Femoral extraction of dropped-in atrial lead with Evolution system

Przeżylne usunięcie złamanej i przemieszczonej do żyły podobojczykowej elektrody przedściankowej z dostępu udowego przy użyciu systemu Evolution

Maciej Dębski¹, Krzysztof Boczar¹, Kazimierz Haberka¹, Andrzej Ząbek¹, Jacek Lelakowski², Barbara Małecka²

¹Department of Electrocardiology, John Paul II Hospital in Krakow
²Institute of Cardiology, Jagiellonian University Medical College in Krakow, Department of Electrocardiology, John Paul II Hospital in Krakow

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

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 TU 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...
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, hypoechoic 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 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 dilator 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 dilator. 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

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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

**Figure 2A.** Manually modified Evolution in order to lengthen the sheath; arrows point the place of modification; **B.** Unmodified Evolution system
traction 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 dilators 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 przezżylne usunięcia złamanego przedsionkowego, czynnej komorowej i porzuconego 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 przemieszcza się do żyły podobojczykowej. Elektrodę tę usunięto z dostępu udowego za pomocą cewnika typu pigtail, cewnika typu lasso, koszyczka Dottera, chwytyka 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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References


