Where there's smoke, there's fire: Chimney stent grafts for hybrid repair of the aortic arch

Grayson H. Wheatley III, MD, FACS

From the Division of Cardiovascular Surgery, Temple University School of Medicine, Philadelphia, Pa.

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Address for reprints: Grayson H. Wheatley III, MD, FACS, Temple University School of Medicine, 3401 N Broad St, 3rd Floor, Zone C, Suite 301, Philadelphia, PA 19147 (E-mail: grayson.wheatley@tuhs.temple.edu).

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Central Message

Hybrid repair of the aortic arch for type A dissections, particularly after proximal aortic repair, can be achieved with a variety of different surgical and endovascular techniques, including chimney and sandwich grafts.

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The term *hybrid arch repair* refers to a multitude of different surgical and endovascular approaches, all intended to provide a less invasive alternative to open arch surgery. There is no consensus surrounding a standardized technique for hybrid arch repair because the aortic pathologies are so varied, as is the capacity to mix and match open surgical techniques with endovascular technologies.¹ Nevertheless, the Achilles heel of a nonsternotomy approach to hybrid arch repair is maintaining patency to the great vessels. Without a dedicated branched aortic stent graft, technologic workarounds are needed to maintain cerebral blood flow while excluding the diseased aortic arch with a standard aortic stent graft. In this issue of the *Journal*, Zhang and colleagues² describe the first nonsternotomy hybrid repair of the aortic arch for a type A aortic dissection with chimney and sandwich stent grafts in a patient with a previous proximal surgical repair and Marfan syndrome.

The chimney and sandwich stent-graft techniques have been used in a number of ways to preserve branch vessel patency. Chimney grafts were first described by Criado³ and refer to a parallel graft configuration in which the chimney graft runs parallel to the main aortic stent graft, which allows both these grafts to receive inflow proximally. By the nature of the process, gutters around the parallel chimney graft are created; with appropriate upsizing of the main aortic stent graft, however, molding of the aortic stent graft occurs around the chimney stent graft to eliminate endoleaks in the gutter spaces. The sandwich stent-graft technique was first described by Lobato and Camacho-Lobato⁴ for thoracoabdominal branch vessel preservation. In this technique, a long parallel graft is sandwiched between 2 aortic stent grafts. The primary difference between chimney and sandwich grafts thus is that the chimney is parallel to an aortic stent graft, whereas the sandwich graft runs parallel and between 2 aortic stent grafts.

This report describes a creative application of chimney and sandwich grafts, along with aortic stent grafts to repair a type A aortic dissection in a patient with previous Bentall surgery and associated Marfan syndrome. Their approach avoids a sternotomy but does include a left carotid–subclavian arterial bypass. The anatomic advantage in this patient is that the

patient had a previous proximal aortic replacement, and as such the proximal landing zone of the aortic stent graft is secure in this patient with Marfan syndrome. There will need to be continued surveillance of the distal landing zone, which is in anatomically normal descending thoracic aorta but still subject to potential degeneration as a consequence of Marfan syndrome.

In summary, physicians and patients now have an additional technique for offering hybrid arch replacement in type A aortic dissection to patients who cannot have or refuse a sternotomy approach. In the future, branched aortic stent grafts may be used for these types of applications; at present, however, they are still in development. For those physicians becoming more familiar with the chimney stent-graft technique for branch vessel preservation in endovascular aortic repair, the message is this: “Chimney grafts are not all *smoke and mirrors*.”

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