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Outcome of Fenestrated Stent-Graft Repair for Abdominal Aortic Aneurysms: Does the Number of Fenestrations Matter?

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Fenestrated endovascular aneurysm repair (FEVAR) has become a widespread technique to treat short-necked and juxtarenal abdominal aortic aneurysms (AAAs).[1] The positive results of early adopters of FEVAR, together with the ongoing centralization of complex aortic procedures in many European countries, the improvements of modern stent-grafts, and the ever-increasing number of hybrid operating theatres, have encouraged many vascular surgeons to extend their endovascular practice to treat more complex aneurysms.

At first, FEVAR was offered only to patients at increased risk for open repair, but the low mortality and good early and midterm results convinced many surgeons to offer this technique as first-line treatment for nearly all patients presenting with short-necked or juxtarenal aneurysms.[2,3] Additionally, endovascular treatment of pararenal or suprarenal AAAs has become a valid treatment option as well, "only" requiring the addition of 1 or 2 more fenestrations to the stent-graft. However, although the superior mesenteric artery (SMA) and the celiac artery (CA) are by far the easiest vessels to cannulate during FEVAR, adding additional fenestrations and thus additional intraoperative procedures might increase the risk of perioperative complications.

There are several reasons to speculate that the use of more complex endografts might cause a worse outcome. Among these reasons are the longer duration of the intervention; the increased number of guidewire and catheter manipulations, which automatically increases the risk of target vessel injury with consequent target organ ischemia; the accidental occlusion of stent-grafts due to flaring of close-lying fenestrations; and the use of more contrast, increasing the risk of renal insufficiency. Midterm results with more complex endografts might also be worse due to complications during follow-up, such as endoleaks, stent fractures, and branch vessel stenosis or occlusion. It is therefore paramount that we know the early and midterm results of FEVAR using more complex stent-grafts than the standard configuration of fenestrations for the renal arteries and a scallop for the SMA. In the April 2017 issue of the *JEVT*, Oikonomou et al[4] have addressed this issue by comparing the early and midterm results of a group of 45 patients (A) treated with stent-grafts featuring renal-only fenestrations with a group of 96 patients (B) treated with stent-grafts with additional fenestrations for the SMA and/or CA in case of more proximal AAAs. Type IV thoracoabdominal aortic aneurysms and aneurysms requiring treatment with a branch graft were not included.

Some very interesting results were obtained. The operative time was not longer and the amount of contrast used was not more in "complex" group B, which is counterintuitive, especially because the fluoroscopy time was significantly longer in this group. The authors do not address this issue although they state that the number of patients is too low to support robust statistical conclusions. However, the groups are not that small, and the authors could have made an effort to help the reader with this puzzling finding. It suggests that adding just 1 or 2 more fenestrations to a stent-graft and thereby making it a "more complex graft" really does not increase the complexity of the procedure itself.

No differences between groups were found in technical success (overall 95.7%), 30-day mortality (3.5%), perioperative complications (12.1%), or hospital stay (mean

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13 days). This hospital stay seems fairly long compared with the 4- and 7-day medians in 2 articles by Verhoeven et al[1,3] reporting the results of 100 and 281 FEVARs, respectively, but this issue is not addressed by the authors. Interestingly, 4 (14%) of 29 patients treated with a 4-fenestrated stent-graft developed spinal cord ischemia (SCI), which fortunately completely resolved in all patients. This high percentage of SCI with 4 fenestrations underlines the risks of placing stent-grafts in the more proximal visceral segment of the aorta. It also supports the authors' protocol to apply cerebrospinal fluid drainage for paraplegia prevention in all patients treated with a 4-fenestrated stent-graft and in selected patients with a 3-fenestrated stent-graft.

Overall, 25 (17.7%) patients had endoleaks during follow-up, but there was no difference between groups. Eleven of these endoleaks were type II without aneurysm progression and were treated conservatively. In the other 14 patients with endoleaks, reinterventions were required, of which 7 were performed for type II endoleaks with aneurysm progression. During a mean follow-up of 33 months, 8 of the 403 target vessels occluded, all 8 were renal arteries (8 of 278 renal artery fenestrations).

Unplanned reinterventions were required in 26 (18.4%) patients, 14 because of endoleaks, 11 because of target vessel issues such as stenosis, occlusion, or pseudoaneurysm formation, and 1 because of aortoduodenal fistula. In group B, only 2 of the 15 reinterventions could be related to a higher graft complexity, including 1 type Ib endoleak from the CA and another CA that could not be stented from the groin, requiring an additional procedure.

To summarize, the early and midterm results of FEVAR for juxta- and suprarenal AAAs in the hands of experienced surgeons from high-volume centers are really good and are apparently not affected by the use of more complex fenestrated designs with additional fenestrations for the SMA and CA. Together with the finding that nearly all unplanned reinterventions were performed for endoleaks and target vessel stenosis/occlusion, another conclusion of the study could be that it is not the complexity of the endograft that determines the outcome of the procedure but merely the anatomical complexity of the aorta and its side branches.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

1. Verhoeven EL, Vourliotakis G, Bos WT, et al. Fenestrated stent grafting for short-necked and juxtarenal abdominal aortic aneurysm: an 8-year single-center experience. *Eur J Vasc Endovasc Surg*. 2010;39:529–536.
2. Katsargyris A, Oikonomou K, Klonaris C, et al. Comparison of outcomes with open, fenestrated, and chimney graft repair of juxtarenal aneurysms: are we ready for a paradigm shift? *J Endovasc Ther*. 2013;20:159–169.
3. Verhoeven EL, Katsargyris A, Oikonomou K, et al. Fenestrated endovascular aortic aneurysm repair as a first line treatment option to treat short necked, juxtarenal, and suprarenal aneurysms. *Eur J Vasc Endovasc Surg*. 2016;51:775–781.
4. Oikonomou K, Kasprzak P, Schierling W, et al. Graft complexity–related outcomes of fenestrated endografting for abdominal aortic aneurysms. *J Endovasc Ther*. 2017;24:230–236.