



Prosthetic Valve Endocarditis After Transcatheter Valve Replacement

A Systematic Review

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ABSTRACT

OBJECTIVES The aim of this review is to describe the incidence, features, predisposing factors, and outcomes of prosthetic valve endocarditis (PVE) after transcatheter valve replacement (TVR).

BACKGROUND Very few data exist on PVE after TVR.

METHODS Studies published between 2000 and 2013 regarding PVE in patients with transcatheter aortic valve replacement (TAVR) or transcatheter pulmonary valve replacement (TPVR) were identified through a systematic electronic search.

RESULTS A total of 28 publications describing 60 patients (32 TAVRs, 28 TPVRs) were identified. Most TAVR patients (66% male, 80 ± 7 years of age) had a very high-risk profile (mean logistic EuroSCORE: $30.4 \pm 14.0\%$). In TPVR patients (90% male, 19 ± 6 years of age), PVE was more frequent in the stenotic conduit/valve (61%). The median time between TVR and infective endocarditis was 5 months (interquartile range: 2 to 9 months). Typical microorganisms were mostly found with a higher incidence of enterococci after TAVR (34.4%), and *Staphylococcus aureus* after TPVR (29.4%). As many as 60% of the TAVR-PVE patients were managed medically despite related complications such as local extension, embolism, and heart failure in more than 50% of patients. The valve explantation rate was 57% and 23% in balloon- and self-expandable valves, respectively. In-hospital mortality for TAVR-PVE was 34.4%. Most TPVR-PVE patients (75%) were managed surgically, and in-hospital mortality was 7.1%.

CONCLUSIONS Most cases of PVE post-TVR involved male patients, with a very high-risk profile (TAVR) or underlying stenotic conduit/valve (TPVR). Typical, but different, microorganisms of PVE were involved in one-half of the TAVR and TPVR cases. Most TPVR-PVE patients were managed surgically as opposed to TAVR patients, and the mortality rate was high, especially in the TAVR cohort. (J Am Coll Cardiol Intv 2015;8:334-46) © 2015 by the American College of Cardiology Foundation.

The use of transcatheter valves for the treatment of valve dysfunction has experienced a very rapid expansion since the initial experiences in the first years of the past decade (Online Refs. 1-4). Although the high procedural success rate and beneficial effects associated with

transcatheter valve replacement (TVR) are widely recognized, some of the well-known risks associated with standard surgical treatment for valve disease also exist in TVR (Online Ref. 5), although the complications probably have modified features that may both make their diagnosis and management difficult

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and change their clinical impact and prognosis. This is the case with prosthetic valve endocarditis (PVE), a rare (3 to 9 cases per 100,000 people) but complex and life-threatening disease.

Although a few TVR series have reported the incidence of early infective endocarditis (IE) (Online Refs. 1-9) (Figures 1 and 2), data on PVE in the field of transcatheter valves are limited to case reports or small series (1-28, Online Ref. 10), which precluded any appropriate evaluation of the clinical characteristics of patients with this syndrome as well as of its management and prognosis. The objective of this systematic review was therefore to provide further insight into the baseline characteristics, incidence, disease features, management, and clinical outcomes of patients with IE as a complication of TVR (transcatheter aortic valve replacement [TAVR] and transcatheter pulmonary valve replacement [TPVR]).

METHODS

All relevant articles in English about TAVR/TPVR and PVE published between December 2000 and June 2013 were systematically searched in BioMedCentral, Google Scholar, and PubMed. The following query terms were used: *transcatheter/percutaneous pulmonary/pulmonic valve replacement/implantation, transcatheter/percutaneous aortic valve replacement/implantation, transcatheter heart valve, infective endocarditis, prosthetic valve endocarditis, valve infection, congenital heart disease treatment and modified Duke's criteria*. Further studies were sought by means of a manual search of secondary sources, including references from primary articles (backward snowballing) and contacts with international experts. We also searched for these topics as case reports in major cardiology meetings between 2004 and 2012.

Citations were first screened at the title/abstract level by 2 independent reviewers (I.J.A.S., H.B.R.). Potential divergences were resolved after consensus to gather all pertinent case reports and case series concerning PVE in TAVR and TPVR. Only cases with definite endocarditis according to modified Duke criteria were included (Online Refs. 11,12). Some additional cases of "probable endocarditis" were also included due to high suspicion of actual PVE and limited sensitivity of the diagnostic criteria in their particular context. Early PVE was defined, according to the guidelines, as that occurring within the first 12 months after the valve replacement (Online Ref. 11).

Gathered data included baseline clinical, echocardiographic, and TVR procedural characteristics. Data on PVE clinical presentation, invasive procedures (any potential source of infection), etiology, in-

hospital or 30-day complications, and mortality at any time point were also gathered. Main baseline characteristics of the TAVR-PVE patients were compared with those of patients included in previous TAVR registries (Online Refs. 13-20), the PARTNER (Placement of Aortic Transcatheter Valve) trial (Online Refs. 6,7), and largest surgical series including the main types of aortic bioprosthesis (Online Refs. 21-25). A similar comparison was also performed for TPVR-PVE patients, including the largest TPVR series (Online Refs. 26-30) and the largest surgical series that reported the incidence of PVE in congenital heart disease (Online Ref. 31), pulmonary valve replacement (Online Ref. 32), and Ross intervention (Online Ref. 33).

Categorical variables were reported as n (%), and continuous variables as mean \pm SD or median (25th to 75th interquartile range) depending on variable distribution.

RESULTS

A total of 60 patients who underwent TVR, including 32 TAVR (1-16) and 28 TPVR (17-28), and who had PVE were included in the study. All cases were published between 2006 and 2013 (Online Table 1 for bibliographic sources and type of articles). The main baseline characteristics of TAVR and TPVR populations are summarized in Tables 1 and 2, respectively. The mean age of TAVR patients was 80 ± 7 years, 66% of them were men, and the mean logistic EuroSCORE was $30.4 \pm 14.0\%$. A comparison of these data with the data on the patients included large TAVR registries, the PARTNER trial (Online Refs. 6-9,19-22), and in surgical studies (Online Refs. 22-25) is shown in Figure 3.

TPVR patients were a much younger population (mean age, 19 ± 6 years), and only 10% of them were women. Tetralogy of Fallot was the most common underlying disease, and most patients (53%) had a homograft as a right ventricular-pulmonary artery conduit. The mean time between surgery and the TPVR procedure was 10 ± 3 years. Stenosis of the valve conduit was the most common reason for TPVR (60%). Baseline characteristics of the patients with PVE compared with those included in large TPVR series are shown in Figure 4.

PROCEDURAL AND IN-HOSPITAL COURSE OF TVR PROCEDURES. The main characteristics of TAVR and TPVR procedures are shown in Tables 1 and 2, respectively. Of the TAVR patients, 58% had received

ABBREVIATIONS AND ACRONYMS

AR = aortic regurgitation

IE = infective endocarditis

PVE = prosthetic valve endocarditis

TAVR = transcatheter aortic valve replacement

TVR = transcatheter valve replacement

TPVR = transcatheter pulmonary valve replacement

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