

How to avoid oversizing Perceval sutureless aortic valve: Technique

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Received: 2025-02-17

Accepted: 2025-07-22

How to cite this article:

Nezafati P, Yadav S. **How to avoid oversizing Perceval sutureless aortic valve: Technique.** ARYA Atheroscler. 2025; 21(5): 1-3.

DOI:

<https://doi.org/10.48305/arya.2025.43498.3031>

Abstract

Aortic valve replacement surgery technique has been revolutionised with the introduction of sutureless valves. Perceval sutureless aortic valve (PSV) is one of the most widely used examples. However, oversizing the PSV has been reported to be an issue. After a case of PSV stent recoil in our institution, a new technique was developed, where only the white obturator is used to size the valve. Recently, this technique was also mentioned by different authors. With this technique, we achieved low rates of paravalvular leaks and pacemaker implantation, with good transvalvular gradients. Therefore, we recommend this technique over the manufacturer's instructions.

Keywords: Perceval, Sutureless Aortic Valve, Technique

Introduction

The Perceval sutureless valve (LivaNova; Saluggia, Italy) (PSV) is a stent-based valve made of bovine pericardium and a nitinol frame. Due to its material properties, the PSV can be collapsed and mounted onto a delivery system. The PSV does not require suturing for implantation, thus significantly shortening cardiopulmonary bypass and cross-clamp times.

The oversizing of the PSV has been reported to be an issue, since this affects the haemodynamic function of the valve and cardiac conductivity^{1,2}. Cerillo et al. analysed data from 151 patients who underwent PSV-AVR at their institution and found that the degree of oversizing is a significant predictor of high transvalvular gradients¹. While the long-term outcomes of these findings are unknown, it is possible to extrapolate using data from traditional AVR that accelerated structural valve deterioration is likely to occur in the presence of a higher transvalvular gradient³.

In this paper, we aim to share a technique utilised in our institution that prevents the oversizing of the PSV. This technique was developed after a case of PSV recoil. Since then, the technique has been adopted as standard practice, and more than 70 procedures on both native bicuspid and tricuspid aortic valves have been performed with good outcomes. Others have also reported similar success with this technique⁴.

Technique

Sizing of the aortic valve is usually performed intraoperatively with a sizing probe. The PSV has its own sizing probe, which consists of two obturator ends: a transparent obturator and a white obturator. The sizing probes come in four sizes: Small (S: 19–21 mm), Medium (M: 21–23 mm), Large (L: 23–25 mm), and Extra Large (XL: 25–27 mm). Following the manufacturer's recommendation, "when the transparent obturator passes through the annulus and the white obturator does not, the valve size identified on the sizer handle must be chosen." Using the recommended technique, if a Large PSV is chosen, the annulus size would be 23 mm, but the deployed Large PSV inner diameter would measure 25 mm. This leads to oversizing, as described by Baert et al³. This issue is observed across all PSV sizes, with the deployed valve tending to measure at least 2 mm more than the actual inner valve diameter.

Our technique is as follows: the transparent obturator is ignored, and only the white obturator is utilised. If the white obturator from an M sizer passes through the annulus and the same obturator from the L sizer does not, we would select an M size PSV. This would be in contrast to the manufacturer's recommendation of an L size PSV in this scenario. In our experience, annular debridement should still be diligently performed, but caution should be taken to avoid injuring the annulus, since annular sutures are not used to seat the PSV.

Post-deployment of the PSV, it is required to perform a post-dilation with a pressurised

balloon at 4 atm for 30 seconds, according to the company's guidelines. However, in our experience, it is better to use 2-4 atm for a maximum of 5 seconds to avoid overexpansion of the valve, which was drawn from our experience with Transaortic Valve Implantation.

Comment

The technique here described is a simple and effective way of preventing oversizing of the PSV in our experience. It was also noted that better expansion of the valve leaflets occurred, thus increasing the effective aortic valve area and leaflet mobility. By avoiding oversizing of the PSV, hence decreasing the radial force, the risk of injury to the heart's conductive fibres decreases, which influences pacemaker implantation rates⁵. To the best of our knowledge, this technique was independently developed in different parts of the world simultaneously, which demonstrates that the recommended implantation technique is not optimum. Our institution formally contacted LivaNova in 2018 regarding sizing issues and suggested that the new technique should be used instead.

Theoretically, undersizing the PSV can lead to an increased incidence of paravalvular aortic regurgitation and valve migration. However, none of these complications have been noticed in our institution. This is a single-operator and single-institution experience; the operator has extensive experience with PSV and traditional AVR, and his peri-operative judgment plays an important role. We are currently collecting data to report our experience with PSV and the new technique.

We believe that this technique should be used instead of the company's recommendation, since it avoids oversizing, demonstrates excellent transvalvular gradients, and lowers the incidence of pacemaker implantation. This technique is also reproducible in the hands of new operators who are accustomed to sizing methods used with conventional surgical bioprosthetic valves.

Conflict of interests

The authors declare no conflict of interest.

Funding

There is no funding in this study.

Author's Contributions

Study Conception or Design: SY

Data Acquisition: SY, PN

Data Analysis or Interpretation: PN

Manuscript Drafting: PN

Critical Manuscript Revision: SY, PN

All authors have approved the final manuscript and are responsible for all aspects of the work.

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