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Case Report

Renal artery side branches patency protection during endovascular exclusion of giant renal artery aneurysm with covered stent: Well done is better than well said

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ABSTRACT

Rationale: Endovascular treatment of renal artery aneurysms has offered a viable alternative with a high success rate and low procedure-related morbidity and mortality.
Patient concerns: A 60-year-old man, having a right renal artery aneurysm involving the main vessel with two arteries (supplying the inferior and superior lobes of the kidney) originating from the aneurysm sac as well.
Interventions: A 6 × 28 mm covered stent was inflated in vitro and a side hole was made with a femoral needle in the polytetrafluoroethylene (PTFE) layer, through which a wire was placed in an outside/inside direction in to be inserted in the inferior pole branch. The other wire was inserted inside the main lumen of the stent (to be inserted in the main artery) and the latter, carefully re-crimped on the balloon. This way, the authors guaranteed continuous access to both arteries during aneurysm exclusion and if needed, a second stent could be advanced at the level of the bifurcation to preserve side branch patency.
Conclusion: Perforating the PTFE of the stent before its introduction into the vessel and keeping a wire into the side branch could be a good strategy to protect any vessel arising from aneurysmal sac that needs to be excluded.
<**Learning objective:** Handling challenging cases of arterial aneurysms percutaneously, especially in high-risk patients.>

Introduction

Renal artery aneurysms (RAAs) are uncommon, with an estimated incidence of less than 1% in autoptic studies [1]. Albeit the risk of rupture remains controversial, repair has been recommended for aneurysms larger than 2.5 cm in diameter (if symptom-free), ≥2 cm in symptomatic patients, and ≥1 cm in childbearing women.

Hereby, we present treatment of a wide-necked RAA involving the bifurcation of the main renal artery treated with a custom-made modification of a stent graft in order to ensure permanent access to both renal arteries' branches during stent placement in case of flow compromise. Tips and tricks of planning and performing the procedure are described thoroughly.

Case report

A 60-year-old man, was admitted in our institute for evaluation of a giant right RAA after presenting to the emergency room for clinical evaluation of severe right flank pain and history of chronic lymphoid leukemia. An abdominal computed tomography (CT) scan discovered diffuse calcification of the aorta and a giant right renal artery saccular aneurysm (38 × 32 mm). In particular, it seemed that two segmental renal artery branches (one for the inferior lobe and one for the superior lobe of the kidney) were also originating from the aneurysm sac. After femoral puncture and

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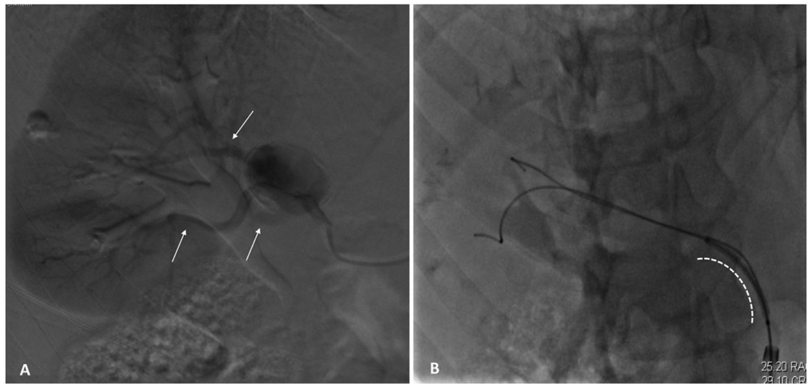

Fig. 1. (A) Complete visualization of the kidney parenchyma (upper, mid, and inferior pole) from the three branch arteries. (B) Placement of two 0.35 standard wires with modified beStent covered stent advancement (dotted line).

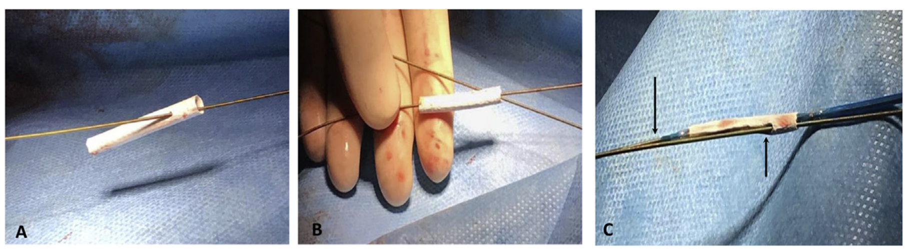

Fig. 2. Pictures showing inflated covered stent (A) with a small hole made across the polytetrafluoroethylene layer, and the first wire placed inside. (B) The second wire inserted longitudinally inside the main stent lumen. (C) The stent re-crimped on the balloon, with the wires forming a double rail (black arrows) before insertion into the 12 Fr sheath. In this way, continued access to both branches is maintained and a second stent could be advanced at the level of the bifurcation to preserve side branch patency, if needed.

placement of a 6 Fr introducer sheath (Terumo, Tokyo, Japan) and intravenous administration of 5000 U of heparin, a 5 Fr Cobra catheter (Medtronic, Minneapolis, MN, USA) was advanced at the ostium of the renal artery and selective catheterization demonstrated that a branch for the upper kidney's pole originated immediately after the take-off of the main renal artery and it was not involved in the aneurysm sac. However, in multiple projections, the branches for the mid and inferior kidney poles seemed to originate within the aneurysm sac (Fig. 1A). In this anatomic situation, placement of a single covered stent would have carried the risk to close one of the branches in association with possible risk of incomplete aneurysm exclusion. Thus, we decided to approach this anatomically challenging situation with a custom-made covered stent. We exchanged the introducer with a 10 Fr straight 45 cm long sheath (Destination, Terumo) and subsequently both renal branches were carefully engaged with 0.014-in. BMW wires (Abbott Vascular, Beringer, Switzerland). Then, those wires were exchanged with two 0.35 standard wires (Cook Medical, Bloomington, IN, USA) over a hydrophilic 4 Fr diagnostic Berenstein catheter (Boston Scientific, Marlborough, MA, USA) (Fig. 1B). A 6×28 mm covered stent (BeGraft, Bentley InnoMed GmbH Co., Hechingen, Germany), was inflated on the table and by the means of a femoral needle, a small opening in the polytetrafluoroethylene (PTFE) layer was created. The opening involved a full cell of the stent. Through this opening, one of the 0.35-in. wires was inserted in an outside/inside direction in the PTFE hole (Fig. 2, Panel A). The other 0.35-in. wire was inserted across the stent main lumen (Fig. 2, Panel B), and finally the such custom-made covered stent was carefully re-crimped on the balloon (Fig. 2, Panel C). In this way, we guaranteed continuous access to both branches during aneurysm exclusion and more importantly, a second stent could be easily advanced at the level of bifurcation through the PTFE hole to maintain side-branch patency, if needed (confirmation was done in vitro as the whole was created in the middle of the expanded cell, across which a guidewire was passed, and another non-expanded stent was tried, and easily re-crossed along the wire through the hole made in the body of the first stent). The stent graft was then smoothly advanced into position and inflated up to 12 atm for 10 s. After removal of the 0.35-in. wire from the branch to the middle kidney pole, it was clear that the inferior pole branch was probably originating outside the aneurysm sac due to the fact that the aneurysm was almost excluded (except for a small endoleak from the PTFE hole), and both arteries were patent (Fig. 3, white asterisks). The wire for the inferior pole was then removed and control angiography demonstrated patency of all three branches associated to complete aneurysm exclusion with no residual endoleak. The femoral access was closed with a 6 Fr Proglide closure system (Abbott Vascular) and the patient was discharged the day after on 100 mg/daily aspirin and 75 mg/daily clopidogrel for 8 months. The patient remained asymptomatic, and an angio-CT scan at 1 month demonstrated permanent and complete RAA exclusion with patency of all three renal artery branches.

Discussion

In this anatomical setting, one strategic approach could be to place a covered stent, and if any of the segmental branches are compromised, utilize a stiff wire (usually a Brockenburg needle) to perforate the PTFE and cross the stent struts to dilate them with a balloon to restore branch patency [2]. The drawbacks of this

Fig. 3. (A) Covered stent positioning and inflation across the aneurysm sac. At control angiography both arteries are patent but there is a residual small endoleak (white arrows) due to the second wire presence across the polytetrafluoroethylene layer (B).

technique are the difficulties in identifying the ostium of the branch (once covered with the stent) and the risk of creating multiple holes in the PTFE layer with subsequent leak and aneurysm incomplete exclusion. Another described technique is to create a custom-made bifurcation-covered stent creating an opening in the PTFE layer and inserting a small balloon with its tip slightly protruding outside the opened cell [3]. The system is then advanced over the guidewires at the level of the bifurcation until the side balloon starts to protrude into the side branch. The stent is then delivered by inflating each balloon separately and then together. The coverage toward the side branch is then completed by advancing a bare metal stent which guarantees side branch patency. The drawback of this technique is that extreme caution must be used not to disrupt the geometry of the PTFE-covered stent during the preparation of the described system.

Conclusion

The present case demonstrates the efficacy and safety of the percutaneous approach in treating RAAs, even in the presence of a complex anatomy. The technique described herein, can be utilized whenever the operator is not confident of the anatomical distribution and origin of the vessels that need to be preserved during aneurysm sac exclusion with a covered stent. Perforating the PTFE of the stent before its introduction into the vessel and keeping a wire into the side branch could be a good technical strategy to protect any vessel arising from aneurysmal sac that needs to be excluded.

Conflicts of interest

None.

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