions to investigate macro findings of complications. When it was first implanted directly into the RV removed during cadaver training, all 4 tines penetrated through the RV apical endocardium to the pericardium (**Figure A**,**B**; **Supplementary Movie 1**). During the second implantation, with fixation of the Micra delivery catheter tip on the RV apical endocardium, the Micra burst from the RV apical wall and popped out (**Figure C**,**D**; **Supplementary Movie 2**). During the cadaver training, the Micra easily penetrated and broke through the RV apical wall despite light pressure, which caused cardiac perforation and tamponade. Both implantations were performed by attaching the Micra to the RV apex; it was assumed that the pressure was less than or equal to that during usual implantations, such as making "gooseneck sign". Although the Micra is a useful device, it should be implanted carefully into the RV septum and not into the thin wall of the RV free wall, apex, or left ventricle-RV hinge.

Disclosures

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Supplementary Files

Supplementary Movie 1. Cardiac penetration by Micra's tines.

Supplementary Movie 2. Cardiac perforation by Micra.

Please find supplementary file(s);
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