

EDITORIAL

Centralization of Abdominal Aortic Aneurysm Repair - We Can No Longer Ignore the Benefits!

Aortic aneurysms are almost always symptom-free. *Primum non nocere* - if we want our patients to benefit from aneurysm surgery, the associated therapeutic risks have to be limited. Prophylactic aneurysm repair is not without hazard, and the risks can be related to patient selection, but also operator and institutional experience. It is thus of utmost importance to determine the optimal organization for the care of patients with abdominal aortic aneurysm (AAA). Particularly relevant but also controversial are the aforementioned issues of surgical volume and centralisation. The relationship between surgical volume (caseload) and outcome has been reported for a range of surgical and interventional specialties. Although an association has been repeatedly demonstrated between higher annual caseload and lower operative mortality for AAA repair, the exact threshold for AAA repair has not yet been defined.¹⁻³ Other important aspects that have to be taken into account are population density and geographical distance, and the fact that current knowledge is mainly derived from the United Kingdom and the United States also makes it difficult to generalize to other countries and healthcare systems. In this issue of the *European Journal of Vascular and Endovascular Surgery* (EJVES) two important papers on this topic are published.^{4,5}

Despite all the evidence in the literature that centers with larger surgical volume have better results compared to those with low volume, indicating that centralization may be advantageous, the real benefit of centralization of AAA repair has not been well demonstrated yet. In an elegant study from Catalonia, Tripodi et al. report on the impact of centralization on AAA repair outcomes.⁴ The analysis of before and after the introduction of a uniform and well-defined centralization of AAA surgery, provides a unique opportunity to study the actual effects of such a strategy. After centralization of AAA treatment into 10 selected hospital units with >30 cases per year, initiated in September 2014 and fully completed already in January 2015, short-term mortality after both intact AAA and ruptured AAA repairs significantly decreased (4.7% vs 2.0% and 53.1% vs 41.9%, respectively). In agreement with previous reports, the volume-outcome relationship for AAA repair shown by Tripodi et al. primarily applies to open repair (8.7% vs 3.6%), while the observed (numerical) improvement after endovascular aneurysm repair (EVAR)

(2.2% vs 1.5%) did not reach statistical significance.^{6,7} A recent report from the International Consortium of Vascular Registries, analysing data on 178 860 prospectively collected primary AAA procedures from 2010 to 2016, also showed, in both crude and risk-adjusted analysis, a significant volume-outcome relationship after open repair for either intact AAA or ruptured AAA. However, and in concordance with Tripoli et al.'s findings, no volume effect on in-hospital or 30-day mortality was reported after EVAR for either intact or ruptured AAA.⁷

Short-term mortality is undoubtedly a relevant outcome measure for major open surgery, with its immediate risks, but perhaps less so for a minimally invasive technique such as EVAR, where the whole concept relates to the lower perioperative risks. For EVAR, the challenge is instead to obtain good durability, as it carries a higher risk of secondary procedures than open repair. Adequate case selection and device implantation are key factors affecting long-term outcomes. In a recent thoughtful commentary, Boyle⁸ suggests that reporting rates of re-intervention following EVAR would provide a more accurate indicator of the quality of the aortic procedure. It can be speculated that high volume EVAR centres plan cases better, deploy devices more accurately, are better at bail-out procedures, and know best when and how to re-intervene. Thus, it is possible that there is a volume-outcome relationship also for EVAR, only that the effect is likely to come later. Future analyses on volume-outcome and centralisation should therefore also include long-term results.

In a nationwide registry study, Sawang et al. report the relationship between surgical volume and perioperative mortality after non-elective AAA repair in Australia.⁵ Here, surgical volume was derived for all AAA repair (i.e. elective, semi-urgent, and emergency repair), as the total operative volume was considered to contribute to experience. A significant inverse correlation was seen between the total hospital volume (but not surgeon volume) and perioperative mortality following non-elective AAA repair. The difference was most pronounced in the emergency open repair group, while mortality after EVAR was not associated with volume. The suggested optimal minimum annual caseload for those providing emergency aneurysm services was set to 17 open surgical procedures (combined elective and non-elective). The lack of an association between the individual surgeons' caseload and outcome is likely due to the fact that AAA repair in the modern era is performed by teams rather than individuals. The difference between high-volume and low-volume center outcomes suggests

differences in the perioperative management of these patients. Early expert management of complications to satisfactory resolution, by a multidisciplinary expert team available 24/7, relates to high case volume hospitals. Of note, the suggested volume thresholds correspond to what is recommended in our recently published ESVS AAA Guidelines.⁹ There, a rather strong recommendation is issued on the required minimum volume (>20 cases per year) to perform aortic surgery at all, and a moderate recommendation (Class IIa) on the desired minimum volume (>30 cases per year). It is assumed that these thresholds should work in different healthcare settings and geographies and be accepted by most. The experiences of Catalonia and Australia support that assumption.

In summary, the firm evidence of a volume-outcome relationship makes it necessary and justifiable to centralise AAA repair. With today's knowledge, a minimum annual caseload of 30 is a reasonable threshold to reduce early mortality following open elective and emergency repairs. Further evaluation is required to correlate annual caseload with EVAR long term outcomes, including re-intervention rates, a more appropriate markers than early mortality. The editors of the EJVES encourage the reporting of high quality long-term data from other countries, to further support the benefit of centralizing the treatment of AAA patients.^{10,11}

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