ASK THE EXPERTS

Which Device Combinations Work Best in Your Hands for Parallel Grafting and Why?

Insights into practitioners' device choices when treating aortic aneurysms.

WITH EDWARD Y. WOO, MD; SONIA RONCHEY, MD; KENNETH TRAN, MD; AND JASON T. LEE, MD

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Parallel grafting has provided a therapeutic option for treating patients with complex aortic pathologies. Recent studies have demonstrated excellent results with different aortic endografts as well as different branch stents. Although I have used almost every combination, I try to abide by the following principles.

In terms of aortic endografts, it is ideal to have an uncovered stent above the fabric. This allows the branch stents to extend proximal to the fabric and minimize the risk of acute occlusion that can occur if they lie within the fabric of the aortic endograft. The uncovered stent also helps pin the branch stents in place, reducing the risk of "toppling" or "collapsing" of the branch stent above the endograft. My preference is to use the AFX endovascular abdominal aortic aneurysm (AAA) system (Endologix). This has a bare-metal stent above the fabric but no active fixation. The hooks from active fixation can puncture the branch stents or trap the delivery catheters, thus making it less desirable. Another benefit of the AFX endograft is that the compliance and the fabric billowing uniquely suit the parallel graft construct by allowing for molding of the endograft around the branch stents. Finally, because the device is built from the bifurcation proximally, it minimizes the time that wires, catheters, and devices are left in the branch vessels. Once the most proximal component is completed, the procedure is finished. Conversely, with modular devices, the iliac work must be completed before completion angiography can be performed; thus, all devices and wires remain in the branch vessels, posing the risk of thrombus formation, dissection, and partial ischemia.

With regard to branch vessel stenting, I always use covered stents. My preference for access is to use the left axillary artery with three offset cannulation sites, each surrounded by a 4-0 Prolene purse-string suture (Ethicon, a Johnson & Johnson company). I use a 7-F sheath at each site and rarely need anything more than the purse-string suture to close each site of cannulation. In the superior mesenteric artery and celiac artery, my preference is the Atrium iCast balloon-expandable covered stent (Getinge) for its strength, precision, and ability to be delivered via a 7-F sheath. For the renal arteries, I use the Viabahn endoprosthesis (Gore & Associates) or the Viabahn VBX balloon-expandable endoprosthesis (Gore & Associates) depending on a few factors. If I need longer lengths or more flexibility, I will use the Viabahn endoprosthesis. If I need precise placement or need to deploy the stent before endograft deployment, I will use the Viabahn VBX. I have found that all combinations have yielded excellent patency and durability.

In the end, one of the greatest benefits of parallel grafting is the true "off-the-shelf" capability of the procedure. Many interventionalists have developed different techniques with different device combinations and have yielded excellent results. This is merely what has worked best for me.

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Our first chimney cases were performed to avoid inadvertent coverage of vital vessels. The good results maintained at follow-up led us to use the technique for urgent emergent cases and those unfit for custom devices.

The main problem with the chimney technique has been identifying the best choice for the graft and parallel graft to obtain perfect sealing and avoid compression of the parallel graft. We tried different combinations but preferred the Excluder AAA endoprosthesis (Gore & Associates) with the Viabahn endoprosthesis (the latter is reinforced with bare stent to accommodate angulations). The reason for this choice was the good conformability of the Excluder graft, the high flexibility of the Viabahn, the similar radial forces of the two stent grafts, and the absence of proximal free flow with hooks in the main graft that could potentially interfere with the parallel graft. Results were highly satisfactory; however, the technique was not part of the instructions for use, raising legal concerns.

Recently, the two-chimneys technique became part of the instructions for use based on the good results reported for the Endurant II stent graft system (Medtronic) with the Advanta 12 (Getinge)/Atrium iCast vascular graft. However, in our experience, this configuration was more prone to gutter endoleak, probably due to the rigidity of the parallel graft.

For these reasons, our choice is the Endurant II in combination with the Viabahn VBX, which is still a balloon-expandable stent graft with good radial force like the other balloon-expandable stents but with higher trackability and flexibility.

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As some of the initial supporters of parallel grafting and its role in complex endovascular aneurysm repair (EVAR), we believe in carefully planned out combinations that are likely to lead to the most durable outcomes.[1] Since the commercial approval of the Zenith fenestrated AAA endovascular graft (Cook Medical) in the United States, we have shifted our elective complex EVAR practice to more fenestrated strategies; however, we still employ parallel graft techniques (chimney, sandwich, periscope), particularly in urgent settings. Based on our experience in the PERICLES registry and learning from other parallel graft collaborators, we prefer a nitinol/polyester graft with suprarenal fixation (eg, Endurant II) as our main body graft of choice. We find that suprarenal fixation is often necessary to increase the stability of the parallel graft to be pinned against the aortic wall, making it easier in the future should it need to be reaccessed. Furthermore, polyester fabric may also better aid in the resolution of small-volume gutter endoleaks compared with polytetrafluoroethylene.[2]

Regarding the specific chimney grafts employed, we often use balloon-expandable covered stents. Most cases in the literature, as well as those in the PERICLES registry, have used the Advanta V12/Atrium iCast balloon-expandable covered stents, which have shown favorable outcomes compared with self-expanding covered stents when paired with a nitinol/polyester main body.[3] This may be due to their more precise deployment, ability to easily perform multivessel balloon molding, and higher degree of radial strength compared with self-expanding grafts. More recently, we have found that the Gore Viabahn VBX endoprosthesis can also be used with success and offers a somewhat higher degree of flexibility and deliverability compared

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with V12/iCast stents. For more tortuous vessels or anatomies that require long (10–15 cm) parallel graft length, covered self-expanding stents (eg, Viabahn) can also be effective. We seldom employ bare-metal stent grafts alone due to the increased risk of gutter endoleak compared with covered stent grafts.[4]

Finally, our group has increasingly employed concurrent chimney/parallel grafting techniques in combination with the commercially available Zenith fenestrated graft. This allows one to preserve perfusion to additional branch vessels beyond the three specified in the current Zenith platform.[5] We have found success with using the Gore Viabahn VBX stent for this purpose due to the balloon-expandable nature and the variety of available lengths and diameters to match specific patient anatomy. ■

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