# Fixation Enhancements in EVAR

An overview of the mechanisms for EVAR graft fixation and where the technology stands today.

**BY SEAN P. LYDEN, MD, FACS**

The current era of endovascular aneurysm repair (EVAR) began in the United States in 1999 with FDA approval of the AneuRx (Medtronic) and Ancure (formerly Guidant Corporation) devices. EVAR held the promise of achieving aortic aneurysm repair through a minimally invasive approach. At that time, we understood very little about the needs for aortic fixation and the durability of EVAR, but we did know the 1-year safety and effectiveness data for these two devices, which had vastly different mechanisms for fixation.[1,2]

The AneuRx device used stents on the outside of the fabric and had the theorized potential of tissue ingrowth, but it solely relied on radial force to hold the device in place. Although the 5-year data were positive, the limitations of radial force as a sole fixation method eventually became apparent.[3-6] In dramatic contrast, the Ancure device used active fixation with hooks driven into the aortic wall for fixation but with almost no radial force in the stent itself. Ancure's design had problems in terms of hook fracture but also a very low late risk of device migration; it was eventually removed from the market for delivery system issues.[7,8]

## THE JOURNEY FORWARD

In the decades that followed, we saw the emergence of new devices and designs, including the incorporation of active and suprarenal fixation into most devices. Experimental data also support the idea of active fixation for improving resistance to migration.[9,10] The suprarenal aorta tends to be less likely to dilate over time than the infrarenal neck and, therefore, makes a better potential place for lasting fixation.[11-15] We also know that the infrarenal neck of an aneurysm dilates over time, and the outward force exerted by a self-expanding aortic endograft promotes neck enlargement and migration.[11,14,16-18] On the other hand, polymer sealing, similar to balloon-expandable stent grafts, does not place outward force on the aortic wall and is not associated with aortic neck enlargement.[19-21]

More recently, endovascular aneurysm sealing (EVAS) was proposed as a novel way to achieve fixation and sealing.[22,23] However, newer data suggest that EVAS technology cannot achieve durable resistance to migration.[24,25]

Active fixation has taken hold as a feasible and stable mechanism to resist migration in the infrarenal neck with the use of EndoAnchors (Medtronic).[26-28] In fact, experimental data with cadaver aortas have suggested that the amount of force needed to displace an EVAR graft reinforced with six anchors is more than with a Dacron graft surgical aortic anastomosis.[10,29] Data from the ANCHOR registry have proven the ability to treat migration of previously placed endografts.[28]

## CONCLUSION

Thus far, we have not seen the ideal fixation mechanism. We know that stability to the aortic bifurcation is helpful,[30] and we know that active fixation works better than passive fixation. Dilation of the aortic neck is more common in self-expanding designs and leads to an increased late risk of migration. The visceral aorta can dilate but does so much less commonly than the infrarenal or pararenal aorta. The biologic mechanism for aortic growth is still not fully understood; once that is defined, novel approaches will hopefully emerge. ■

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**Sean P. Lyden, MD, FACS**
Professor and Chairman
Department of Vascular Surgery
Cleveland Clinic
Cleveland, Ohio
lydens@ccf.org
*Disclosures: Consultant to Abbott, Boston Scientific Corporation, Endologix, Intact Vascular, PQ Bypass, Medtronic, Philips, Shockwave Medical, Spectranetics; board member for VIVA Physicians.*