

## Imaging in Cardiology: Introducer Wire Removal after Loss of Control

J.C.J. RES, R. ABELS, G. KROON  
Zaans Medical Center, de Heel, Department of Cardiology, Zaandam, The Netherlands

### Introduction

The femoral approach for pacemaker lead extraction or the extraction of foreign bodies is described as a safe and efficacious procedure [1]. After gaining access to the venous system by puncturing the subclavian vein (in order to implant one or more permanent pacemaker leads), an introducer wire is re-introduced through the sheath after insertion of the permanent pacemaker lead. During manipulation of the pacemaker lead, with pulling and pushing it backwards and forwards many times, the introducer wire can either extrude from the sheath or, in the worst case scenario, be completely inserted into the vessel. We describe a case involving the unfortunate complete introduction of an introducer wire, an event that occurs very seldom. It is recommended to fixate the introducer wire on the outside when it is re-inserted. The introducer sheath can be removed, and access to the venous system is still possible without puncturing the subclavian vein. The loosened introducer wire can be removed via the transvenous femoral route.

### Case Report

A 75-year-old man was referred for pacemaker implantation due to symptomatic bradycardia and intermittent atrial fibrillation. The patient's history revealed no shortness of breath during exercise, but he had been treated for several years for hypertension. Intermittent atrial fibrillation was present for the last years. Medication included anticoumarins, diuretics, and an ACE inhibitor. A physical examination revealed no distinguishable abnormalities. A 24-hour ambulant ECG showed permanent AV block, irrespective of the presence of atrial fibrillation.

During implantation, the subclavian vein was punctured and a 9-French Biolith introducer sheath (Biotronik, Germany) was inserted. After introduction of the pacemaker lead (Solox, Biotronik), the introducer wire was

re-inserted and the sheath was removed. Routinely, the guide wire was fixated to the wound or sterile cover of the patient. A second access to the venous system was easily accomplished when a new introducer sheath was introduced over the guide wire. Due to manipulation (pulling and pushing) of the pacemaker lead as well as the poor fixation of the introducer wire, the introducer wire was accidentally introduced into the subclavian vein and further into the vena cava superior (see Figure 1). The distal part of the guide wire was at the junction of the superior vena cava and the right subclavian vein, and the proximal part was advanced into the left iliac vein. The introducer wire could not be retrieved during the implantation procedure, because its proximal part had totally disappeared into the venous system. The patient was referred for transvenous retrieval and removal of the introducer wire.

The left femoral vein was punctured and an 8-French introducer was inserted (see Figure 2). A thin guide wire (comparable to a standard  $\varnothing = 0.014$  inch angioplasty guide wire) was folded in the form of a lasso, which could be retracted completely into the 6-French coronary artery catheter (Judkins R4, Cordis, USA). This lasso was used as a snare. The coronary artery catheter had to be shortened for that purpose, because the folded guide wire was originally 150 cm long, and when folded it was 75 cm long. The snare of the so-called "lasso" could be opened by pushing the guide wire out of the coronary artery catheter. By forming an angle of about  $90^\circ$  between the lasso (guide wire) and the tip of the right Judkins catheter, the snare could be moved towards the direction of the introducer wire. With an open snare, the whole catheter could be pushed into the vein over the tip of the introducer wire, and when the introducer wire was captured into the snare, the loop of the snare was tightened or snared firmly. The introducer wire could not escape from the lasso-snare, and the whole (lasso-snare and introducer

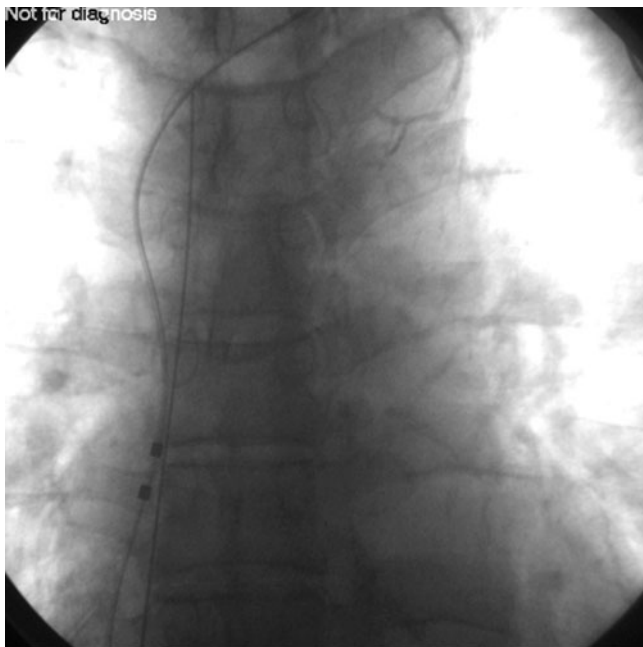


Figure 1. The proximal part of the introducer wire is seen next to the single-pass VDD lead.

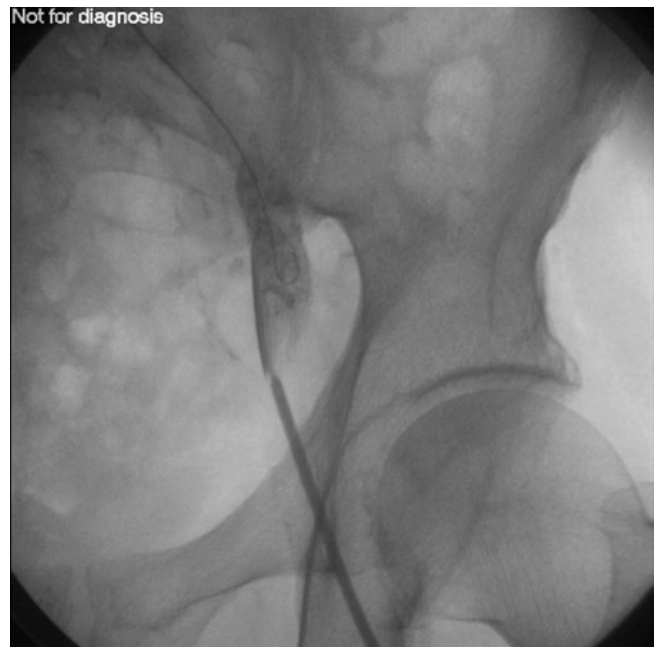


Figure 2. Via the left femoral vein, an 8-French introducer sheath is introduced and contrast is administered to visualize the sheath, the femoral vein, and distal part of the lost introducer wire.

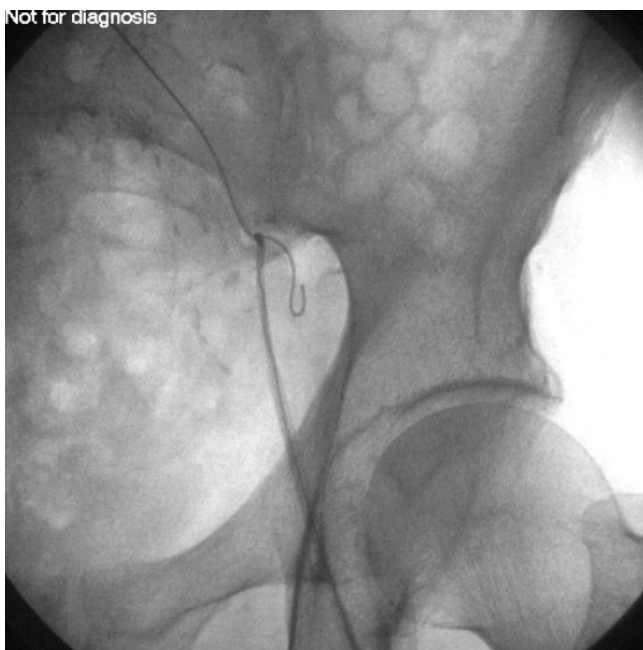


Figure 3. Via an 8-French introducer, a rather straight coronary artery catheter is introduced with a folded wire ( $\text{Ø} = 0.014$  inch) to form a snare loop. The wire is then snared firmly over the introducer wire.



Figure 4. The snare loop and the introducer wire are retracted via the 8-French introducer without any discomfort to the patient.

wire) was pulled back through the 8-French femoral introducer. The procedure of the complete retrieval and removal required a total of 15 min. The patient remained comfortable during the procedure.

### Discussion

The retrieval and removal of catheter fragments or guide wires can be safely performed via the transvenous route and with a variety of simple tools, leaving the choice up to the operator. There are basically three retrieval tools: the snare, the wire basket, and the endoscopy forceps [2]. Each technique has its advantages and disadvantages. The wire basket is a commercially available tool, as is the the endoscopy forceps. However, the device is not always readily available when needed. The advantage of the snare technique is that it can be made out of standard tools in each catheterization laboratory: a thin wire ( $\varnothing = 0.014$  or 0.018 inch), which has to be folded to make a snare loop, which (folded, thus doubled) fits into a standard right coronary artery catheter, or any other type of catheter with a rather straight shaft. To avoid any damage to the vessel wall, the snare has to be pulled back into the coronary artery catheter during introduction. According to the literature factors associated with the small percentage of unsuccessful retrieval attempts include fragments advanced totally in the distal pulmonary artery, extravascular lodging sites, chronically-implanted fragments, and pacemaker-catheter fragments. For the vast majority of cases, however, these simple and uncomplicated techniques have been highly successful and widely utilized in the nonsurgical retrieval of intracardiac foreign bodies.

The snare-and-loop technique has also been applied successfully for the removal of broken guide wire fragments, for example, in the coronary artery during percutaneous transluminal coronary angioplasty (PTCA)

[3-5]. According to an overview article on this topic, the majority of lost foreign bodies, as much as 80%, were polyethylene central venous pressure catheters that were cut in two by the needle introducer. The introduction of a soft polyethylene catheter should be performed via an introducer sheath, or if it is inserted directly through the sharp needle, it should not be retracted through the needle, but it should be retracted together with the needle.

Similar removal techniques can be applied to extract permanent implanted pacemaker leads, but in most cases dedicated tools must be used [6]. Forceful countertraction has to be applied to remove the lead from its fixation site. But this type of intervention cannot be compared with the simple retrieval and removal of foreign bodies in the venous vascular system. In conclusion, it can be stated that removal of foreign bodies can be easily, safely, and efficaciously performed in the operating room or catheterization laboratory using standard tools when the snare-and-loop technique is used.

### References

- [1] Love CJ . Current concepts in extraction of transvenous pacing and ICD leads. *Cardiol Clin.* 2000; 18: 193-217
- [2] Bloomfield DA. The nonsurgical retrieval of intracardiac foreign bodies – An international survey. *Cathet Cardiovasc Diagn.* 1978; 4: 1-14.
- [3] Mikolich JR, Hanson MW. Transcatheter retrieval of intracoronary detached angioplasty guidewire segment. *Cathet Cardiovasc Diagn.* 1988; 15: 44-46.
- [4] Watson LE. Snare loop technique for removal of broken steerable PTCA wire. *Cathet Cardiovasc Diagn.* 1987; 13: 44-49.
- [5] Reith S, Volk O, Klues HG. Mobilization and retrieval of an entrapped guidewire in the right coronary artery. *Z Kardiol.* 2002; 91: 58-61.
- [6] Klug D, Jarwe M, Messaoudene SA, et al. Pacemaker lead extraction with the needle's eye snare for countertraction via a femoral approach. *PACE.* 2002; 25: 1023-1028.

### Contact

Jan C.J. Res, MD, PhD  
 Zaans Medisch Centrum "De Heel"  
 P.O. Box 210  
 1500 EE Zaandam  
 The Netherlands  
 Telephone: + 31 72 5817030  
 Fax: + 31 72 5817031  
 E-mail: janres@quicknet.nl or janres@tref.nl