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# Femoral extraction of dropped-in atrial lead with Evolution system

## Przezżylne usunięcie złamanej i przemieszczonej do żyły podobojczykowej elektrody przedsionkowej z dostępu udowego przy użyciu systemu *Evolution*

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### Abstract

We present a case of an 82-year-old patient who underwent transvenous lead extraction of a broken atrial lead, a functional ventricular lead and an abandoned ventricular lead due to suspicion of lead dependent infective endocarditis. The atrial lead was implanted 18 years ago, and 10 years ago it dislodged into the subclavian vein following a fracture. The lead was removed via the femoral vein approach using a pigtail catheter, lasso, Dotter basket, Needle's Eye Snare and finally the Evolution system.

Key words: pacing complication, lead extraction, migrating leads, mechanical sheath

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## Introduction

The need for transvenous lead extraction (TLE) has increased progressively over the last years, due to a growing number of active and abandoned endocavitary leads and their prolonged dwell-time in the cardiovascular system. The method of choice for leads reachable through the access site is extraction via the implant vein [1]. Venous access from femoral approach is required in cut or broken leads of which the free end migrated in the cardiovascular system. The inferior approach offers versatile techniques and full array of tools utilized to grasp and pull the lead [2]. The extraction of completely intravascular leads is a challenging procedure that demands high-skilled operators capable to modify ad hoc the techniques and tools. We present a successful femoral extraction of a broken dropped-in atrial lead by Evolution mechanical dilator sheath (Cook Medical). It is a hand-powered mechanical sheath provided with a rotating-cutting metal tip.

## Case report

An 82-year-old male underwent primary DDD implantation 18 years ago because of hypersensitive carotid sinus with syncope. Both atrial (Biotronik TIJ 53-BP) and ventricular (Biotronik TIR 60-BP) leads were inserted by subclavian vein puncture. At a routine follow-up visit 14 years ago fracture of atrial lead in the mechanism of crush syndrome was discovered. The pulse generator was switched to VVI mode. During reimplantation of a pacemaker 10 years ago the atrial lead was identified to have dislodged into

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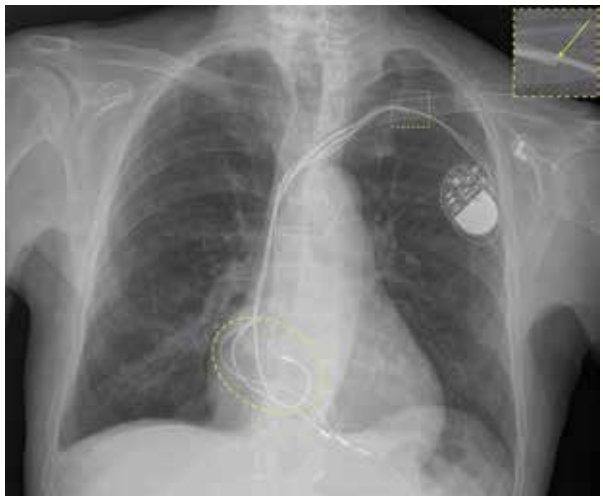

**Figure 1.** Patient's chest X-ray before the procedure. The fractured atrial lead is dislodged into subclavian vein. There is an extensive length of the leads in right atrium

subclavian vein and unfixable damage of the ventricular lead was observed. A new ventricular lead Medtronic 5092 was implanted and the previous ventricular lead abandoned (Figure 1).

Recently the patient was admitted to the hospital due to battery depletion for TLE and restoration of DDD pacing system. The routine transoesophageal echocardiography demonstrated numerous, oscillating, hypoechogenic structures attached to the leads in the right atrium, which prompted the suspicion of lead-dependent infective endocarditis (LDIE), despite negative inflammatory markers. Venography revealed total occlusion of ipsilateral left subclavian vein. The patient was selected for TLE and antibiotic therapy.

## Lead extraction

During the procedure both ventricular leads were approached and extracted via the left subclavian vein. Then two punctures of the left femoral vein were performed and through each Medtronic Attain delivery system was inserted. Through one of them a pigtail containing a guidewire was inserted into the right atrium. The guidewire formed a loop encircling the atrial lead. The other loose end of the guidewire was grasped by lasso catheter, inserted through second Attain delivery system. Pulling both ends of the guidewire led to detaching of the tip of the atrial lead from the endocardium. Then the lead was pulled down the inferior vena cava by exerting gradual traction force in turn on lasso, Dotter Retrieval Set and finally Needle's Eye Snare. Even though the lead was exposed through femoral vein, its broken and dropped-in end did

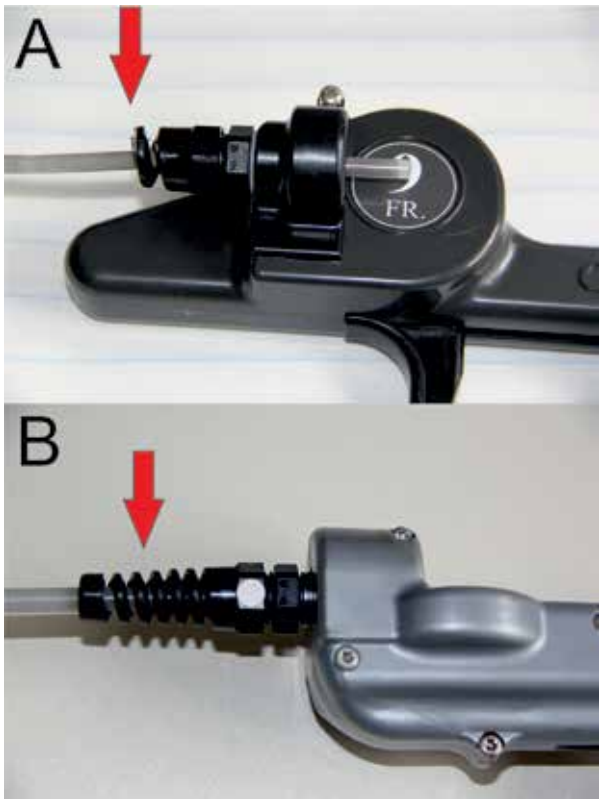


**Figure 2A.** Manually modified Evolution in order to lengthen the sheath; arrows point the place of modification; **B.** Unmodified Evolution system

not change its position in the left subclavian vein. Silicone insulation of the lead ruptured in several places and the internal wire straightened up. Extra-long (measuring 46 cm) green Byrd dilatator and then 16 Fr. Needle's Eye Snare sheath (cut diagonally beforehand in order to exert rotating-cutting force) were used to cut away lead's strong adhesions in the vein. Both methods were unsuccessful. The last attempt was performed with 9 Fr. Evolution mechanical dilatator. The sheath was manually modified by cutting off the rubber coil near the handle which added 4 cm to its length (Figure 2), and then inserted over the lead up to the left brachiocephalic vein. Simultaneous application of traction on the lead and cutting force of the Evolution system finally succeeded in separation of the lead from fibrous tissue (Figure 3, 4). There were no intra-operative complications

## Conclusions

In the presented case the lead of which the broken end migrated to the vascular system and upon admission to the hospital was considered as not posing immediate

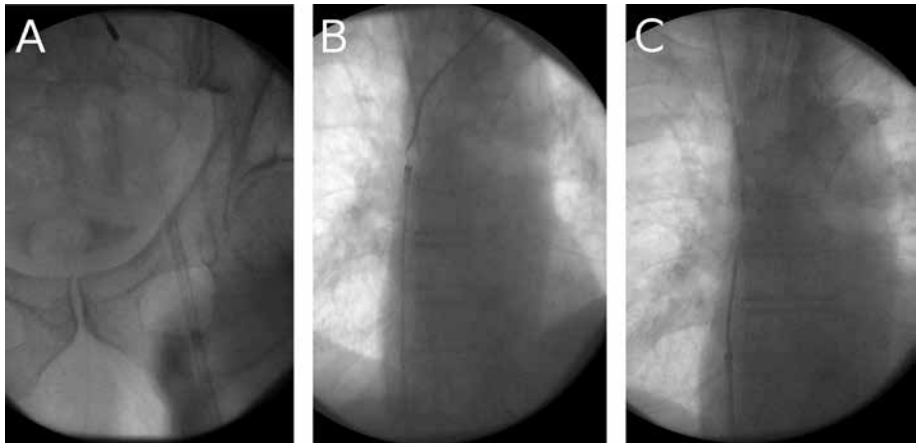


**Figure 3A.** Evolution inserted via femoral vein moves along the elongated body of the atrial lead; **B.** Evolution cutting fibrous adhesions in superior vena cava; **C.** Proximal end of the atrial lead released from the left subclavian vein and pulled back into Evolution

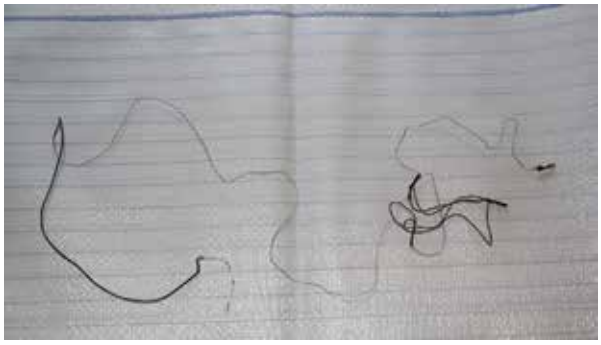

**Figure 4.** Atrial lead after extraction

threat to the patient if left in place, was class 2b indication for TLE according to Heart Rhythm Society guidelines [1]. However, due to the suspicion of LDIE the total extraction of leads and the device was class 1 indication. Most of the descriptions of dislodged lead extraction from femoral vein access employed exclusively snaring techniques [3–6]. If the leads were strongly ingrown in the cardiovascular system the dilatators were utilized [7, 8]. Patients with LDIE in whom the catheter-based methods were ineffective required thoracotomy for lead removal [9]. To our knowledge, this is the first description of Evolution system use from femoral approach. It should be noted that the use of Evolution system from other than superior approach is off-label. Undoubtedly, there is need of longer extraction tools designed to explant leads from inferior approach.

## Conflict of interest(s)

The authors declare no conflict of interest.


### Streszczenie

Autorzy prezentują przypadek kliniczny 82-letniego mężczyzny, u którego wykonano zabieg przezżylnego usunięcia złamanej i wpadniętej elektrody przedsionkowej, czynnej elektrody komorowej i porzuconej elektrody komorowej z powodu silnego podejrzenia infekcyjnego zapalenia wsierdzia związanego z układem stymulującym. Elektrodę przedsionkową implantowano 18 lat temu; złamała się w mechanizmie *crush syndrome* i 10 lat temu przemieściła się do żyły podobojczykowej. Elektrodę tę usunięto z dostępu udowego za pomocą cewnika typu *pigtail*, cewnika typu lasso, koszyczka Dottera, chwytaka *Needle's Eye Snare* i ostatecznie mechanicznego systemu *Evolution*.



Słowa kluczowe: powikłania stałej stymulacji serca, przezżylne usuwanie elektrod, wpadnięte elektrody endokawitarne, mechaniczne systemy do usuwania elektrod

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