


Sealing the Deal: Easier Methods Are on the Horizon for Postoperative Evaluation of Stent-Graft Seal Zones

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Endovascular aneurysm repair (EVAR) has unquestionably changed the way we treat abdominal aortic aneurysm (AAA), but durability remains a major concern. This was evident in the early days two decades ago and remains so today. Two important aspects that greatly influence long-term results have been refined over time: patient selection (recognition of anatomic risk factors leading to failure) and surveillance (recognition of preclinical signs of failure and subsequent elective treatment). While anatomy is unequivocally related to risk, it is how the operator makes use of the anatomic potential that finally equates to problems over time. This information can be obtained only postoperatively. The benefit, frequency, and modality of imaging surveillance, on the other hand, have been repeatedly questioned. Since the rationale behind surveillance programs is to allow early detection and elective treatment of complications, it is critical that we optimize strategies and improve discriminatory power and efficacy of the available imaging tools.

With current EVAR technology, the large majority of devices rely on graft apposition to “healthy” portions of the aorta and iliac arteries to achieve an effective and durable seal, thereby excluding the aneurysm wall from systolic blood pressure. Previous reports^{1,2} have shown that most secondary interventions after EVAR are prompted by symptoms arising in the intervals between surveillance imaging. Others have published conflicting evidence on the survival benefit of adherence to surveillance programs.^{3,4} The conclusion is that current strategies are highly inefficient in identifying the early signs of failure. Since the majority of complications are related to the seal zones, there is surely room for improvement.

Evaluation of sealing after EVAR, albeit of demonstrated prognostic importance, is not routinely performed in most practices, probably because it is not easy using current “standard” software. Unreconstructed 3-planar computed tomography (CT) analysis with direct distance measurement is not sufficiently accurate, and center lumen line (CLL)

reconstruction required for distance measurements is somewhat laborious and may result in distortion, especially when large grafts are used. A promising alternative is to calculate sealing surface area since it considers total surface apposition and also position changes of the endograft in relation to the vessel wall and not just the length of coverage.

In the December 2019 issue of the *JEVT*, Goudeketter et al⁵ have validated a CT-applied prototype Vascular Imaging Analysis (VIA) software used to determine endograft limb position and apposition after EVAR, following their earlier work using this software to assess proximal sealing.⁶ It would be interesting to compare in a large cohort of patients the predictive capacity of the method presented by Goudeketter et al⁵ to the one proposed by our group based on CLL reconstruction and measurement of 1-mm intervals of circumferential graft-wall apposition.^{7,8}

While the majority of research on the subject has focused on the proximal neck, the importance of the iliac sealing zone has long been known, and its dynamics are of upmost importance.⁸ In most practices, a large proportion of failures and secondary interventions are actually related to the distal seal. However, less attention is typically given to the iliac segments in EVAR planning, and a suboptimal result is more frequently accepted at the distal end. The pertinence of the article by Goudeketter et al⁵ is therefore high.

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Although the studied population was small, there were statistically relevant results indicating the effectiveness of the proposed VIA software. A larger validation cohort clearly demonstrating the added value is a logical next step and may allow improved individualization of postoperative surveillance in line with current guidelines.

One relevant bias in this study is the variety of different endografts included, with different fixation methods. A notable example is how different models may or may not allow for long iliac apposition zones, which may limit conclusions since the sample is small. The case may be that the prognostic capacity of the tool is higher with some devices than others.

Another factor to consider is the AAA lumen volume and its possible impact on limb retraction and loss of seal by facilitating sideways displacement of the limbs within the lumen. This has been alluded to in prior research,⁹ but the relationship between aortic lumen volume, total AAA volume, and iliac displacement remains to be studied.

A further relevant aspect to consider is the option to quantify seal as a percentage rather than an absolute value. A percentage may favor the interpretation of changes in a specific subject but may not be as relevant clinically as an absolute number. The reason for this is that a percentage of an already short seal zone will still be short even if the implant is optimal, while percent loss of a very long seal zone may have no clinical consequences because the absolute coverage is still sufficient to maintain a stable seal. Perhaps in future research both methods can be assessed to deliver the ideal model.

Last, a potential limitation of this software is the extra cost involved in acquisition once commercially available, as well as the extra labor that may be involved. This may deter many from using the tool, although the possible long-term gains may largely outweigh the initial expense.

In conclusion, Goudekettig et al⁵ provide a user-friendly tool based on an interesting concept that may facilitate serial evaluation of sealing zones (including iliac arteries), therefore having the capacity to predict complications and lead to appropriate preventive action. It is also likely that the tool will aid in stratifying the frequency of and modality

used in subsequent follow-up. Larger validation studies, as well as comparison to alternatives, are needed to upscale and expand the use of this software.

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.

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