Received: 10 November 2020 | Revised: 21 December 2020 | Accepted: 30 January 2021

DOI: 10.1002/ccr3.3948

CASE REPORT

Clinical Case Reports Open Access WILEY

Distal retrieval of dislodged and migrated guidewires after retrograde puncture of the deep femoral and dorsal pedal artery. A case series

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Abstract

We report on retrograde retrieval of the soft end of dislodged guidewires during complex interventions. Interventionalists may consider this as an option for the endovascular management of this complication if an antegrade retrieval is not possible or fails.

KEYWORDS

atherectomy, calcified, guidewire migration, peripheral artery disease, retrograde puncture, snaring devices, thrombectomy

1 | INTRODUCTION

We present 2 patients, where atherectomy and thrombectomy devices sheared of the guidewires due to unfavorable anatomical angulations. Retrieval was not possible by snaring the proximal end of the dislodged guidewires but could be facilitated using micro-snaring devices after retrograde puncture of the distal arteries.

Endovascular techniques for the treatment of peripheral artery disease (PAD) have developed tremendously in the past decades, emerging as the first choice of treatment in most patients with claudication and critical limb threatening ischemia (CLTI).[1] Such therapeutic options, including thrombectomy and atherectomy devices, are increasingly gaining clinical importance, especially when considering comorbidities and high perioperative risk of elderly patients.[2] According to current guidelines, such procedures may be considered even in long and complex occlusive lesions as a first treatment option.[3]

Due to the increasing use of endovascular atherectomy and thrombectomy devices in complex lesions, more complications may occur during treatment. Thus, the appropriate management of such complications is an important cornerstone for the further establishment and wide acceptance of endovascular procedures. Herein, we present 2 patient cases, where the guidewire was lost during the treatment with atherectomy or thrombectomy devices. The dislodged wires could in both cases be successfully retrieved by endovascular means.

2 | CASE PRESENTATION 1

An 84-year-old male patient was referred to our department due to CLTI with ischemic rest pain accompanied by an ulceration of his left leg (Rutherford category 5). Duplex sonography revealed a strongly calcified lesion in his left common femoral artery (CFA).

The patient had chronic renal failure, hyperlipidemia, and arterial hypertension. Due to age and comorbidities, he was scheduled for endovascular treatment. After inserting a 6F introducer cross-over sheath, digital subtraction angiography (DSA) confirmed a calcified subtotal occlusion of the ostial superficial femoral artery (SFA) and strong calcifications in the distal CFA and proximal deep femoral artery (DFA) (blue arrows in Figure 1A). Due to the lesions' calcification and complexity, atherectomy was performed using a 2.4 mm deflecting rotational atherectomy device. Atherectomy was initially performed in the distal CFA and proximal SFA (Figure 1B) and was then continued in the distal CFA and proximal DFA after guidewire repositioning (Figure 1C). During atherectomy of the DFA, however, and possibly due to acute angulation of the artery (Figure 1C), the tip of the atherectomy device was sheared of the 0.014-inch hydrophilic guidewire, which was dislodged in the DFA (red arrows Figure 1D). Treatment of the CFA, SFA, and DFA was continued with drug coated balloon angioplasty, achieving good angiographic result without stent placement (orange arrows in Figure 1D). An attempt was performed to remove the dislodged wire by inserting an Envoy aspiration catheter over the proximal end of the wire, which however failed, possibly due to the short distance between the proximal end of the dislodged wire and the arterial vessel wall (red arrow with asterisk in Figure 1D). Because a snaring system fitting to the size of the proximal DFA was not available at this time, we decided to stop the procedure and give some additional anticoagulation to aspirin and clopidogrel during the next 48 hours. The distal end of the dislodged wire was localized in the distal DFA at the end of the procedure (red arrow Figure 1E).

The complication was explained to the patient and discussed with our vascular team, considering surgical wire removal, which was however refused by the patient. Thus, 2 days after the index procedure, a second angiography was performed aiming to snare the proximal end of the dislodged wire. After inserting a 6F introducer cross-over sheath in the right CFA, however, DSA revealed an unexpected finding. Thus, the proximal end of the dislodged guidewire had migrated, now being in the abdominal space at the level of the distal aorta (Figure 2A). Accordingly, the distal soft end of the dislodged wire moved in the mid part of the DFA (Figure 2B). Because the retrieval of the proximal end of the dislodged wire was considered impossible, we decided to attempt retrieval by snaring the distal end of the

FIGURE 1 Angiography shows a strongly calcified type III CFA lesion, with a subtotal occlusion of the ostial SFA and strong calcifications in the distal CFA and proximal deep femoral artery (DFA) (blue arrows in A). Rotational atherectomy was initially performed in the CFA and SFA (B) and then in the proximal DFA (C). During atherectomy of the DFA, the tip of the atherectomy device sheared of the 0.014-inch hydrophilic guidewire, which was dislodged in the DFA (red arrows D). Treatment of the lesion was continued with drug coated balloon angioplasty, achieving good angiographic result (orange arrows in D). The distal end of the dislodged wire was localized in the distal DFA (red arrow in E)

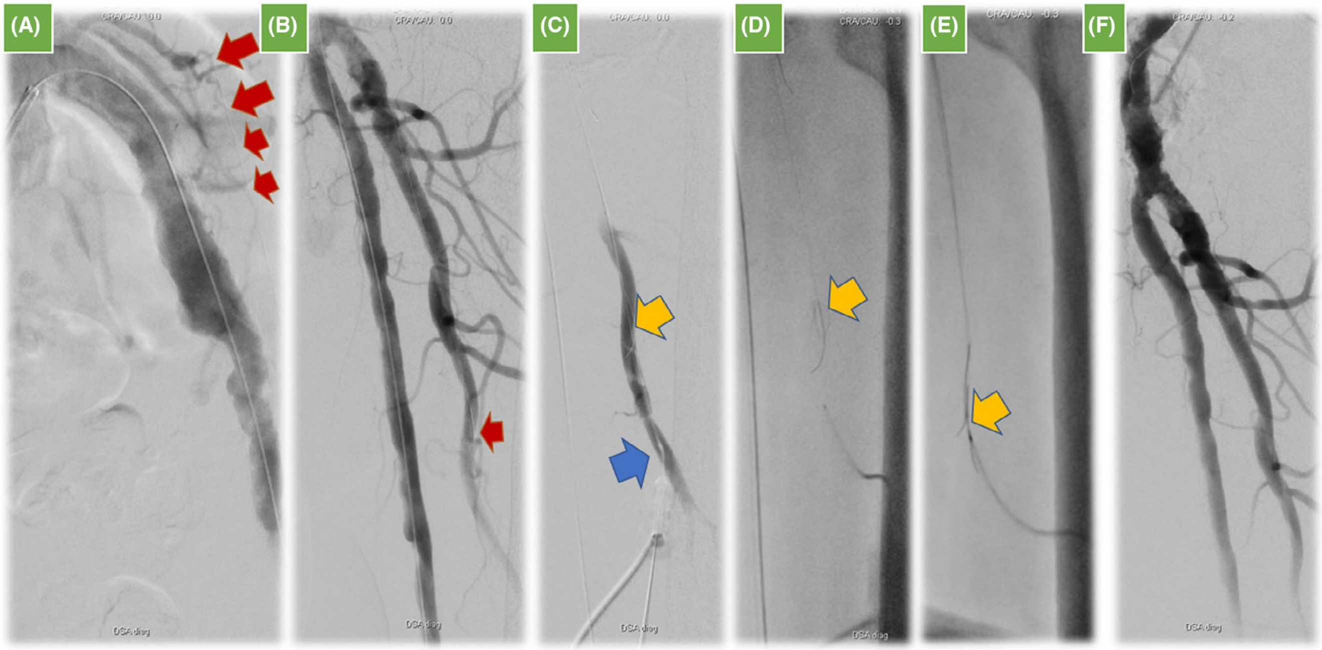
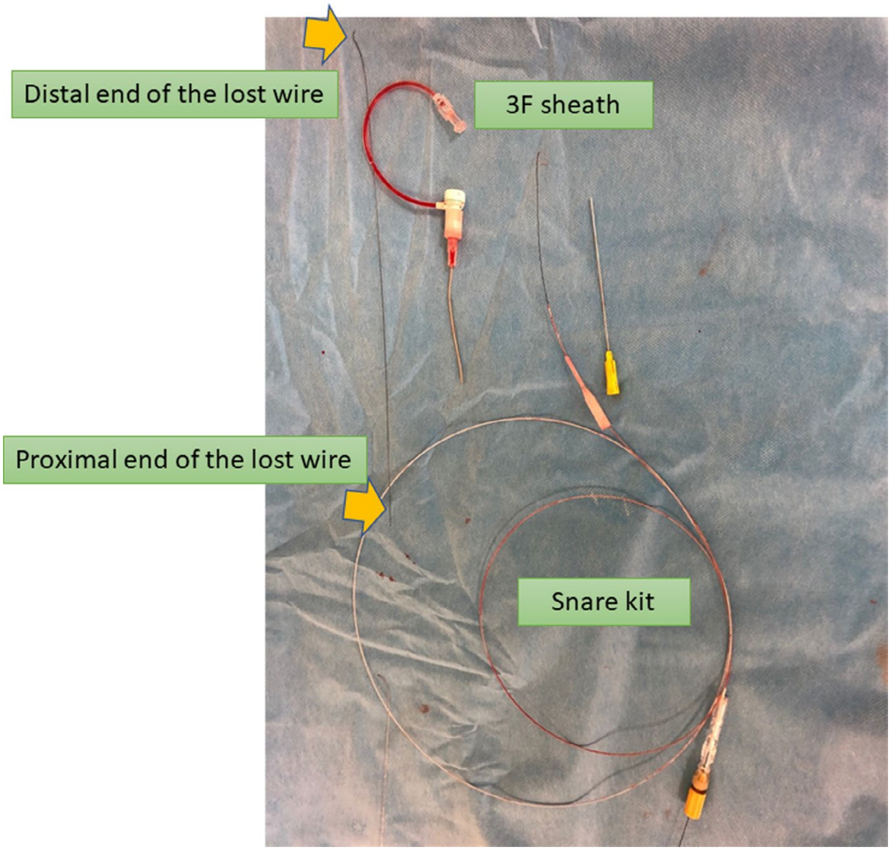


FIGURE 2 The proximal end of the dislodged guidewire migrated in the abdominal space at the level of the distal aorta after 2 d (A), so that its distal soft end moved in the mid part of the DFA (B). After retrograde puncture of the distal DFA, a 3F sheath was introduced (C), allowing the insertion of a "gooseneck" snare kit with a 7.0 mm loop diameter, which successfully facilitated retrieval of the dislodged wire (D-E). The final angiographic result is shown in F

FIGURE 3 Photograph of the dislodged guide wire, the 3F sheath, and the micro-snare kit used for guidewire retrieval



guidewire. Thus, after retrograde puncture of the distal DFA, a 3F sheath was introduced (Figure 2C), allowing the insertion of a "gooseneck" snare kit with a 7.0 mm loop diameter (Medtronic GmbH), which successfully facilitated retrieval of the dislodged wire (Figure 2D-E). The final angiographic result can be appreciated in Figure 2F. In addition, a photograph of the dislodged guide wire and the kit used for retrieval is provided in Figure 3.

The course of the patient was stable, and he was discharged 2 days after the second procedure. His foot wound healed completely after 8 weeks. Duplex sonography at 8 weeks of follow-up showed triphasic flow in both SFA and DFA.

3 | CASE PRESENTATION 2

An 81-year-old patient experienced sudden onset of claudication of the right leg 4 weeks prior to presentation at our institution. Two weeks later, during a routine cardiac evaluation, new onset nonvalvular atrial fibrillation was diagnosed. The patient was started on treatment with rivaroxaban 20 mg daily. Duplex sonography showed a thrombotic occlusion of the distal superficial artery, the popliteal artery, as well as the proximal trifurcation of the right calf. Comorbidities included arterial hypertension, prior tobacco use and chronic kidney disease. He was transferred to our department for endovascular treatment of the right leg. Angiography via antegrade access using a 6F sheath confirmed the above-mentioned thromboembolic occlusions (Figure 4A). We opted for a mechanical thrombus removal with a 6F Rotarex device (AB Medica GmbH). Passage of the Rotarex wire through the soft thrombotic occlusion into the anterior tibial artery was performed without difficulties (Figure 4B). After several passages of the Rotarex device in the femoropopliteal segments, the catheter was gently advanced into the proximal part of the anterior tibial artery. Unfortunately, due to the acute anatomical angulation, the tip of the Rotarex device sheared of the wire (Figure 4C, arrow). Since a snaring of the hard end of the Rotarex wire from antegrade did not seem to be a suitable option, we decided for a retrograde access of the dorsal pedal artery using a 4F sheath. A small snaring device (En Snare Endovascular Snare System) was advanced through the sheath, and the soft end of the Rotarex wire was successfully snared and removed (Figure 4D). After removal of the sheath, hemostasis was achieved with manual compression. A 6.0 × 120 mm Supera™ stent (Abbott Medical) was placed in the distal superficial femoral and popliteal artery. The proximal part of the anterior tibial artery was treated with

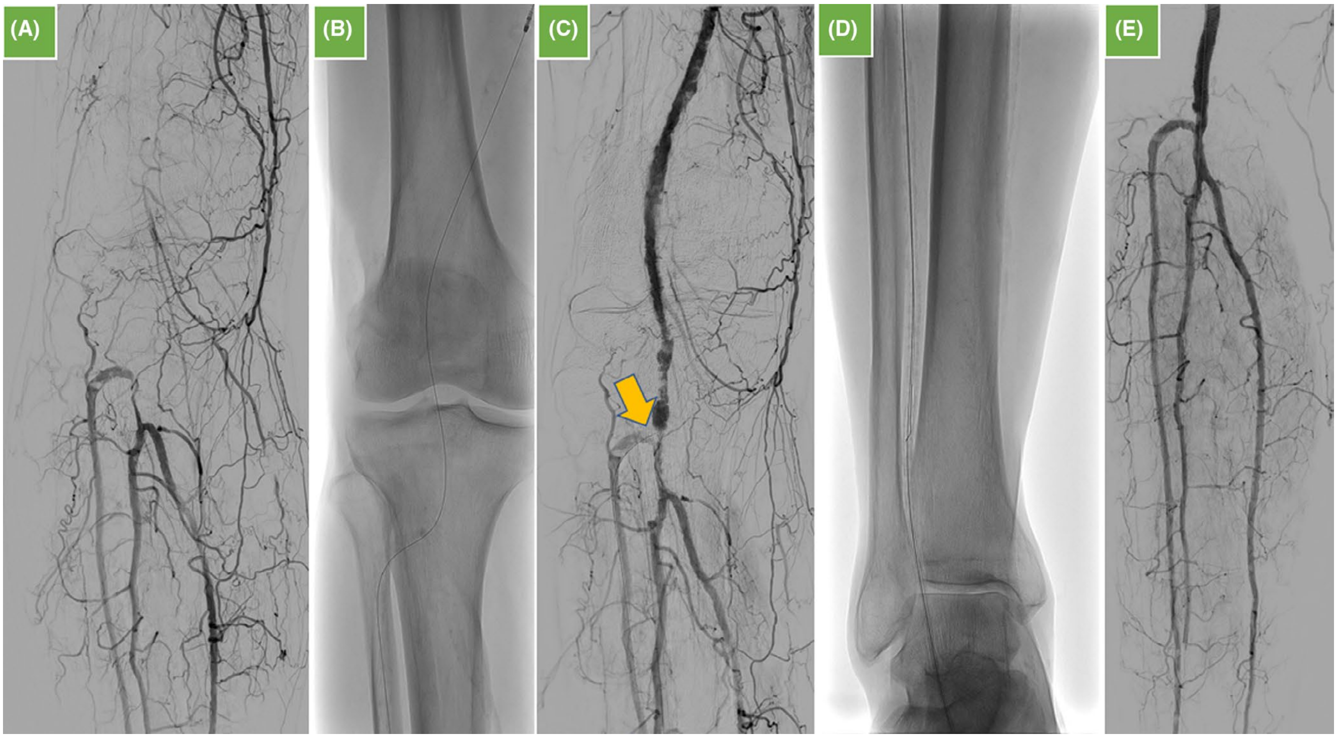


FIGURE 4 Thromboembolic occlusion of the distal superficial artery, the popliteal artery, as well as the proximal trifurcation of the right calf (A). Passage of the Rotarex wire through the soft thrombotic occlusion into the anterior tibial artery was performed without difficulty (Figure 4B). During advancement of the Rotarex device into the proximal part of the anterior tibial artery, however, the tip of the Rotarex device sheared of the wire (arrow in C). Subsequently, retrograde access was gained after puncture of the dorsal pedal artery and a small snaring device was advanced through the 4F sheath, facilitating retrieval of the soft end of the Rotarex wire (D). The final angiographic result after adjunctive balloon angioplasty is shown in E

balloon angioplasty with a good final angiographic result (Figure 4E).

4 | DISCUSSION

To our knowledge, this is the first case series, reporting on retrograde retrieval of the soft end of sheared and dislodged guidewires during complex peripheral interventions. Many devices and techniques have been used in the past as solutions for the retrieval of various types of dislodged catheter and guidewire fragments or stents, such as biopsy forceps, Dormia baskets, and tip-deflecting wires[4-7] However, with the introduction of dedicated snare and micro-snare kits and due to the atraumatic nature of these systems, retrieving dislodged objects with baskets or forceps generally does no longer represent the method of choice. In addition, if endovascular retrieval fails, open retrieval may be the only option, which of course has the disadvantage of not being minimally invasive. Furthermore, in some cases the option of hybrid retrieval may be considered, where the dislodged object is repositioned down to the femoral vein or artery, where it can be easily removed by a small cut-down.[8-10] An overview of potential retrieval options of dislodged objects, including advantages and limitations of each method, is provided in Table 1.

The novelty with our cases series is the fact that retrieval of the dislodged wires was facilitated by distal puncture. Interventional angiologists, radiologists, or vascular surgeons may consider this as an option for the endovascular management of wire dislodgement if an antegrade retrieval fails or is not considered appropriate. Since interventional physicians possess the required skills for antegrade snaring, we anticipate that the retrograde snaring approach would be easy to implement in most institutions in this context. The first description of the retrograde access with peripheral lesions goes back in 1988.[11] However, the adoption of this technique for the treatment of infrainguinal occlusive lesions has taken many years and is even nowadays frequently used only in some specialized high-volume centers. We and others recently demonstrated the excellent safety with low complication and high success rate of the retrograde access for the recanalization of complex infrainguinal disease in a cumulative large number of patients.[12-14] In our case series, we demonstrate the ability of the retrograde access for the minimally invasive retrieval of sheared guidewires. The advantage of this approach is that the soft tip of the wire can be snared, which is easier to catch than the stiffer proximal tip. In addition, in one of the described cases, migration of the guidewire occurred to the abdominal space, which possibly happened after erosion of the vessel wall by the stiff proximal end of the dislodged guidewire. Because the migration of the wire occurred in the opposite direction of the blood flow, we hypothesize that this possibly occurred due to flexion of the lower limb during patient movement within the 2 days between the 1st and 2nd endovascular procedure. In this case, proximal snaring of the guidewires would have been impossible by endovascular means, so that snaring of the distal soft tip, using a retrograde access, was the only option. In both cases, shearing and dislodgement of the guidewires occurred due to the atherectomy and thrombectomy devices used, respectively. It should be noted, however, that the wire used during the atherectomy procedure was hydrophilic, and not the dedicated guidewire compatible with this specific device, as it was done in the second case. In the first case, we had to deal with a strongly calcified CFA lesion, so that atherectomy was performed to allow for adequate debulking and avoid subsequent stent placement. In the second case, the patient was treated with mechanical thrombectomy to avoid local lysis, which may be associated with bleeding complications, especially in elderly patients.

TABLE 1 Overview of retrieval options for dislodged objects, including advantages and limitations

Endovascular retrieval	Advantages	Disadvantages and limitations
Vascular retrieval forceps	Vascular retrieval forceps are typically are used for the retrieval of misplaced coils.	Use limited in smaller vessels. In larger arteries or veins, it may be difficult to correctly position to grab a small device within a larger lumen.
Helical baskets	Designed for ureteral stone extraction and considered as the only available product which can reliably engage a spherical or ovoid object.	Suitable for medium-sized or larger arteries and not for small arteries. Usually require large 5-8F sheaths.
Snare devices	Availability as dedicated snare and micro-snare kits, which can be used for the retrieval of a multitude of dislodged objects with low risk for vessel injury due to their atraumatic nature.	Spherical objects and ovoid objects may be difficult to get engaged by snaring devices.
Hybrid retrieval	The dislodged object is repositioned down to the femoral vein or artery, where it can be easily removed by a small cut-down.	Endovascular target may fail. Even if successful, still minor surgery is required.
Surgical retrieval	Preferable in symptomatic patients and in patients where an endovascular approach has already failed once or twice.	Requires open surgery, including thoracotomy or laparotomy, depending on the area of dislodgement.

In the past decade, emerging technical developments have occurred with endovascular therapy, which offer several advantages of minimal invasive treatment over surgical techniques. Development and refinement of complication management options, as described in our case series, is therefore useful, aiding further establishment of such endovascular techniques for the treatment of PAD.

CONFLICT OF INTEREST

No conflicts of interest to declare upon of all the authors of this manuscript.

AUTHOR CONTRIBUTIONS

GK and EB: conceived the study, participated in data acquisition, performed statistical analysis, drafted, and critically revised the manuscript. SG, AS, and MA: participated in study design, data analysis, helped to draft, and critically revised the manuscript. All authors read and approved the final manuscript.

ETHICAL APPROVAL

Applicable.

INFORMED CONSENT

Informed consent was obtained from the patient included in the study.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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How to cite this article: Korosoglou G, Giusca S, Antaredja M, Schmidt A, Blessing E. Distal retrieval of dislodged and migrated guidewires after retrograde puncture of the deep femoral and dorsal pedal artery. A case series. *Clin Case Rep*. 2021;9:2077–2082. https://doi.org/10.1002/ccr3.3948