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# SUCCESSFUL RETRIEVAL OF A DISLODGED LEADLESS PACEMAKER FROM THE RIGHT ATRIUM

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## ABSTRACT

*Background:* Leadless pacemakers have been widely adopted for their safety and efficacy in treating bradyarrhythmia. While rare, device dislodgement during implantation necessitates retrieval.

*Case report:* We present the case of a 91-year-old man with end-stage renal failure receiving maintenance dialysis, who experienced symptomatic complete atrioventricular block. During leadless pacemaker implantation, after multiple unsuccessful attempts to secure the device in the right ventricle, the device dislodged into the right atrium during tether traction. The device initially caught on the tricuspid valve before floating into the posterior right atrium near the inferior vena cava. Using a snare technique, we successfully retrieved the device within 115 minutes of dislodgement. Post-procedure imaging showed no complications. This case highlights that unexpected migration into the right atrium may facilitate safer, simpler retrieval compared to right ventricular or pulmonary artery dislodgement.

*Conclusions:* The right atrial location offered advantages including reduced cardiac motion influence and fewer premature contractions, enabling easier capture from the inferior vena cava using the snare. Prompt recognition and management of device dislodgement during implantation procedures is of key importance.

## KEYWORDS

Leadless pacemaker, dislodgement, complication

## LEARNING POINTS

- This report highlights the successful retrieval of a leadless pacemaker that migrated into the right atrium during implantation.
- Clinicians will learn the importance of prompt recognition of device displacement and how unexpected migration to the right atrium can facilitate safer retrieval, particularly using a snare.
- Understanding the implications of device migration into the right atrium versus more complex locations, such as the right ventricle or pulmonary artery, is essential for effective management of leadless pacemaker implantation complications.

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## INTRODUCTION

Leadless pacemakers have been widely adopted and their safety and efficacy as implantable devices for bradyarrhythmia have been confirmed[1]. The Micra Transcatheter Pacing System (Medtronic, Minneapolis, USA) is widely utilized, with numerous cases reported. Due to the absence of complications related to pockets or leads, patients who require preservation of the subclavian vein, such as those on dialysis, greatly benefit from this device.

Although rare, removal is necessary in some cases due to threshold elevation or dislodgement, and removal after the acute phase is occasionally reported[2]. The frequency of device dislodgement within 30 days after implantation is very low, at 0.13%, and reports of successful retrieval of a floating device during implantation are scarce[3].

We report a case in which a dislodged leadless pacemaker that floated during implantation was successfully retrieved from the right atrium. Dislodgement into the right atrium facilitated safer, simpler retrieval, and we discuss our considerations regarding the retrieval technique based on this experience.

## CASE DESCRIPTION

The patient was a 91-year-old man who presented with general malaise as the primary complaint. He had end-stage renal failure due to diabetic nephropathy and was scheduled for maintenance dialysis. He was hospitalized for uraemia on February 6th 2025 and underwent emergency dialysis via insertion of a dialysis catheter into the right internal jugular vein. Attempts to create an arteriovenous fistula for haemodialysis were made, but both forearm veins were severely narrowed. A long-term indwelling dialysis catheter was therefore inserted into the left subclavian vein for maintenance dialysis.

On hospital day 27, the patient was referred to the cardiology department due to complete atrioventricular block and episodes of syncope. An electrocardiogram (ECG) revealed sinus rhythm with evidence of infra-Hisian block. Monitor ECG during syncope showed 4.2 s of long pauses due to complete atrioventricular block. Chest X-ray showed cardiomegaly and mild pulmonary congestion. During hospitalization, the patient experienced symptomatic complete atrioventricular block with episodes of syncope. Since reversible causes were not evident, permanent pacemaker implantation was indicated. Non-sustained ventricular tachycardia was also present, necessitating consideration of both permanent pacemaker implantation for symptomatic bradycardia and intensified antiarrhythmic drug therapy.

Pacemaker implantation was performed on hospital day 38. As the subclavian vein needed to be preserved for maintenance dialysis, a leadless pacemaker was implanted. Attempts to implant the leadless pacemaker in the right ventricular septum via the right femoral vein were unsuccessful despite multiple attempts due to suboptimal pacing and sensing parameters. On the 7th attempt, acceptable pacing and sensing parameters were obtained in the right ventricular apical region. At this point, 85 minutes had elapsed since sheath insertion.



*Video 1. While pulling the tether, the device dislodges from the right ventricle and a tine catches on the tricuspid valve. Continued observation reveals that after initial dislodgement into the right ventricle, the device migrates into the right atrium. After that, the device remains relatively stationary in the right atrium.*
*https://youtu.be/QPScZZrvsyo*

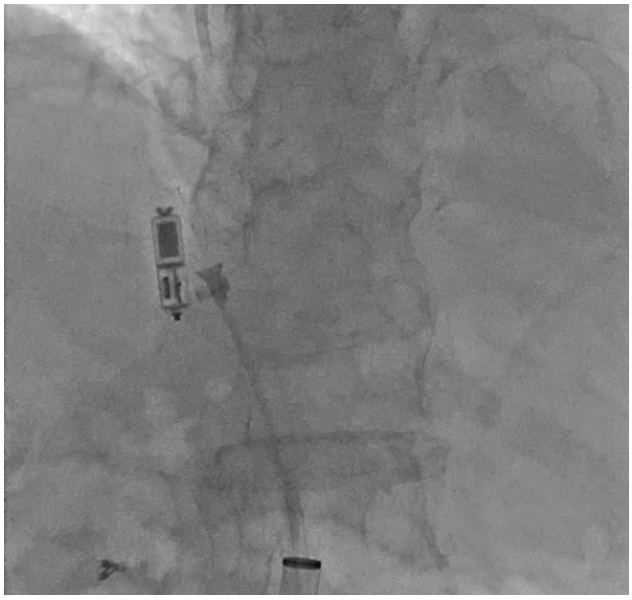


*Figure 1. The device exhibits minimal movement in the right atrium by the inferior vena cava. Due to the minimal impact of cardiac beats and infrequent premature contractions, the device was able to be captured using the snare.*

Resistance was encountered during tether traction, and close inspection revealed that the device had already dislodged from the right ventricular myocardium and was floating, with one tine caught on the tricuspid valve. High mobility of the leadless pacemaker was apparent *(Video 1)*. Continuing observation, after the tine detached from the tricuspid valve and the device floated into the right ventricle, it then passed

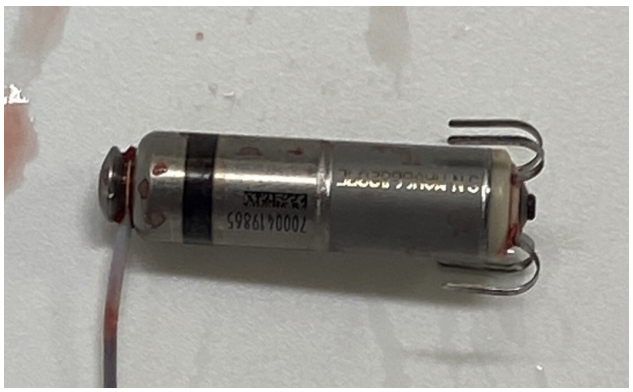


*Figure 2. The retrieved device does not show any adherent cardiac muscle or valve tissue. A small amount of thrombus is adherent to the snare.*

in a retrograde manner through the tricuspid valve and fell into the posterior right atrium *(Video 1)*. Fortunately, the leadless pacemaker exhibited minimal movement in the right atrium near the inferior vena cava.

While an assistant operated the deflection button, the operator attempted to capture the retrieval head using a snare (Amplatz gooseneck snare 7 mm). Snaring proved successful and the device was retrieved into the sheath and removed from the body *(Fig. 1)*. A total of 115 minutes elapsed from dislodgement to extracorporeal retrieval. Examination of the retrieved device revealed no evidence of myocardial or valve tissue *(Fig. 2)*, with only a small amount of thrombus adhering to the snare.

Postoperative echocardiography and computed tomography showed no evidence of pericardial effusion or worsening tricuspid regurgitation. Reimplantation of the pacemaker was considered, but uncertainty as to whether adequate thresholds would be obtained and the need to preserve the subclavian vein led to a decision for medical therapy, followed by transfer to a chronic care medical facility.

## DISCUSSION

A leadless pacemaker that dislodged during implantation was successfully retrieved from the right atrium. As a result of the time-consuming implantation procedure, strong resistance occurred during tether traction. This led to detachment of the tine, causing the device to float. Fortunately, in this case, the entry of the detached device into the right atrium was considered to have contributed to the successful retrieval.

The right atrium receives less influence from cardiac motions and experiences fewer premature contractions, and the posterior location anatomically adjacent to the inferior vena cava facilitates capture using a snare from the inferior vena cava. A report on the retrieval of a transcatheter pacing system floating between the inferior vena cava and tricuspid valve annulus also described successful retrieval utilizing the double-snare technique in the right atrium[4].

When the device migrates into the right ventricle or pulmonary artery, the procedure is expected to be more challenging due to anatomical bends or the need to pass through valve tissues. In such cases, priority must be given to capture and stabilization of the device by introducing a large-diameter snare from the internal jugular vein, using a combination of diagnostic catheters, or employing a double-snare technique and pulling the snared device into the right atrium[5,6]. If this is not possible, consideration should be given to surgical intervention or conservative therapy.

This case presents a valuable experience with successful retrieval of a dislodged leadless cardiac pacemaker from the right atrium during implantation and provides insights into the complications associated with leadless cardiac pacemaker implantation and the management strategies.

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