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Guide Catheter Extension Device Is Effective in Renal Angioplasty for Severely Calcified Lesions

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Conflict of interest: None declared

Patient: Male, 69
Final Diagnosis: Atherosclerotic renal artery stenosis
Symptoms: None
Medication: —
Clinical Procedure: —
Specialty: Radiology

Objective: Unusual setting of medical care

Background: The GuideLiner catheter extension device is a monorail-type "Child" support catheter that facilitates coaxial alignment with the guide catheter and provides an appropriate back-up force. This device has been developed in the field of coronary intervention, and now is becoming widely applied in the field of endovascular treatment. However, there has been no report on the effectiveness of the guide catheter extension device in percutaneous transluminal renal angioplasty (PTRA).

Case Report: We encountered a case of atherosclerotic subtotal occlusion at the ostium of the left renal artery. Due to the severely calcified orifice and weaker back-up force provided by a JR4 guide catheter, we could not pass any guidewires through the target lesion. Therefore, we introduced a guide catheter extension device, the GuideLiner catheter, through the guide catheter and achieved good guidewire maneuverability. We finally deployed 2 balloon-expandable stents and successfully performed all PTRA procedures.

Conclusions: The guide catheter extension device can be effective in PTRA for severely calcified subtotal occlusion.

MeSH Keywords: Angioplasty • Case Reports • Renal Artery Obstruction

Full-text PDF: http://www.amjcaserep.com/abstract/index/idArt/903876

Background

Although renal angioplasty with stenting has been commonly performed for patients with atherosclerotic renal artery stenosis (ARAS), severely calcified lesions are usually fatal obstacles for successful interventions due to the insufficient back-up force provided by guide catheter. Guide catheter extension devices such as the GuideLiner catheter (Vascular Solutions Inc., MN, USA) have been shown to be effective in various percutaneous coronary interventions (PCI) [1,2] or endovascular treatment (EVT) mainly for the lower extremities [3] by coaxially providing back-up support for the guide catheter. However, its clinical advantage in percutaneous transluminal renal angioplasty (PTRA) has never been reported.

Case Report

A 69-year-old man who had hypertension and chronic kidney disease was admitted to our hospital for further examination of gradually deteriorating renal function. He had been diagnosed with proteinuria in his early forties. His blood pressure was 146/88 mmHg, and pulse was 64/min and regular. A laboratory study demonstrated BUN/Cre at 28.4/3.21mg/dL, and his estimated glomerular filtration rate (eGFR) was as low as 16.1 mL/min/1.73 m^2. Computed tomography (CT) and magnetic resonance (MR) angiography showed severe stenosis with calcification at the ostium of the left renal artery (Figure 1). Furthermore, radioisotope renography revealed the findings of renal hypoperfusion. The progressively worsening renal function led to our decision to perform revascularization for this lesion.

We initially attempted percutaneous transluminal renal angioplasty (PTRA) via the right femoral artery. We used 6-Fr JR4 and RDC1 guide catheters and approached the lesion with a microcatheter. However, this system could not provide sufficient coaxial support for guidewire manipulation, and we could not advance the guidewire any further into the lesion (Figure 2). Therefore, we switched to a left brachial approach and could achieve good coaxiality between the JR4 guide catheter and left renal artery (Figure 3A). We tried to penetrate the proximal tight calcified lesion with several guidewires: Cruise (ASAHI INTECC Co., Ltd., Aichi, Japan), Athlete Wizard PV3 (Japan Lifeline Co., Ltd., Tokyo, Japan), Treasure XS (ASAHI INTECC), Naveed4 Hard15 (Terumo Corp., Tokyo, Japan), and Naveed4 Hard50 (Terumo Corp., Tokyo, Japan). However, because the JR4 guide catheter disengaged backward from the left renal artery on pushing the guidewires, none of those guidewires could pass the severely calcified proximal cap (Figure 3B).

To overcome this problem, we inserted a guide catheter extension catheter, the "GuideLiner catheter", near the ostium of the left renal artery through the JR4 guide catheter, and achieved a sufficient back-up force against the contralateral aortic wall (Figure 3C arrows). We successfully penetrated the proximal hard calcification with a Naveed4 Hard 50 guidewire and passed it distally (Figure 4A). After inflating balloons sequentially with 2- and 4-mm diameters (Figure 4B), we deployed 2 Palmatz Genesis (Cordis Corp., CA, USA) balloon-expandable stents (5.0/18 and 5.0/15 mm) (Figure 4C), and achieved favorable dilation of the target artery (Figure 4D). The patient safely tolerated the entire procedure, and we successfully completed the treatment. The total irradiation time was 140 minutes and the volume of contrast medium used was 122.2 mL. He followed an uneventful hospital course and was consequently discharged on the next day. Thereafter, his renal function gradually recovered, and eGFR was 27.7 mL/min/1.73 m^2 at 2 months after the intervention.

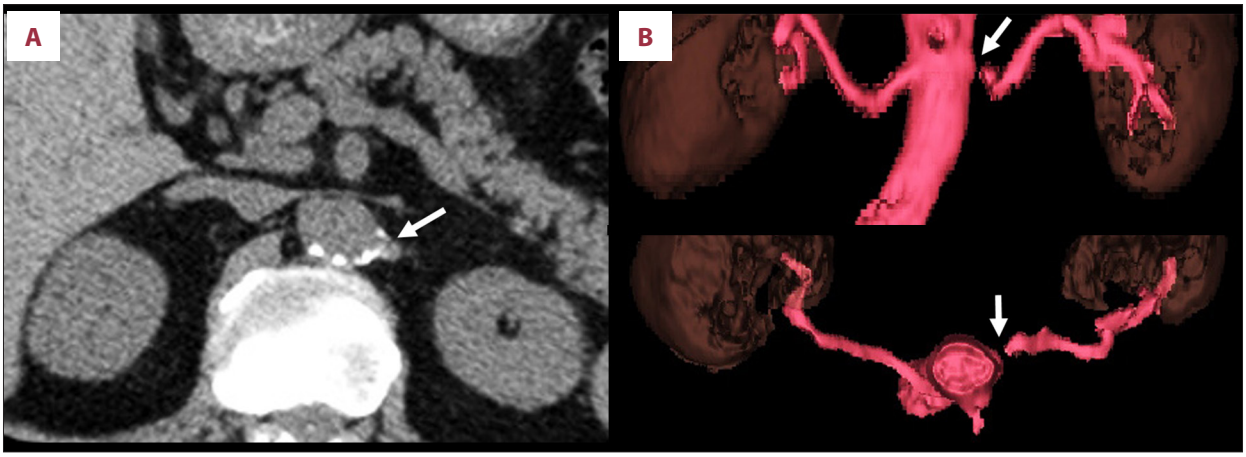

Figure 1. (**A**) An axial section of plain abdominal CT showing the calcified orifice of the left renal artery (arrow). (**B**) A 3-dimensional image of MR angiography showing severe stenosis at the ostium of the left renal artery (arrow). Antero-posterior view of the upper column. Cranial-caudal view of the lower column.

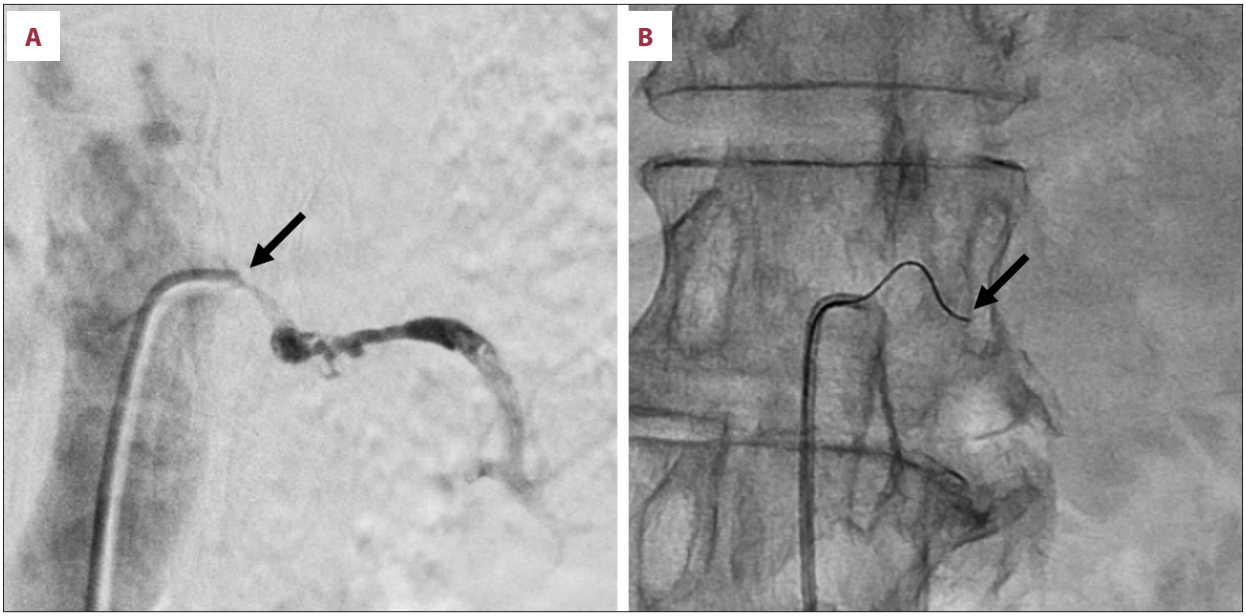

Figure 2. (**A**) A control image of the left renal artery showing severe stenosis at the orifice (arrow). (**B**) The system with a 6-Fr JR4 guide catheter via the right femoral artery could not achieve sufficient coaxial support for guidewire manipulation. Arrow indicates the ostium of the left renal artery.

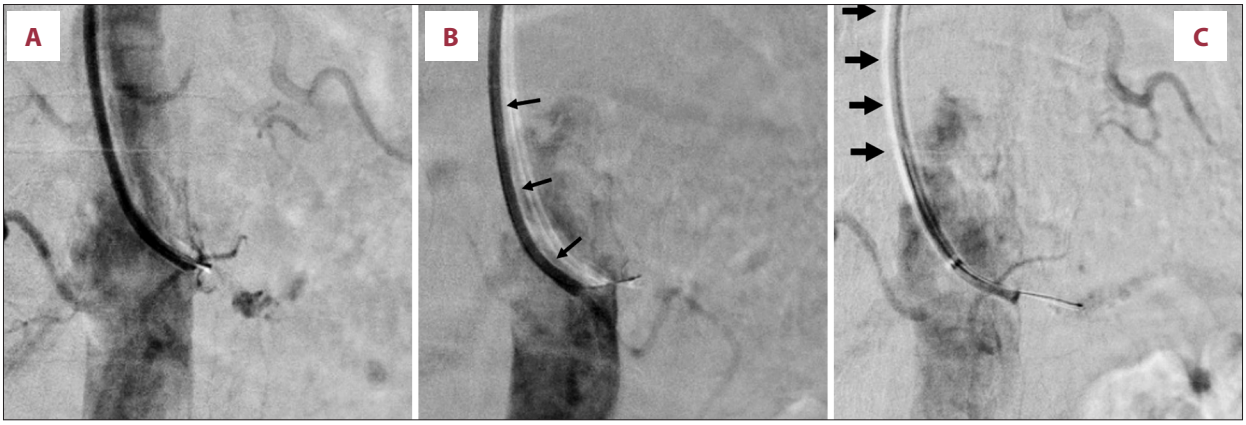

Figure 3. (**A**) The JR4 guide catheter via the left brachial artery achieved good coaxiality to the left renal artery. (**B**) The JR4 guide catheter disengaged backward from the left renal artery by pushing the guidewire (arrows). (**C**) We inserted a guide catheter extension device near the ostium of the left renal artery through the JR4 guide catheter, and achieved a sufficient back-up force against the contralateral aortic wall (arrows).

Discussion

Since the first renal angioplasty was performed in 1978, technical improvements and sophisticated devices for PTRA have been developed [4]. Although angioplasty with stenting has been commonly used for patients with ARAS [5], the 2 major randomized trials of PTRA, the ASTRAL [6] and the CORAL [7] trials, concluded that PTRA offered no advantage to patients with ARAS; i.e., they were inconclusive and did not support comprehensive indications for current clinical application. Therefore, appropriate candidates who will benefit from PTRA should be carefully selected with sufficient diagnostic evaluation. Recent best evidence supports angioplasty for patients with ARAS of >80% with a significant pressure gradient, and patients with a rapid deterioration of renal function [8]. In this case, we encountered a patient with a subtotal occlusive lesion at the ostium of the left renal artery. Various imaging modalities showed the presence of severe stenosis, and hypoperfusion of the diseased kidney was also noted using a radioisotope. Considering the progressively worsening renal function, we thought this patient would be an appropriate candidate for PTRA.

The back-up support provided by a guide catheter is essential for successful procedures involving all interventional

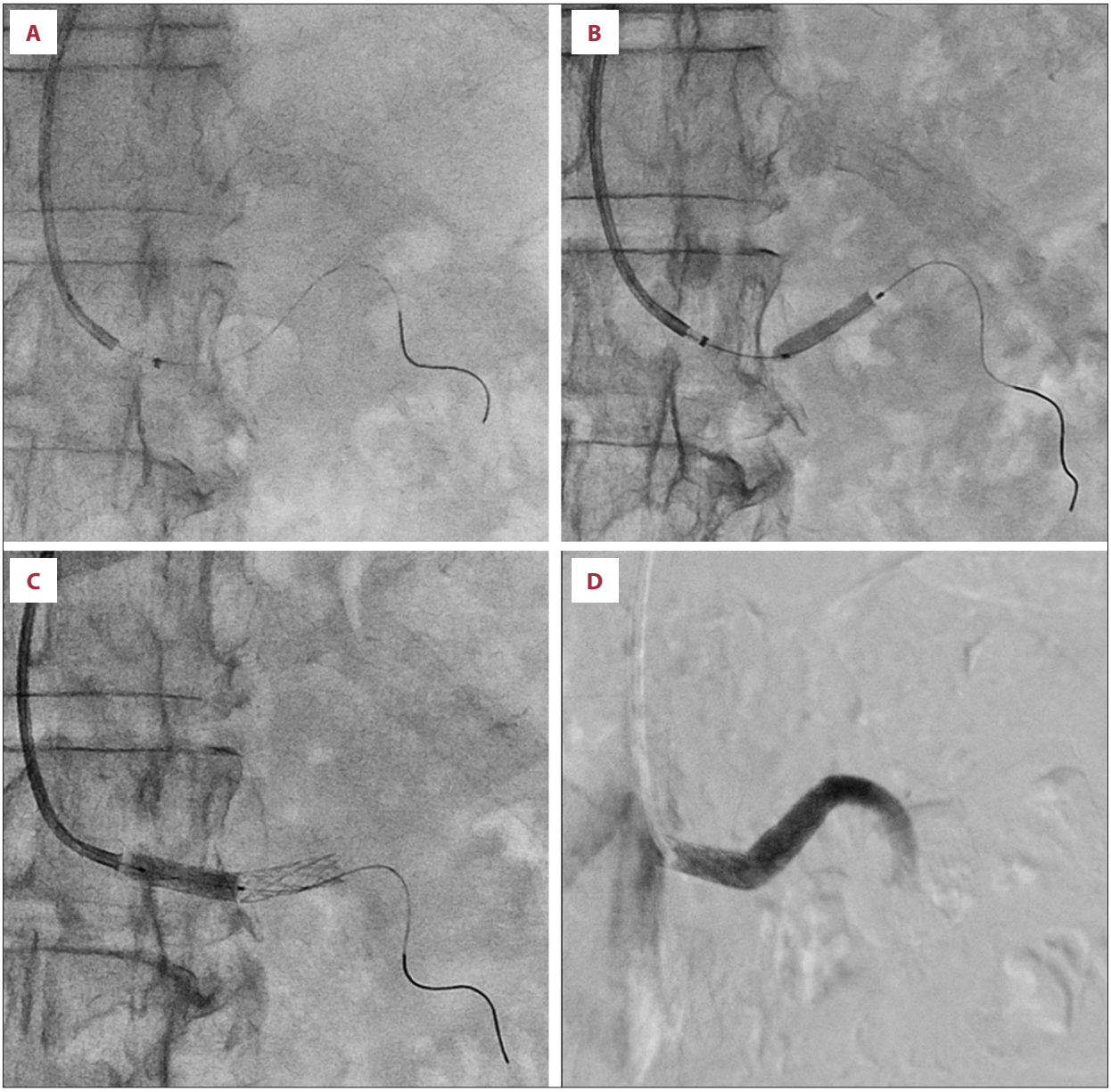

Figure 4. (**A**) A Naveed4 Hard 50 guidewire passing through the lesion. (**B**) Sequential balloon inflation with 2.0- and 4.0-mm diameters. (**C**) Deployment of 2 balloon-expandable stents. (**D**) Final angiography showing favorable dilation of the target artery.

catheterizations. On the other hand, during the procedure of PTRA, because renal arteries bifurcate from the abdominal aorta, which has a relatively large vessel diameter, it is usually difficult for an ordinary guide catheter to gain sufficient back-up force from the aortic wall on the opposite side of the target renal artery. A guide catheter extension device is promising for resolving this problem. It can extend the guide catheter tip without deforming the guide catheter and maintain coaxiality from the guide catheter to target vessel, which provides a sufficient back-up force for device maneuverability.

The GuideLiner catheter is a monorail-type "Child" support catheter that comprises a 25-cm silicon-coated guide extension catheter connected via a metal "collar" with a 125-cm stainless steel shaft to a proximal positioning tab. It can be advanced over the guidewire through the hemostatic valve without the need to disconnect the valve from the Mother guide catheter. This device compensates for the shortcomings of the conventional Child in Mother technique by adopting a monorail system. Practical application of the GuideLiner catheter was first reported in humans in 2010 [9], and since then it has been utilized effectively for complex percutaneous

coronary interventions [1,2]. We were the first authors to report the application of this guide catheter extension device in the field of EVT for peripheral arterial disease, in 2016 [3]. This device is easy to use and can be expected to be advantageous in various types of EVT. However, to our knowledge there has been no report on the effectiveness of this device during PTRA.

In our patient, we used a 6-Fr GuideLiner catheter through a 6-Fr JR4 guide catheter, which was critical for improving guidewire manipulation. After passing a guidewire through the lesion, we delivered 0.014-inch guidewire-compatible balloon catheters with 2.0- and 4.0-mm diameters through the 6-Fr GuideLiner catheter. Although the balloon catheter with a 4.0-mm diameter could be smoothly delivered through the 6-Fr GuideLiner catheter, there was some resistance when retrieving it. As we previously found in the bench test and reported, balloon catheters with a diameter of more than 4.0 mm should not be used through a 6-Fr GuideLiner catheter in actual clinical cases due to their incompatibility [3].

Conclusions

The guide catheter extension device facilitates coaxial alignment with the guide catheter and exerts an appropriate backup force, allowing us to achieve successful results in various catheterization procedures. This is the first report to show the advantage of using this device in PTRA procedures, and it may be useful in other interventional catheterizations.

Conflicts of interest

None declared.

References:

1. Cola C, Miranda F, Vaquerizo B et al: The Guideliner catheter for stent delivery in difficult cases: Tips and tricks. J Interv Cardiol, 2011; 24: 450–61
2. Shirota A, Nomura T, Kubota H et al: Successful percutaneous coronary intervention with GuideLiner(R) catheter for subtotal occlusive lesion in the right coronary artery with anomalous origin from the left sinus of Valsalva: A case report. J Med Case Rep, 2015; 9: 163
3. Kubota H, Kato T, Nomura T et al: Successful endovascular treatment with GuideLiner catheter of chronic aortic occlusion with severe calcification. Cardiovasc Interv Ther, 2016 [Epub ahead of print]
4. Zeller T: Percutaneous endovascular therapy of renal artery stenosis: Technical and clinical developments in the past decade. J Endovasc Ther, 2004; 11: II96–106
5. Jaff MR, Bates M, Sullivan T et al: Significant reduction in systolic blood pressure following renal artery stenting in patients with uncontrolled hypertension: Results from the HERCULES trial. Catheter Cardiovasc Interv, 2012; 80: 345–50
6. The ASTRAL Trial Investigators: Revascularization venous medical therapy for renal-artery stenosis. N Engl J Med, 2009; 361: 1953–62
7. Cooper CJ, Murphy TP, Cutlip DE et al: Stenting and medical therapy for atherosclerotic renal-artery stenosis. N Engl J Med, 2014; 370: 12–22
8. Mohan IV, Bourke V: The management of renal artery stenosis: An alternative interpretation of ASTRAL and CORAL. Eur J Vasc Endovasc Surg, 2015; 94: 465–73
9. Mamas MA, Fath-Ordoubadi F, Fraser DG: Distal stent delivery with Guideliner catheter: First in man experience. Catheter Cardiovasc Interv, 2010; 76: 102–11