Incidence, predictors and outcomes of Valve-in-valve (ViV) Transcatheter aortic valve replacement (TAVR): a systematic review and meta-analysis

F. Bruno[1], F. D'Ascenzo[1], F. Giordana[1], A. Saglietto[1], F. Conrotto[1], O. De Filippo[1], W. Grosso Marra[1], S. Salizzoni[1], A. Trompeo[2], M. La Torre[2], M. D'Amico[1], M. Rinaldi[2], C. Giustetto[1], G. De Ferrari[1]

[1]Hospital Molinette of the University Hospital S. Giovanni Battista/City University Hosp of Health an, Cardiology, Turin, Italy; [2]A.O.U. Citta della Salute e della Scienza di Torino, Cardiosurgery, Turin, Italy

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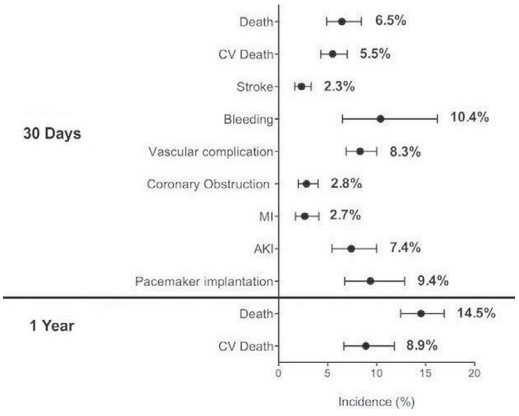
Background: Surgical aortic valve replacement has been the treatment of choice for patients with aortic valve disease before the arrival of transcatheter aortic valve replacement (TAVI), although limited by degeneration of the bioprosthesis. "Redo" intervention itself is burdened by high risk of complications and valve-in-valve (ViV) TAVI could be a valid strategy of redo for patients with comorbidities. The aim of this meta-analysis is to give an overview of the state of the art of ViV TAVI in high-risk patients, analyzing efficacy, safety, intra-hospital outcomes and 1-year outcomes and assess predictors of survival at short and mid-term follow up.

Methods: Two independent reviewers screened all studies investigating patients undergoing ViV TAVI. PubMed database was searched for reports published in English according to the following highly sensitive strategy: (Transcatheter[All Fields] AND "aortic"[All Fields]) AND valve-in-valve[All Fields] AND "implantation"[All Fields] NOT (review[pt] OR editorial[pt] OR letter[pt])AND "humans"[MeSH Terms]). Mortality at 30 days and at 1 year were the primary end point, while procedural and short-term outcomes and echocardiographic parameters at hospital discharge were the secondary end points.

Results: Of 286 studies identified, 26 articles were included, with a total of 1448 patients. Median age was 78.8 years, 57.7% of the patients were male. Median STS-predicted risk of mortality was 9.4% while median Logistic EuroSCORE was 31.3%. Median age of bioprosthesis was 10 years with 84.6% of stented valves. Stenosis (45%), followed by regurgitation (31%) and mixed defects (21%) were the causes of prosthesis failure. Diameter of the degenerated valve was $\leq$21 mm in 25.4%, 22–25 mm in 55% and $>$25mm in 11.7% of the patients. Transfemoral approach was preferred (76%), with a prevalence of balloon expandable valve (73.3%). Mean post procedural gradient was 16.7±0.8 mmHg. Mean follow up was 376 days. Overall and cardiovascular mortality at 30 days was 6.5% and 5.5% respectively, while at 1 year it was 14.5% and 8.9% respectively. Regarding short-term outcomes, overall bleeding (10.4%), pacemaker implantation (9.4%) and vascular complications (8.3%) were the most common periprocedural complications, while stroke (2.3%), myocardial infarction (2.7%) and coronary obstruction (2.8%) were less frequent. At meta-regression analysis study year ($p<0.001$), Logistic Euroscore ($p<0.01$) and valve diameter $\leq$21 mm ($p<0.05$) at 30 days, and stenosis as reason for failure ($p=0.05$) at 1 year were identified as possible predictors of survival.

Conclusions: Percutaneous valve-in-valve aortic valve implantation offers a valid strategy to treat high risk patients with a degenerative bioprosthesis. Short and mid-term outcomes are substantially superimposable to those of TAVI, except for coronary obstruction which appears more frequent. Future studies are needed to find predictors of long- term survival and outcomes in lower risk patients.



Outcome of VIV TAVI