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Minimally invasive sutureless aortic valve replacement in the Redo setting: the new surgical frontier in the valve-in-valve era

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The horizon of a future without aortic valve surgery, in which only interventional approaches will be used, raises the question of how should those patients be treated for whom transcatheter aortic valve implantation (TAVI)/valve-in-valve (VinV) procedure is contraindicated. For these patients, there will also be increasing demand for optimal results at the price of minimal surgical risk. Patients with contraindication for TAVI (either for technical or anatomical reasons) are among those notably at highest risk. Therefore, for this patient population, the new frontier could be a minimally invasive approach with the use of sutureless/rapid-deployment prostheses, which allows shorter ischemic times, thus contributing to reduce surgical risk within an “integrated” risk reduction strategy.

Due to the increased life expectancy of the aging population and widespread use of bioprostheses over the past years (1), many patients still require surgical aortic valve replacement (AVR) or re-replacement (re-AVR). Despite the higher risk, especially in the setting of infective endocarditis, these procedures have shown encouraging results (1). Notwithstanding this, Redo surgery for AVR is considered as a ‘too’ high-risk procedure, given that TAVI or VinV-TAVI may potentially be offered to all patients.

For these reasons, in patients undergoing reintervention (re-AVR or Redo cardiac surgery) for isolated AVR, previous experience has suggested minimally invasive surgical approaches using J-shaped ministernotomy (2-4). Only limited data is available on the feasibility of minimally invasive approaches in Redo patients. Recently, the Sutureless and Rapid-Deployment Aortic Replacement Valve International Registry (SURD-IR) has collected

data on 63 patients undergoing reintervention through a minimally invasive approach using a sutureless prosthesis. In this series, neither conversion to full sternotomy nor in-hospital deaths occurred.

Obviously, the decision to treat via surgical reintervention or minimally invasive reintervention and not using the TAVI/VinV procedure should be tailored to the individual patient. The adoption of minimally invasive AVR techniques remains questionable with a patent left internal mammary artery, isolation and clamping, to provide myocardial protection (2-4). In the process of decision-making, minimally invasive techniques allow for less extensive mediastinal dissection and minimize surgical trauma, thus reducing the risk of operative bleeding, procedure-related complications and graft injury associated with sternal re-entry (2-4).

Moreover, reoperation may be required as not all Redo patients can undergo a safe TAVI or VinV intervention (e.g., too-small implanted bioprosthesis, low coronary takeoff). Conversely, all these conditions can be safely managed during open surgery. Patients amenable to this treatment strategy are not few in terms of prevalence, given the increasing adoption of biological valves in younger patients as well as the unfavorable results of some biological models widely implanted in recent years (5,6).

Our considerations are notably largely speculative, given that evidence on the use of sutureless prostheses in Redo procedures derives mostly from single-center experiences with small sample size (7). In particular, only one study compared sutureless *vs.* VinV implantation, in which both procedures were found to be effective and safe in preventing

the occurrence of paravalvular leakage but with a better capacity of sutureless prostheses to minimize patient-prosthesis mismatch (7). Despite the presence of patient-prosthesis mismatch, no differences in clinical outcome and quality of life were observed at follow-up. In addition, transcatheter VinV implantation has been proposed as a viable option in 'all' Redo patients, despite being burdened by significant limitations (e.g., some prosthetic models with biological leaflets mounted outside the stent) (8). The VinV procedure also results in significant patient-prosthesis mismatch, occurring in almost 50% of patients (9). Data on Redo procedures using a minimally invasive approach have shown shorter operation times and lower risk for sternal instability or infection. All these elements contribute to lower intra-operative morbidity and mortality (2).

Therefore, in this perspective, we hypothesize that in the Redo setting, the use of sutureless/rapid-deployment prostheses, though currently contraindicated, could represent a new frontier if we consider that most patients are affected by endocarditis. In fact, the use of prostheses in cases of endocarditis is currently off-label and still under investigation.

Although we do not see any limitations to this technique, in young and older patients alike, the surgeon's experience with the non-Redo minimally invasive approach and use of sutureless prostheses is crucial before performing minimally invasive Redo procedures.

Previous experience and speculation about the future of cardiac surgery—for example when coronary stents were introduced—teach us that expectations from the Cardiology world are not always met but, on a positive note, have led to 'integrated' treatment strategies with indications for patient-tailored procedures; in other words, they have led to the creation of the heart team. One thing the heart team should know is that there are, and will be, many patients who require surgical reintervention for aortic valve/prosthesis replacement. Our experience to date leads us to believe that, for these carefully selected patients, the addition of the 'weapons' consisting of (I) a minimally invasive approach and (II) the use of sutureless prostheses can contribute to improve outcomes. Therefore, both should be questioned within the heart team discussions in order to choose the best treatment option for the patient.

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Footnote

Conflicts of Interest: The authors have no conflicts of interest to declare.

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