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TECHNICAL NOTE

# Successful Retrieval of a Stuck Guidewire by Guiding Catheter Lock Technique in Renal Artery Stenting

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**Introduction:** The guiding catheter lock technique is a therapeutic technique to increase backup force of the guiding catheter in coronary artery interventions.
**Surgical technique:** A 71 year old man presented with rapidly declining kidney function resulting from bilateral renal artery stenosis. During the renal artery stenting procedure, the 0.014" guidewire became trapped at the stent's distal edge. Although attempts were made to advance a microcatheter and balloon catheter over the trapped guidewire, these failed because of insufficient pushability of the guiding catheter. Therefore, the guiding catheter lock technique was used with a second guiding catheter, and the guidewire was successfully retrieved.
**Discussion:** The guiding catheter lock technique facilitated strong pushability to allow for successful retrieval of a stuck guidewire during renal artery stenting.

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## INTRODUCTION

The guiding catheter lock technique is a therapeutic technique used to increase the backup force of a guiding catheter during coronary artery interventions.[1] This technique requires two approach sites and two guiding catheters. The main guiding catheter is fixed by balloon dilatation via the second guiding catheter, thus providing strong pushability to the main guiding catheter. This is a report of use of the guiding lock technique to retrieve a stuck guidewire during renal artery stenting (RAS).

## SURGICAL TECHNIQUE

A 71 year old hypertensive man was referred with renal function deterioration. He had been an active smoker for 50 years. His plasma creatinine level had increased from 68.1 μmol/L one year previously to 396.0 μmol/L based on a periodic medical check up. His estimated glomerular filtration rate (eGFR) declined to 11.1 mL/min/1.73 $m^2$ and his chronic kidney disease (CKD) grade was 5. His blood pressure, measured at home, had risen for half a year, although he had been taking 5 mg amlodipine for several years. Duplex echo revealed bilateral >80% renal artery stenosis (peak systolic velocity = 376.3 cm/s to the right; 386.7 cm/s to the left); however, renal size was normal bilaterally. Given that his renal function had been rapidly declining over a year, a decision was made to perform RAS.

First, a Brite Tip 6Fr. JR4.0 guiding catheter (Cordis, Miami, FL, USA) was inserted into the left renal artery by the left brachial approach. After intravascular ultrasound (IVUS) evaluation, two balloon expandable stents (ExpressSD, Boston Scientific, Boston, MA, USA) were implanted with distal protection using a filter wire (Filtrap, Nipro, Osaka, Japan). A 0.014" soft guidewire (Prowater, Asahi Intecc, Aichi, Japan) was crossed before filter wire retrieval to prevent disengagement of the guiding catheter. Next, the filter wire was retrieved using the dedicated retrieval catheter. At that time, the Prowater guidewire was pulled simultaneously, forming a loop and becoming trapped at the distal edge of the stent (Fig. 1). Although attempts were made to push the guidewire using a microcatheter (Prominent Advance Neo, Tokai Medical, Aichi, Japan), it remained trapped because of insufficient backup force from the guiding catheter. Next, attempts were made to deliver and inflate a balloon catheter over the trapped guidewire. However, these also failed for the same reason. Therefore, the right groin was punctured and a second guiding catheter was inserted (Brite Tip 6Fr. JR4.0) into the left renal artery, and the first guiding catheter was locked with a 6.0 mm balloon catheter via the second guiding catheter (Fig. 2). Next, a microcatheter was advanced over the trapped guidewire through the first guiding catheter. By pushing the microcatheter, the guidewire was released as the locked guiding catheter provided strong pushability. The retrieved guidewire was highly deformed and fractured (Fig. 3). Although IVUS and

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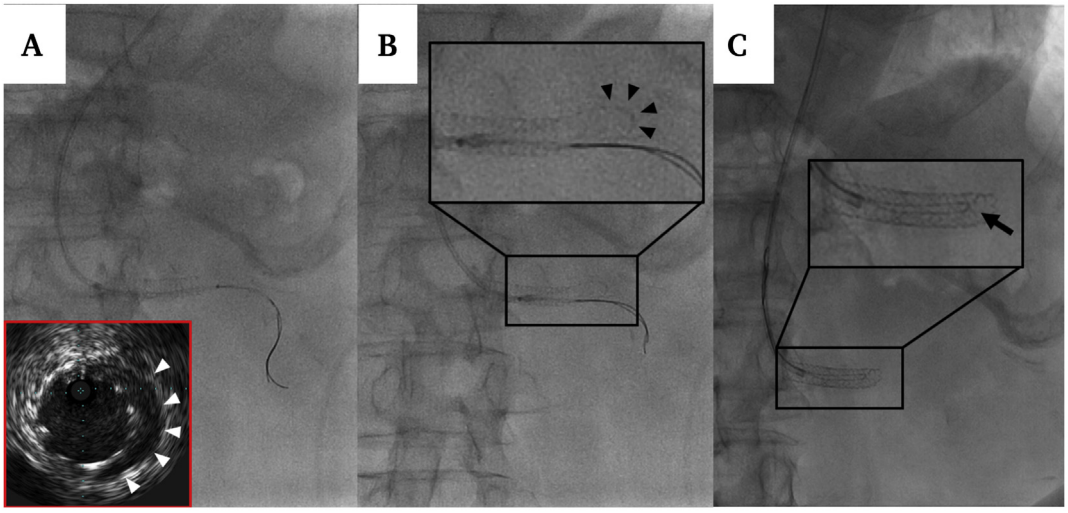


**Figure 1.** (A) Post-stent implantation. The Prowater guidewire was crossed in addition to the Filtrap guidewire. The red box includes the intravascular ultrasound image, showing stent malapposition at the stent distal edge (arrowheads). (B) During filter wire retrieval, the second guidewire was pulled simultaneously, forming a loop (arrowheads show the loop of the flipped guidewire). (C) The second guidewire trapped at the distal edge of the stent accompanying stent edge deformation (arrow).

fluoroscopy images taken after removal of the trapped guidewire revealed distal stent deformation, the stent lumen area was preserved (Fig. 4A). Thus, the procedure was finished at this point without implantation of an additional stent. Subsequently, a stent was implanted (ExpressSD) in the right renal artery and the procedure completed. The stenting procedure was performed without contrast medium, under IVUS guidance, and the final angiogram was performed employing only an adjusted

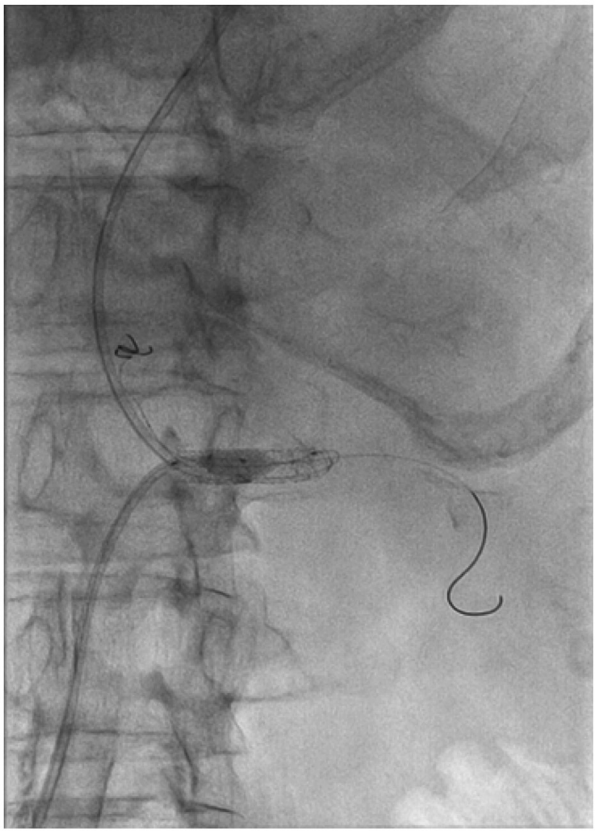

**Figure 2.** The guiding catheter lock technique. The first guiding catheter was trapped with a balloon catheter from the second guiding catheter.

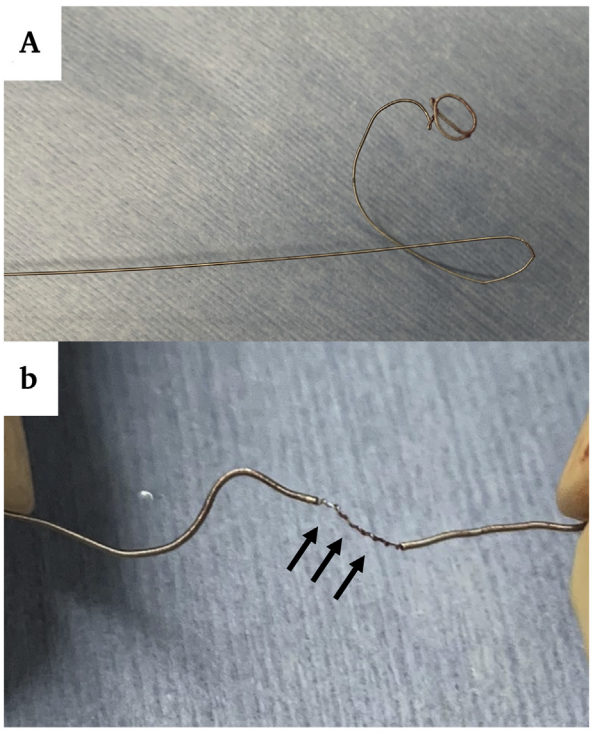


**Figure 3.** (A) The retrieved guidewire after removal. (B) The severely damaged guidewire shaft; its core was torn, and the outer coil was stretched (arrows).

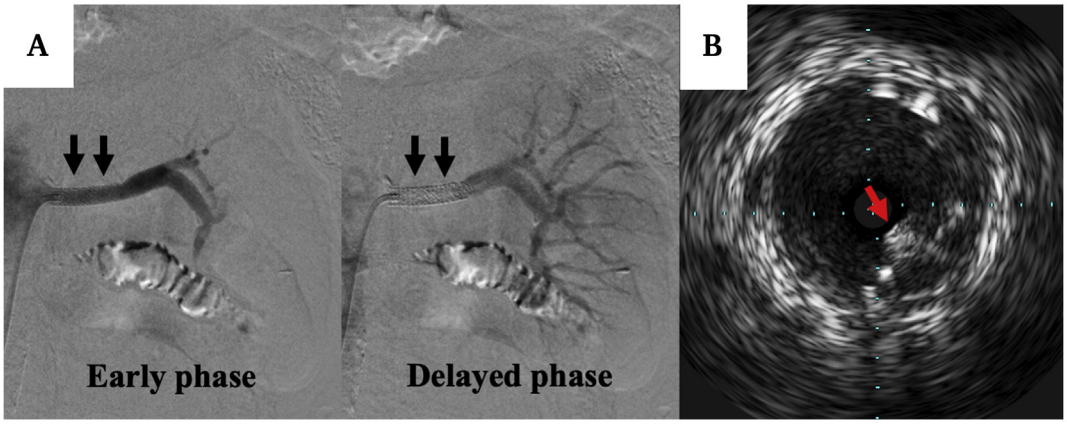


**Figure 4.** (A) Final angiogram of the left side using an adjusted digital subtraction angiography programme with diluted contrast medium showing acceptable expansion of the stents (black arrows) and favourable flow. (B) The intravascular ultrasound image at the stent distal edge shows stent deformation (red arrow).

digital subtraction angiography (DSA) programme with diluted contrast (Fig. 4B).[2] Therefore, the amount of contrast used was 1 mL on each side. Kidney function markedly improved after RAS. The patient's plasma creatinine level and eGFR at two days and one month after treatment were 129.1 µmol/L and 38 mL/min/1.73 $m^2$, and 94.6 µmol/L and 53 mL/min/1.73 $m^2$, respectively. His CKD stage and blood pressure control also improved after the RAS (CKD stage: 5 to 3).

## DISCUSSION

The number of RAS cases markedly decreased after the CORAL and ASTRAL trials,[3,4] because these studies were unable to demonstrate the clinical benefit of renal artery revascularisation for renal and cardiovascular events. However, some conditions, such as recurrent flash pulmonary oedema, rapidly declining kidney function, and refractory hypertension, certainly benefit from RAS.[5,6] The main complications of RAS are arterial dissection, access site trouble, and renal function deterioration, and a stuck guidewire is a rare complication.[3,4] There are limited reports on the efficacy of distal protection in RAS.[7,8] In the present case, a filter wire was used as the distal protection device, because the IVUS image revealed a diffuse lesion containing a large amount of plaque. However, this made the procedure difficult and caused complications.

In coronary intervention, fractured or trapped guidewires are relatively rare complications;[9] however, they are serious complications that can require surgical rescue. In the present case, the second guidewire, a 0.014" stainless steel coil wire, was pulled out simultaneously during retrieval of the filter wire, possibly because of the wire's twist. Also, given that a guidewire with a silicon coated tip was used to avoid wire perforation, this could have caused guidewire interference. Furthermore, there was stent malapposition at the stent's distal edge, because the vessel diameter distal to the stenotic lesion was large (Fig. 1A). The stent malapposition could have been a causative factor for the stuck guidewire.

In general, a trapped guidewire cannot be retrieved even if it is forcibly pulled; therefore, it is important to push it. In this case, attempts to push and release the trapped guidewire with a microcatheter and balloon catheter failed because of insufficient pushability from the guiding catheter. One of the therapeutic options in such a situation is to exchange the microcatheter for a stiffer one. Another alternative is to exchange the guiding catheter or guiding sheath for one with stronger pushability. However, it is sometimes difficult to obtain sufficient pushability in the renal artery via the upper limb approach. Also, such a steerable guiding sheath providing strong pushability is not available in Japan. Therefore, the guide lock technique was performed, which achieved removal of the trapped wire. The disadvantage of this technique is the risk of iatrogenic injury at the balloon dilatation site in addition to the need for another puncture. The authors recommend that this technique be performed at the in stent site. This technique could be useful for removal of a guidewire stuck not only in the renal artery, but also in other arteries.

### *Conclusion*

The guiding catheter lock technique can be useful when other alternatives are ineffective, such as in this case of a guidewire stuck during RAS.

## CONFLICT OF INTEREST

None.

## FUNDING

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