Cross-wire technique for difficult contralateral limb cannulation during endovascular abdominal aneurysm repair for tortuous proximal aortic neck

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Received 12 April 2018; received in revised form 8 June 2018; accepted 15 June 2018

Abstract

In selected cases of endovascular aortic repair (EVAR) of an abdominal aortic aneurysm, such as patients with tortuous proximal aortic neck, achieving a successful cannulation can sometimes be difficult. Herein, we described a novel cross-wire technique to help overcome such anatomical variations. During the EVAR procedure among our 5 cases, the main body of the Gore Excluder Stent Graft was deployed through an ipsilateral guidewire. Because of a large angle between the contralateral guidewire and the contralateral short limb of the main body, a successful traditional cannulation was unfeasible. Therefore, the contralateral guidewire was cannulated into the ipsilateral long limb, and the ipsilateral guidewire was cannulated into the contralateral short limb. The contralateral and ipsilateral iliac limb components of the stent graft were deployed through the ipsilateral and contralateral guidewires, respectively. All 5 patients receiving this technique during EVAR of an abdominal aortic aneurysm were free of mortality or any kind of complication at the 1-year follow-up. In conclusion, the cross-wire technique might be safe and effective for EVAR of an abdominal aortic aneurysm when a traditional cannulation is unachievable in selected cases without creating additional percutaneous access or using extra devices.

Keywords: Endovascular aortic repair • Cross-wire technique • Abdominal aortic aneurysm

INTRODUCTION

To accomplish a successful endovascular aortic repair (EVAR) for an abdominal aortic aneurysm (AAA), proper guidewire cannulations towards the limbs of the main body of the stent graft are crucial. In some cases, the cannulation of the contralateral wire into the contralateral short limb of the main body of the stent graft might be challenging. Some rescue techniques have been developed to overcome such challenges, including the cross-limb (or ballerina position) technique, adjusting the position of the main body of the stent graft to let the contralateral short limb face the ipsilateral iliac artery to help wire cannulation [1], and 2 pull-down techniques, in which a snare device is introduced through the contralateral iliac artery to capture the guidewire introduced from the ipsilateral iliac limb [2] and the guidewire introduced from one of the radial or brachial arteries (typically from the left brachial artery) [3]. However, in some cases with tortuous proximal aortic neck, the cross-limb technique is not that easy to help contralateral wire cannulation. The extra snare device is somewhat expensive and not always available at some institutions, and the extra access from the upper arm could bring some discomfort to postoperative care and possible complications. Herein, we describe a novel cross-wire technique, which may be an alternative rescue to help successful wire cannulations without an extra snare device and upper arm access.

MATERIALS AND METHODS

Under general anaesthesia, 2 wires and catheters were, respectively, introduced into the bilateral femoral artery under ultrasound guidance. After confirming the relevant size of the landing zone and aortic length by angiography, the main body of the stent graft (Gore Excluder Stent Graft, W. L. Gore & Associate, Inc. Flagstaff, AZ, and New York, NY, USA) was delivered over the guidewire from the ipsilateral femoral artery and deployed just below the lower renal artery (Fig. 1A). Typically, the guidewire from the contralateral femoral artery is cannulated into the contralateral short limb of the main body of the stent graft.
However, among our 5 cases with a severely tortuous proximal aortic neck, we faced obstacles during the cannulation of this guidewire into the contralateral short limb. Therefore, the guidewire from the contralateral femoral artery was cannulated into the ipsilateral long limb of the main body (Fig. 1B), and another guidewire from the ipsilateral femoral artery was cannulated into the contralateral short limb (Fig. 1C). The contralateral wire and the ipsilateral wire were exchanged. One iliac limb of the stent graft was then deployed from the ipsilateral long limb of the main body of the stent graft to the contralateral common iliac artery through the contralateral guidewire (Fig. 1D), and another iliac limb of the stent graft was deployed from the contralateral short limb of the main body of the stent graft to the ipsilateral common iliac artery through the ipsilateral guidewire (Fig. 1E). After adequate ballooning over landing zones and stent junctions, the final angiography was performed to confirm the secure sealing of the stent graft without endoleak and the appropriate blood flow through the stents without sacrificing the bilateral renal and internal iliac arteries.

RESULTS

From November 2006 to December 2017, 839 patients received EVAR for an AAA in our institute. We applied the cross-wire technique on 5 patients, and they were all free of mortality or any kind of complication and their course was uneventful at the 1-year follow-up.

DISCUSSION

A successful cannulation into the contralateral short limb of the main body of the stent graft could be challenging during EVAR. Some anatomical variations causing poor alignment between the contralateral short limb of the main body of the stent graft and the contralateral iliac artery in AAA morphology, such as a severely tortuous proximal aortic neck and large angle between the bilateral iliac arteries and severe infra-renal aortic angulation (>60°), might preclude successful contralateral wire cannulation.
Under such circumstances, solutions are sought to accomplish wire cannulation. Several rescue techniques have been developed to overcome these challenges, including introducing various angled catheters, the cross-limb (or ballerina position) technique and pull-down techniques.

Traditionally, the contralateral short limb is deployed at the contralateral site of the aorta. In some challenging AAA anatomies, the cross-limb technique [1] is employed to adjust the deployment of the main body of the stent graft to let the contralateral short limb face the ipsilateral side, allowing the contralateral wire to be closer to the contralateral short limb, so that wire cannulation can be done easier. Finally, the 2 limbs of the stent graft are deployed as a crossed configuration, like a ballerina crossing her legs. This technique has been widely used in daily practice. However, in some difficult cases of a severely tortuous proximal aortic neck, even after we adjusted the main body, the wiring of the contralateral short limb was still hard to approach the contralateral limb. The main difference between our cross-wire technique and the cross-limb technique is that our cross-wire technique completely exchanged the pair of bilateral guidewires and bilateral limbs of the main body (the contralateral guidewire cannulating to the ipsilateral limb of the main body and the ipsilateral guidewire cannulating to the contralateral limb) and can help wire cannulation if the cross-limb technique fails.

The 2 pull-down techniques, administrating a snare device through the contralateral iliac artery to capture the guidewire introduced from the ipsilateral iliac limb [2] and the guidewire introduced from one of the radial or brachial arteries [3], were reported to be an effective technique when various kinds of traditional wiring and catheters failed. The difference between these 2 techniques and our cross-wire technique is the requirement of an additional snare device. Besides, with our cross-wire technique, there is no additional percutaneous access site over the upper limbs, which might increase operative time and patient discomfort.

**Limitations**

The limitation of our technique is that it cannot be performed if the opening of the ipsilateral long limb of the main body is lower than the aortic bifurcation. In other words, the cross-wire technique as an alternative way for cannulation can only be administrated when the length of the main body (from the upper-side of the main body of the stent graft to the opening of the ipsilateral long limb) is shorter than the length between the lower renal artery and aortic bifurcation. Hence, it is not possible to apply our technique with a 2-piece stent graft. However, there has been no study providing evidence that a 2- or 3-piece stent graft would affect the overall outcome or causing higher incidence of Type 3 endoleak. Therefore, we recommend careful selection of the main body of the stent graft when preoperative planning of EVAR for a severe tortuous AAA to achieve a successful wire cannulation.

During the last 11 years with 839 cases of EVAR for an AAA performed in our institute, only 5 patients needed this cross-wire technique to complete the EVAR with the Gore Excluder Stent Graft (W. L. Gore & Associate, Inc.) implantation, which meant that the current main technique for contralateral wire cannulation has been quite effective, and our cross-wire technique was only used in some very difficult cases of EVAR for an AAA.

**CONCLUSION**

The cross-wire technique may be an alternative technique for EVAR of an AAA if traditional cannulation is challenging or unachievable in patients with a severely tortuous proximal aortic neck.

**ACKNOWLEDGEMENTS**

The authors thank the Taiwan Association of Cardiovascular Surgery.

**Conflict of interest:** none declared.

**REFERENCES**


