CORRESPONDENCE

More Attention Needed for the Distal Landing Zone in TEVAR

In their recent article, Berezowski *et al*. focus on an area of TEVAR that deserves more attention by operators and manufacturers to improve results of TEVAR and avoid type IB endoleaks.[1] The problem of low deployment accuracy and upward migration of the distal ends of endografts is well known, but less attention is paid to this problem as to precision and control of proximal landing as the authors rightly observe. I congratulate the authors for bringing this important issue to the reader's attention and for the effort to develop a bench top deployment model for testing. It is not a surprising finding that reverse deployment of the tested endografts allows for more accurate position in the distal landing zone and reversing the deployment mechanism is an available solution as shown by the Altura EVAR device (Endologix, Santa Rosa, USA) that offers reverse deployment of its iliac component in EVAR .[2] However, the employed mechanism of Altura may have challenges in thoracic segments, as the curve of the aortic arch may prevent this technique. Antegrade transapical access may appear to offer another feasible solution to allow reverse deployment in the descending aorta, but operators should be warned as this is associated with increased neurological risks by crossing the aortic arch with a large bore device. Furthermore, the curvature of the aortic arch increases friction during release significantly, as we experienced previously.[3] However, transapical access offers distinct advantages over transfemoral access for TEVAR in the ascending aorta regarding inner wall apposition, access profile, etc.[4] A serious problem with antegrade deployment of stent grafts is that their distal ends are usually not designed to be exposed to antegrade arterial flow with too few fixation points of the fabric to the stent tops with the potential consequence of type IA endoleak or stent graft collapse. This applies to most stent grafts, while the Zenith TX2 ProForm stent grafts (Cook Medical, Bjaeverskov, Denmark) and the C-TAG (Gore, Flagstaff, USA) have the same number of fabric attachment points both on the proximal and distal ends of the device and therefore are probably best suited for antegrade deployment.

The Zenith thoracic endografts by Cook Medical, which were, regrettably, excluded from the study, offer a specific staged deployment system for the distal landing zone when treating thoracic aneurysms with the stainless steel TX2 ProForm as well as with the new low profile nitinol based Zenith Thoracic Alpha stent graft.[5,6] These stent grafts are currently the only system offering a proximal and a distal component to take care of the specific requirements of the proximal and distal landing zones. The distal component includes a distal bare stent with reverse barbs and a "bottom cap" to allow controlled staged deployment in the distal landing zone and prevent future upward migration (Fig. 1). Even the proximal component of the Zenith devices offer better distal deployment accuracy in our experience compared with the tested devices as the distal stent graft edge of the Zenith stent grafts is fixed on the delivery system by a fixation wire that is released in a staged fashion and thereby prevents the "stent graft jump" effect. These

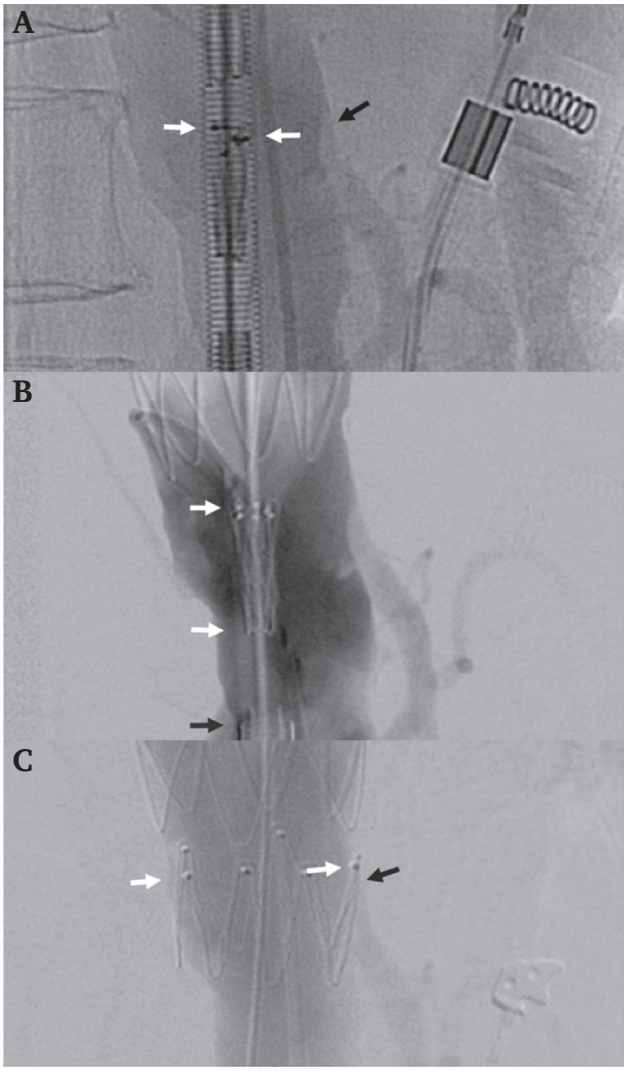

Figure 1. Staged distal deployment of a Zenith Thoracic Alpha distal device (Cook Medical, Bjaeverskov, Denmark) in the distal descending thoracic aorta proximal to the coeliac artery (CA, black arrow). (A) Angiography prior to deployment with the stent graft constrained by its outer sheath showing the markers of the distal stent graft edge (white arrows) positioned close to the CA (black arrow). (B) Staged deployment of the stent graft with the outer sheath fully retracted (black arrow) and the distal bare stent still fully constrained in the bottom cap (white arrows). At this stage, small longitudinal adjustments can still be made. (C) Angiography showing deployment result with the markers of the distal stent graft edge (white arrows) just proximal to the CA (black arrow).

advantages compared with the tested devices may be just what the authors are looking for to improve distal landing accuracy. All three tested devices have some homework to do in this respect as they lack distal fixation and therefore are prone to the "stent graft jump" effect. This phenomenon is well known in self expandable nitinol stents and is caused by the temperature dependant radial force of the nitinol stents when not fully constrained or retained by a distal fixation.

Lastly, both anatomies used in the tests seem to lack a distal healthy parallel walled landing zone even proximal to the superior mesenteric artery, and might be better treated by fenestrated or branched repair choosing a more distal landing zone in the infrarenal aorta or iliac arteries.

CONFLICTS OF INTEREST

Consultant, Proctoring, IP, Royalties, Research Grants with Cook Medical.

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Available online 10 June 2019

https://doi.org/10.1016/j.ejvs.2019.03.041
DOI of original article: https://doi.org/10.1016/j.ejvs.2018.07.034

Re: "More Attention Needed for the Distal Landing Zone in TEVAR"

We are thankful to Kölbel & Panuccio for their thoughtful comments on our recent experimental study on the accuracy of thoracic stent graft deployment in the distal landing zone.[1,2] It is truly encouraging to see interest growing in this underrated clinical problem. We would like to address some points raised in their letter.

Firstly, the exclusion of Zenith stent grafts (Cook Medical, Bloomington, IN, USA) was unavoidable in our experimental setting, as every stent graft deployment was repeated several times and, due to barbs and a low profile introducer sheath, it was impossible to re-upload this prosthesis manually into the delivery device. Indeed, both the TX2 and Zenith Thoracic Alpha stent grafts have different components dedicated to proximal and distal landing; however, the notion that they permit more accurate landing in the distal landing zone relies on personal opinion and not on any published clinical or experimental studies. In our clinical study on 59 patients with challenging distal landing zones, three patients underwent thoracic endovascular aneurysm repair (TEVAR) with a Zenith Alpha stent graft and in only one of the three was distal deployment accurate.[3]

Secondly, we wish we could agree that use of the reverse implantation mechanism, similar to that available with the Altura EVAR device (Endologix, Santa Rosa, CA, USA), would be made impossible due to the curve of the aortic arch. Challenging distal landing zones are located in the distal thoracic aorta, usually just above the coeliac trunk or mesenteric artery. Supplying such a distal landing zone with as short a distal component as 70–100 mm would have left the aortic arch intact, even with the most proximal part of the delivery device working similarly to the Altura device. As the length of thoracic aortic pathologies usually means there are at least two prostheses to seal, we believe the optimal means would be to use the currently available mechanism; that is, opening from poximal to distal to supply the proximal landing zone and a short distal component reversely deployed to supply the distal landing zone.

If we are talking about "accuracy landings", allow us to refer to what must be the oldest skydiving discipline, whereby skydivers aim to land as closely as possible on a 2 cm target on the ground ("dead centre"): the current world record is 10 consecutive landings.[4] With the current stent grafts on the market, unfortunately we do not have the means or even the hope of being similarly accurate. Having a delivery device deploying the stent graft from distal to proximal to supply the distal landing zone may enable us to "jump" and land more accurately within the TEVAR "dead centre"- the short distal landing zone.

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