IJC Heart & Vasculature 56 (2025) 101608

Contents lists available at ScienceDirect

IJC Heart & Vasculature

journal homepage: www.sciencedirect.com/journal/ijc-heart-and-vasculature

Editorial

TAVI vs SAVR: The timeless showdown in aortic valve replacement

The management of a small aortic annulus (SAA) remains one of the most debated challenges in aortic valve replacement. Patients with this anatomical feature often face higher risks of prosthesis-patient mismatch (PPM), which can adversely affect clinical outcomes [1,2]. Indeed, this issue continues to be a matter of ongoing discussion due to several reasons. One challenge arises from indexing the effective orifice area (EOA) to body surface area, which can overestimate the prevalence of PPM, particularly in obese individuals. To address this, the updated VARC-3 definitions by body mass index come into play [3]. Another layer of complexity stems from inconsistencies between echocardiographic and invasive methods for evaluating bioprosthetic valve performance. Doppler echocardiography often reports higher transvalvular gradients and smaller EOA compared to cardiac catheterization [4]. This discrepancy is partly attributed to echocardiography capturing pressure gradients across the valve without accounting for downstream pressure recovery, a phenomenon where part of the pressure drop is regained, resulting in lower gradients during catheterization [5]. The energy loss index, which adjusts for pressure recovery, has demonstrated a reclassification of PPM severity in TAVI patients [6]. To further clarify these differences, the DISCORDANCE TAVR trial (NCT04827238) is set to provide critical insights into the disparity between gradients measured by echocardiography and invasive techniques.

In this context, the choice between transcatheter aortic valve implantation (TAVI) and surgical aortic valve replacement (SAVR) has sparked considerable interest, as both approaches have distinct implications for hemodynamics, durability, and patient recovery. The recently published meta-analysis by Awad et al. [7] provides valuable insights into the comparative outcomes of TAVI and SAVR in this particular population, offering an opportunity to explore some crucial points.

Their analysis included 11 studies with a total of 3670 patients. TAVI was associated with a significantly lower risk of PPM and new-onset atrial fibrillation but showed higher rates of permanent pacemaker implantation and vascular complications. Additionally, TAVI resulted in significantly greater improvements in EOA and indexed EOA. In contrast, SAVR demonstrated a lower risk of paravalvular leak and more pronounced improvement in left ventricular ejection fraction at discharge. The reconstructed time to event analysis showed that the overall survival between the two groups reported no significant difference along 24 months of follow-up (Hazard Ratio: 0.74, 95 % Confidence Interval [0.48, 1.14], $p = 0.18$). The authors should be congratulated for their investigation, however, there are some points that warrant discussion.

The paper has confirmed how the definition of SAA remains contentious, with ongoing debates regarding the optimal measurement methods and cutoff values [8]. Indeed, the included studies have not applied a unique SAA definition. Early definitions suggested an annulus size of less than 20 mm, later adjusted to less than 23 mm in the VIVA trial [9]. More recent studies, such as TAVI-SMALL 2, defined SAA as an annular perimeter of less than 72 mm or an area of less than 400 mm^2 by CT [10], while the SMART trial considered an area of less than 430 mm^2 [11]. This evolution underscores the need for standardized, precise cutoff values.

The observed outcomes can be attributed to the distinct characteristics of the two procedures. Unlike TAVI, SAVR requires a suturing ring, which may compromise hemodynamic performance, but SAVR can effectively reduce the risk of PVL through complete valve excision and annular decalcification. However, the analysis included a wide range of bioprostheses. The TAVI group encompassed devices from the earliest iterations to the latest generations, involving both balloon- (BEV) and self-expandable valves (SEV). Similarly, the SAVR group utilized various types of bioprostheses, including stented, stentless, and sutureless valves. Each of these devices exhibits distinct hemodynamic characteristics [8,11–13], warranting cautious interpretation of the results, especially given the absence of individual-level data. The current differences in postoperative atrial fibrillation, vascular complications, and pacemaker rates are well known and documented in literature.

The survival outcomes were limited at two years and did not find any significant differences between TAVI and SAVR. A longer follow-up period and a larger cohort may be necessary to uncover potential differences in clinical outcomes, as evidence in this area remains limited. With a mean age of 80 years, the study primarily included patients at intermediate surgical risk. This could be considered a limitation, as outcomes might differ in younger, lower-risk populations, as concluded quite agreeably by the authors. Also other subgroups divided by sex or ethnicity could not be investigated, due to the lack of sufficient data.

The present study comparing TAVI and SAVR highlights the importance of tailoring treatment strategies to individual patient profiles, particularly in the context of SAA. Identifying the most suitable candidates for each approach requires a nuanced understanding of anatomical, procedural, and patient-specific factors, as well as the long-term implications of valve choice. As the field continues to rapidly evolve, particularly for TAVI, longer-term outcomes for the latest generation of valves are needed. While newer TAVI devices are anticipated to offer greater efficiency, the long-term durability of TAVI remains uncertain, particularly in younger patients with longer life expectancies. Besides,

DOI of original article: https://doi.org/10.1016/j.ijcha.2024.101578.

https://doi.org/10.1016/j.ijcha.2025.101608
Received 4 January 2025; Accepted 9 January 2025

sex-specific indications and outcomes are far from being clear. A subgroup analysis of the SMART trial, consisting of 87 % of females, found that women with small aortic annuli had better bioprosthetic valve dysfunction outcomes at 1 year after TAVI with the SEV compared to BEV (Mehran R. Small aortic annuli patients treated with TAVI: outcomes in women in the SMART trial. EuroPCR 2024. May 14, 2024. Paris, France). Data from the ongoing RHEIA trial (NCT04160130) indicate that a superior composite outcome with latest generation BEV than with SAVR (Eltchaninoff H. RHEIA – Transcatheter versus surgical aortic valve replacement in women with severe aortic stenosis. ESC 2024. August 31, 2024. London, England). These challenges highlight the importance of thorough preoperative assessment and patient selection, underscoring the need for careful consideration when deciding between TAVR and SAVR. The incidence of TAVR failure and the need for reintervention, including TAVR-explant or redo-TAVR, is expected to rise, as low-risk and younger patients are increasingly considered [14]. As elegantly discussed by García-Villarreal regarding SAVR after TAVR: "are we dropping a clanger or meeting a challenge?" [15].

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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