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NVT ALLEGRA transcatheter heart valve for valve-in-valve procedures in failing surgical aortic bioprostheses: let us wait and see

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Initially performed as an off-label procedure[1] in the context of failing surgical aortic valves, valve-in-valve (ViV) transcatheter aortic valve implantation (TAVI), over the last decade, has gained widespread application in the management of increasingly complex cases deemed at high risk for traditional open chest surgery. This technique presents some potential complications, such as ostial coronary obstruction (e.g., Mitroflow; Sorin Group, Saluggia, Italy), and the risk of technical failure due to patient-prosthesis mismatch leading to excessively high post-procedural gradients, particularly in small bioprostheses (<23 mm)[2]. Until now, the majority of ViV procedures have been performed using Medtronic or Edwards Lifesciences devices, showing better effective orifice area (EOA) and post-procedural gradients with the supra-annular self-expanding valves compared to the intra-annular balloon-expandable ones in small bioprostheses[3]. Data from international registries confirm the feasibility of the procedure and its clinical safety and efficacy in the vast majority of patients, with acceptable short-term and midterm outcomes[3]. On the other hand, studies on long-term follow-up after ViV TAVI are scarce. Although available data[4] showed an overall stability on valve haemodynamics over time, notably the three-year survival was quite low (around 75%) and 10% of the patients exhibited some degree of structural valve degeneration during the seven-year follow-up.

In the current issue of EuroIntervention, Schäfer et al present the short-term outcomes of the VIVALL study[5].

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In this prospective, multicentre, single-arm study the investigators enrolled thirty patients with failing surgical aortic valves undergoing TAVI with the NVT ALLEGRA transcatheter heart valve (THV) (New Valve Technology [NVT], Hechingen, Germany). This is a second-generation supra-annular self-expanding prosthesis, fully retrievable from the circulation, which incorporates a trileaflet, bovine pericardial bioprosthetic THV attached to a nitinol stent frame. The valve was specifically designed 1) to avoid haemodynamic compromise, through its particular stepwise controlled releasing (Permaflow® principle [NVT]) that helps to avoid any flow obstruction, and the diamond-shaped configuration with a variable cell size distribution allowing improved coronary perfusion, and 2) to facilitate its correct positioning thanks to the radiopaque gold markers placed at the level of the valve plane together with a delivery system allowing a controlled positioning without interfering with the left ventricular outflow[6].

The predefined follow-up was planned at 30 days, 6 and 12 months. The primary endpoints were the invasive post-procedural mean pressure gradient and 30-day survival. In the study protocol, technical success of implantation (i.e., device success)

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was defined as the absence of procedural mortality, the correct positioning of a single ALLEGRA THV into the proper anatomical location, no severe (<0.65 cm²/m²) patient-prosthesis mismatch (PPM), a mean aortic valve gradient <20 mmHg and no moderate or severe prosthetic valve regurgitation.

Patients had a mean age of 78.6±6.0 years, presenting an intermediate surgical risk (STS score 4.5±2.1% and EuroSCORE II 9.2±4.3%). Of note, the majority of the prostheses (90%) were small (true inner diameter ≤22 mm). The investigators excluded patients presenting a low position of the coronary ostia, in particular in combination with shallow sinuses, both features identifying subjects at high risk of coronary obstruction. The prosthesis was successfully implanted in 97% of the patients, without cases of coronary obstruction. At transthoracic echocardiography, the EOA increased from 1.18±0.58 cm² at baseline to 1.4±0.52 cm² post procedure, whereas the mean pressure gradient was reduced from 30.6±12.6 mmHg to 14.8±6.5 mmHg, respectively. Of note, eight patients showed a severe PPM (defined as an EOA index <0.65 cm²/m²) at discharge, contributing to the overall low device success rate of 60%. The authors concluded that the use of the NVT ALLEGRA valve is feasible and safe for the treatment of failing surgical bioprostheses, even in the presence of very small prosthetic valves.

Compared to the VIVID registry[3] (30-day survival 92.4%; median STS score 10% [interquartile range: 6.2-16.1]) and to the more recent VIVA study[7] (30-day survival 97.5%; mean STS score 6.6±5.1%), the VIVALL study presented a higher 30-day survival but, at the same time, enrolled patients at lower surgical risk. Interestingly, another recent small series[8] investigated ViV TAVI using Medtronic and Edwards Lifesciences THVs in a population at similar surgical risk (STS score 5.2±3.1%) and equal clinical short outcomes (100% 30-day survival). These data are particularly striking, taking into consideration that none of the procedures was complicated by coronary obstruction despite the VIVALL study enrolling a very high percentage of small degenerated prostheses (80.0% presented an inner diameter of ≤21 mm and 23.3% less or equal to 19 mm), which are known to be at high risk for coronary obstruction[9], and in particular those with externally mounted leaflets.

In contrast, the VIVID registry and VIVA study presented a lower proportion of small valves (label size ≤21 mm) of 29% and 41.8%, respectively, associated with a not negligible number of cases complicated by coronary obstruction (2% in both studies).

Unfortunately, data presented in this early report do not include multislice computed tomography (MSCT) measurements, preventing the identification of anatomical features related to an increased risk of coronary obstruction. Of note, the authors did not present any information about possible preventive measures (e.g., chimney or BASILICA techniques) adopted during the procedures, suggesting that the enrolled patients were more likely to be at low risk for coronary obstruction.

The VIVALL study reported similar mean gradients and EOA at 30 days, compared to the VIVID registry: 14.8±6.5 mmHg vs 15.8±8.9 mmHg and 1.40±0.52 cm² vs 1.47±0.50 cm², respectively. On the other hand, the VIVA study reported slightly worse echocardiographic values: 17.5±8.6 mmHg and 1.30±0.5 cm², respectively. The lower EOA values of the VIVALL study compared to the VIVID registry might be the consequence of the higher proportion of small valves, although the rate of PPM was lower in the former than in the latter (27% vs 31.8%, respectively).

There is still intense debate about the best parameter (mean gradient, EOA, and the presence of PPM) to assess and predict valve deterioration over time. In a recent study about the echocardiographic evaluation of THVs, Hahn et al proposed the use of both mean gradient and percentage changes in EOA associated with the Doppler velocity index (DVI) to assess valve deterioration, rather than the simple mean gradient and its changes, as suggested by sub-analysis of the older PARTNER trial[10]. At this point, the short-term nature of the present report does not allow any extrapolation on the durability of the prosthetic valve.

The authors reported less than mild paravalvular leak (PVL) for all the implants, while in the VIVID registry and VIVA study the rates of at least moderate PVL were 5.4% and 2.8%, respectively. A possible explanation for this remarkable result might be the presence of a clear marker of implantation both on the valve and on the delivery system of the NVT ALLEGRA THV, allowing precise implantation, in particular in the context of ViV procedures. Nevertheless, no data regarding the depth of implantation where available are reported in the present manuscript. Further insights are warranted to support this statement and, hopefully, they will be presented in a possible future publication on the midterm outcomes of the study. Notably, the need for post-dilatation in the VIVALL study was relatively high compared to the only other available data in the literature, from the VIVA study (56.7% vs 20.8%, respectively)[7]; unfortunately, no further information is available about the causes leading to immediate post-dilatation. Finally, device repositioning during the implantation was attempted in 13.3% of the procedures, was slightly higher than in the VIVID registry (10.3% of self-expanding procedures), but lower than in the more recent VIVA study (17.5%).

The VIVALL study presented interesting results on the short-term safety and efficacy of the novel NVT ALLEGRA THV, most notably the complete absence of coronary obstruction and more-than-mild paravalvular leaks, together with outstanding data on survival at 30 days post procedure. However, in light of the aspects discussed above, together with the small number of cases, the very short follow-up and the lack of a control arm at the moment, it is difficult to draw definite conclusions on the potential role of the NVT ALLEGRA THV system in the context of patients with failing surgical prostheses. The publication of data on the long-term outcomes and a more in-depth analysis of the technical aspects (MSCT measurements and implantation depth) will be helpful for a better understanding of the early results. Long-term follow-up data, together with further studies showing a direct comparison between the NVT ALLEGRA valve and other commercially available THVs, are warranted to support the use of this new valve in the context of ViV TAVI.

Conflict of interest statement

F. Ribichini is a consultant for Medtronic and Edwards Lifesciences. The other authors have no conflicts of interest to declare.

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