

Percutaneous extraction of a leadless Micra pacemaker after dislocation: a case report

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Background

Leadless pacemaker implantation rates are increasing worldwide. Until now leadless pacemaker dislocation and extraction has been rarely reported.

Case summary

An 83-year-old patient with cardiac amyloidosis, chronic atrial fibrillation, and complete heart block was implanted with a leadless pacemaker (Micra, Medtronic). On the day after implantation, the device showed an exit block and on cardiac echocardiography and cardiac computer tomography, a device dislocation could be detected. During the day, the device moved at least three times between the tricuspid valve and the right ventricular apex. Each time causing non-sustained ventricular tachycardia. At the next day device extraction was scheduled. After 189 minutes of procedure time, it was possible to retrieve the device with the help of two steerable introducers (Agilis) and two snare catheters.

Discussion

Implantable transcatheter leadless pacemakers can be implanted safely most of the time. However, in rare cases device dislocations may occur. Device extraction is possible, but is described as challenging in most published cases

Keywords

Leadless pacer • Micra • Extraction • Dislocation • Case report

Learning points

- Dislocation of a leadless pacemaker is a rare complication.
- Extraction of a leadless pacemaker can be difficult and time consuming.

Introduction

Leadless Pacemakers (Micra, Medtronic, Minneapolis, USA) are implanted because of occluded subclavian or superior cava veins, or to reduce the risk of lead associated complications like lead injury, dislocation, infection etc. Leadless Pacemaker implantation rates are

increasing worldwide. At the end of 2017, more than 10'000 patients in 40 countries had such an implanted device.¹ In a recently published registry with 795 patients, successful device implantation was possible in 99.6% of cases, and major complications occurred only in 1.51% of cases.² Until now, leadless pacemaker extraction has rarely been reported,³ and device dislocation was reported only once – into the

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pulmonary vein in a patient with a congenital heart defect.⁴ We report here on a patient with an acute leadless pacemaker device dislocation after one day with subsequent successful percutaneous device extraction.

Timeline

Day 1	Patient was submitted because of suspected amyloidosis and shortness of breath
Day 2	Cardiac MRI to confirm amyloidosis
Day 3	Coronary angiography and right heart catheterization, on the evening development of complete heart block
Day 7	Implantation of a leadless pacemaker (Medtronic Micra)
Day 8	Device dislocation
Day 9	Extraction of dislocated leadless pacemaker
Day 10	Implantation of a conventional VVI pacemaker
Day 12	Discharge home in good condition

Case presentation

An 83-year-old patient was admitted to our hospital due to suspected amyloidosis. The patient presented with dyspnoea, ascites and suspicious left ventricular hypertrophy (ventricular septum thickness 25 mm). In the physical examination findings on admission, he showed slight leg oedema. Besides of that, no signs of cardiac congestion were present. He had systolic murmur at the 4th intercostal area. Otherwise, physical examination was normal.

The patient had a moderately impaired left ventricular function, chronic atrial fibrillation, a known left bundle branch block, a higher degree tricuspid insufficiency, and a moderate mitral insufficiency.

We conducted cardiac magnetic resonance imaging, and the findings were in accordance with the suspected amyloidosis. In the laboratory results, we could not detect light chains or results in accordance with multiple myeloma or MGUS. Obstructive coronary artery disease and pulmonary hypertension were ruled out by invasive coronary angiography and right heart catheterization. In the following night, the patient developed higher degree heart block with a need for temporary pacing. Three days later, the decision for a permanent pacemaker was made due to ongoing complete heart block. Owing to the presence of a moderate to severe tricuspid regurgitation, the placement of a leadless pacemaker was scheduled.

The implantation of the leadless pacer device was performed using fluoroscopy and echocardiography guidance, and the procedure was done according to the manufacturer's training recommendation. The procedure was aggravated due to a very thick moderator band that led to a difficult placement. Nevertheless, the leadless pacer device could be successfully implanted into the septum close to the moderator band, showing good sensing and pacing values. Additionally, in the tilt test, at least three times were firmly secured.

After catheter and sheath removal, the patient developed a short phase (about 1 second) with loss of capture of the pacer device.

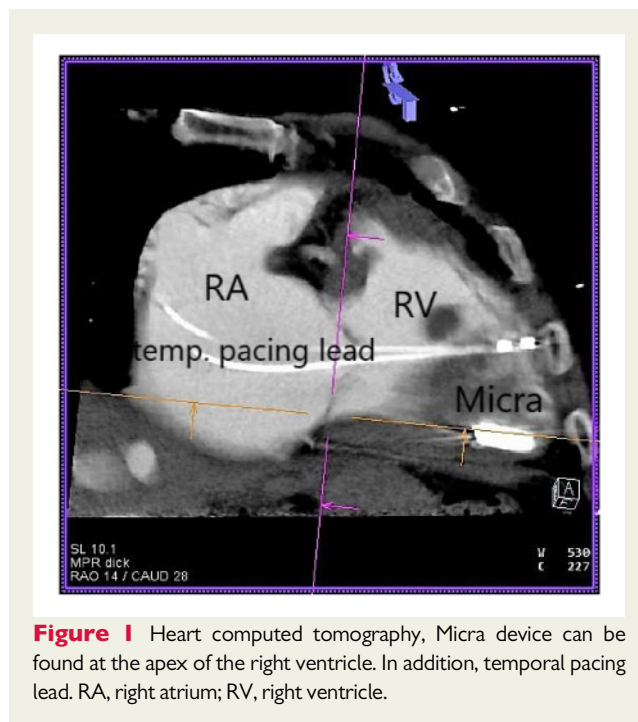


Figure 1 Heart computed tomography, Micra device can be found at the apex of the right ventricle. In addition, temporal pacing lead. RA, right atrium; RV, right ventricle.

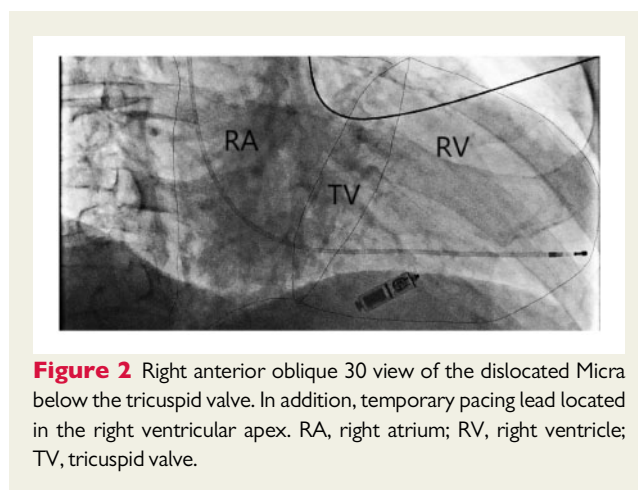


Figure 2 Right anterior oblique 30 view of the dislocated Micra below the tricuspid valve. In addition, temporary pacing lead located in the right ventricular apex. RA, right atrium; RV, right ventricle; TV, tricuspid valve.

However, a second periprocedural interrogation showed stable pacing and sensing values. Therefore, the temporary pacing lead was maintained on a backup pacing mode. The next morning, the leadless pacemaker showed an exit block with device dislocation just below the tricuspid valve on echocardiography and device extraction was scheduled for the next day. Because the leadless pacemaker could not be visualized below the tricuspid valve after the first movement, and we feared that it dislocated into the pulmonary artery, a cardiac CT study was performed; with the result that the device was located at the right ventricular apex (Figure 1). However, during the next night, it moved back to the postero-septal right ventricular groove below the tricuspid valve. With each device movement, which occurred at least three times, the patient developed a non-sustained ventricular tachycardia. Device extraction was not scheduled on the

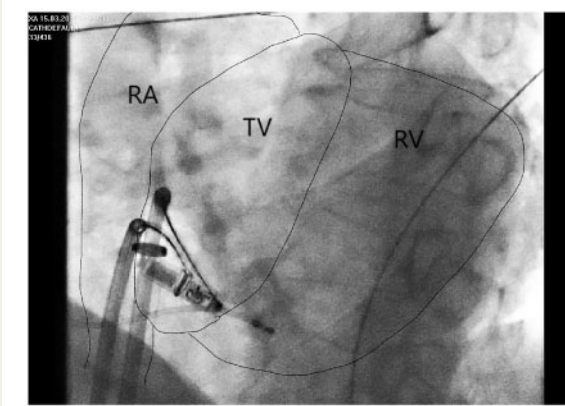


Figure 3 (left anterior oblique) view: extraction of the Micra. One snare is holding a fixation tine (right side) and the other snare is holding the Micra body. In addition, temporary pacing lead. RA, right atrium; RV, right ventricle; TV, tricuspid valve.



Figure 4 Explanted Micra, snared through an Agilis steerable introducer which is located in the Micra sheath.

same day, because we felt that a specialist for tricuspid clipping should be present during the procedure.

For device extraction, external pacing patches were applied and the leadless pacemaker sheath (Micra introducer, Medtronic, Minneapolis, USA) was inserted via the right femoral vein (for the position of the dislocated leadless pacemaker, see *Figure 2*). Into this sheath, the following additional items were inserted: first, a 14 french short sheath for hemostasis; second, a large curve steerable introducer (Agilis, Abbott, Abbott Park, Illinois, USA); third, a 6 F Amplatz (AL 2, Cordis, Milpitas, USA) diagnostic catheter with a snare (Amplatz Goose Neck 20 mm). After multiple repositionings, it was possible to snare one of the 'FlexFix' tines. However, it was not possible to retrieve the device out of the tricuspid valve. Therefore, a second large curve steerable introducer (Agilis, Abbott, Abbott Park, Illinois, USA) was inserted into the left femoral vein. Via the 2nd introducer, another Amplatz diagnostic catheter (AL 2, Cordis, Milpitas, USA) and another snare (Amplatz Goose Neck 20 mm) were introduced. Again, after multiple repositionings, it was possible to snare the body of the leadless pacemaker capsule. With both the snared tine and the body of the capsule, the device was finally retrieved successfully into the leadless pacemaker delivery sheath (Micra introducer, Medtronic, Minneapolis, USA) and extracted (see *Figures 3* and *4*). The entire procedure lasted 189 minutes. No pericardial effusion or aggravation of the tricuspid regurgitation occurred. Afterwards, the patient was implanted with a conventional VVI pacemaker and was successfully discharged. Unfortunately the patient did not come for a follow-up visit.

Discussion

Implantable transcatheter leadless pacemakers can be implanted safely most of the time. However, in rare cases device dislocations may

occur. Until now, only one case of device dislocation has been published,⁴ in which a patient with congenital heart disease was treated with a leadless pacemaker which dislocated into the pulmonary artery, and could be safely extracted. In two other cases, device extraction had to be performed due to loss of capture several weeks after implantation or device infection.^{3,5}

In theory, a dysfunctional leadless pacemaker can be removed by retrieving the device via the proximal retrieval feature into a leadless pacemaker delivery sheath after implanting a new device with the aim of reducing the risk of perforation or damage to the tricuspid valve, because the 'FlexFix' tines are pulled back into the proximal retrieval feature inside the right ventricle. However, since the reason for the dislocation of the current device was unknown in this case, we opted for implanting a conventional pacemaker. In addition, an 'empty' proximal retrieval feature is not available. It should also be mentioned that during our attempts to retrieve the dislocated leadless pacemaker, we were unable to snare the proximal retrieval feature. This was also the case in the other three reported cases.³⁻⁵ We assume that our inability to snare the proximal retrieval feature was mainly due to anatomical reasons; in particular, the device was located too close to the septum. The most feared complication in our case was further damage to the tricuspid valve and pericardial tamponade because of the 'FlexFix' tines. Fortunately, this did not happen.

Until now, no data on leadless pacemaker implantation in patients with cardiac amyloidosis have been published. It can be hypothesized that in such cases, the device tines may slip due to the presence of amyloid between the myocytes. Another explanation is that the large moderator band led to an incomplete fixation of the 'FlexFix' tines.

Conclusion

In very rare cases, leadless pacemaker dislocation can occur. Device extraction is possible, but is described as challenging in most published cases.

Lead author biography



Dr. Stephanie Fichtner, born 26 December 1979 in Germany, works since 2012 at the University hospital Klinikum der Universität München. She is specialized in interventional electrophysiology and device therapy. From 2007 to 2012, she underwent her specialist training for cardiology at the German Heart center in Munich. She went to medical school at the Medizinische Hochschule Hannover.

Supplementary material

[Supplementary material](#) is available at *European Heart Journal - Case Reports* online.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as [Supplementary data](#).

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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