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Being prepared for redo-TAVI in self-expanding Evolut valves – important insights

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The rapidly growing trend towards the utilisation of transcatheter aortic valve implantation (TAVI) in younger, less comorbid aortic stenosis patients with an increased life expectancy will inevitably result in an increased need for reintervention for bioprosthetic valve dysfunction[1]. Although surgical explant of the failed transcatheter aortic valve (TAV) may be an option in some cases, redo-TAVI is likely to be the preferred treatment. There exists a paucity of data relating to how to best perform redo-TAVI in order to protect the coronary arteries during the TAVI procedure and to preserve future coronary access. Redo-TAVI pins the index valve leaflets in the open position, creating a neoskirt of tissue, which can not only compromise coronary flow but may also limit future coronary access[2,3].

In this issue of EuroIntervention, Grubb et al used computed tomography (CT)-based simulations to evaluate the anatomical feasibility of redo-TAVI in an index self-expanding transcatheter Evolut (Medtronic) valve, utilising an Evolut or balloon-expandable SAPIEN 3 (S3; Edwards Lifesciences) as the second valve in 204 patients from the Evolut Low Risk CT substudy[4]. Five virtual redo-TAVI positions were evaluated: S3-in-Evolut inflow-to-inflow, S3 outflow at Evolut nodes 4, 5, and 6, and Evolut-in-Evolut inflow-to-inflow. Overall, the authors reported that the feasibility of redo-TAVI after a failed Evolut is multifactorial and relates to the native aortic root anatomy and the implant depth of the index and second TAV. The CT-identified risk of coronary flow and access compromise was the highest for Evolut-in-Evolut and S3-in-Evolut with the S3 outflow positioned at Evolut node 6. Coronary flow and accessibility were found to be most favourable when the S3 outflow was positioned at node 4 of the Evolut stent frame. For this particular TAV-in-TAV scenario, a smaller aortic annulus diameter, a shorter and narrower sinus of Valsalva (SoV), lower coronary take-off, a smaller sinotubular junction (STJ) diameter and a shallower Evolut implant depth were all associated with an increased risk of coronary flow compromise.

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The authors of the current study are to be congratulated for their contribution towards the better understanding of the importance of the choice and positioning of the second TAV and how to manage the expected increasing rate of TAV degeneration in this patient cohort. However, it may also be interesting to take one step back to reflect on how to optimise coronary access when having to treat a naïve patient with severe aortic stenosis and a longer life expectancy. The clinical importance of future coronary access is often underappreciated at the time of the index TAVI. In patients with

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high-risk anatomical features for coronary flow or access compromise in case of TAV-in-TAV, one could opt for an index TAV with a short stent frame and/or intra-annular leaflet position, and a too shallow index TAV implant position could be avoided.

The data reported in this study should be seen in the context of the feasibility of redo-TAVI relating to a particular self-expanding platform, the Evolut TAV. A limitation of the current study is that patients did not undergo an actual redo-TAVI; the CT-based evaluation criteria used still need clinical validation. It is currently unclear whether further Evolut stent frame expansion by S3 implantation – as described in recent bench test work[5] and applied in this study – should be taken into account when assessing the risk of coronary flow or access compromise. Another unknown factor is the implication of overhanging calcified or thickened Evolut leaflets on the S3 valve function in cases of S3-in-Evolut. Also, the risk of Evolut stent frame misalignment, in cases of Evolut-in-Evolut, may further compromise coronary access, an aspect which was not considered in this study analysis. Finally, the predictor analysis results as reported in this study only apply to the S3 outflow at the Evolut node 4 implant position and were limited by a relatively small sample size. As a consequence, the authors also recognise that the study findings should not be (blindly) extrapolated to direct clinical practice without considering individual patient characteristics. In this context, it can be expected that computational modelling will be helpful in the future planning of redo-TAVI cases as well as in the planning of the index TAVI in patients with a longer life expectancy, simulating multiple TAV-in-TAV options and their outcomes.

In conclusion, using the Evolut Low Risk trial post-TAVI CT database, placement of a SAPIEN 3 outflow at Evolut node 4 predicted the lowest risk of coronary flow compromise and coronary inaccessibility in case Evolut revalving is needed. However, an individualised preprocedural planning should be adopted, paying attention to multiple factors described by Grubb et al and discussed in this Editorial. Finally, a clear lifetime strategy and the initial choice of the index TAV must be discussed by the Heart Team, particularly in younger, low-risk patients with longer life expectancies, considering not only valve haemodynamics and durability but also future coronary access options after redo-TAVI.

Conflict of interest statement

O. De Backer has received institutional research grants and consulting fees from Abbott, Boston Scientific, and Medtronic. L. Søndergaard is Chief Medical Officer and Divisional VP for Medical Affairs at Abbott Structural Heart and has received consultant fees and/or institutional research grants from Abbott, Boston Scientific, Medtronic, and SMT. N. J. Montarello has no conflicts of interest to declare.

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