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ORIGINAL ARTICLE

Transapical Aortic Valve Implantation—An Australian Experience

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Background The aim of this study was to report our initial experience with the transapical approach to transcatheter aortic valve implantation (TAVI) at an Australian institution.

Methods All patients with severe, symptomatic aortic stenosis were assessed by our multidisciplinary team. A total of 32 patients received a transapical TAVI using an Edwards SAPIEN prosthesis. Data were prospectively collected and analysed according to the Valve Academic Research Consortium version 2 guidelines.

Results Intraoperative outcomes included: 100% device success with no conversion to surgical valve replacement, extracorporeal membrane oxygenation was used electively in 15.6% and emergently in 6.3%, and no valve migration or malpositioning requiring prosthesis retrieval and re-implantation.
Outcomes at 30 days post-TAVI included: No mortality, 3.1% myocardial infarction, no disabling stroke, 3.1% non-disabling stroke, no transient ischaemic attacks, 6.3% life-threatening bleeding, 15.6% major bleeding, 3.1% major vascular complications, and 12.5% postoperative acute kidney injury requiring renal replacement therapy. Mild paravalvular regurgitation was present in 29%, and there was no moderate or severe regurgitation.
Mean follow-up time was 28.8 ± 12.9 months. Cumulative results included: 9.4% mortality, 6.3% stroke, 6.3% myocardial infarction, and no repeat procedures. At one year postoperation, echocardiography demonstrated that the mean pressure across the prosthesis was 10.1 ± 1.7 mmHg, and the mean aortic valve area was 1.4 ± 0.2 cm^2.

Conclusion Good short-term outcomes and low or zero mortality are achievable with transapical TAVI at an Australian institution.

Keywords Transapical • Transcatheter aortic valve implantation • Heart valve prosthesis • Aortic valve stenosis

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Introduction

Transcatheter aortic valve implantation (TAVI) has been rapidly adopted as the primary treatment for severe aortic stenosis in patients who are not suitable for surgical aortic valve replacement (SAVR) due to high operative risk. In these patients TAVI has been shown to be superior to medical management and able to achieve short-term efficacy comparable to SAVR [1]. Catheterisation of the native valve can be achieved via a number of approaches, including transfemoral (TF), transapical (TA), transaortic and transubclavian. A TF approach is generally preferred for minimal invasiveness, but if contraindicated due to iliofemoral atherosclerosis or small diameter, a TA approach via mini-thoracotomy may be considered. In a recent large series, the TA approach was used in 16.4% of cases, and 28.6% of all SAPIEN XT valves [2].

The aim of this study was to analyse the TA-TAVI outcomes at a single Australian quaternary referral centre (The Royal Prince Alfred Hospital, Sydney) during the first phase of our TAVI program, and to investigate specific difficulties and management strategies for the TA approach.

Methods

Patient Selection

All patients with severe, symptomatic AS were assessed by our TAVI multidisciplinary team, which consists of two TAVI-trained interventional cardiologists (M.N. and M.A.), one non-TAVI cardiologist, two cardiothoracic surgeons (M. K.W. and M.P.V.), one cardiac anaesthetist and one geriatrician. We have previously described our efforts to establish and run a TAVI program [3]. Patients are accepted into the program on the consensus of all team members that risk of mortality and morbidity from SAVR is too high, defined as logistic EuroSCORE >15%, STS score >10%, and the presence of other complicating factors not represented in classical risk-scores, such as frailty, liver disease or hostile chest.

Our comprehensive pre-TAVI assessment includes in all patients a coronary, aortic and iliofemoral angiogram, a complete CT angiogram of the heart and great vessels, a complete echocardiographic study, carotid Doppler ultrasounds, and respiratory, anaesthetist and geriatric evaluations. Taking into consideration the anatomical and clinical characteristics, the team considers the most suitable approach for each patient. The more remarkable characteristics considered to favour the TA approach include:

1. Severely atherosclerotic, small diameter, or tortuous iliofemoral vessels,
2. Heavily calcified or tortuous aorta,
3. Patients requiring support ECMO during the procedure.

Surgical Technique

A combined team, including the cardiothoracic surgeons and interventional cardiologists, performed all procedures. In all cases apical access and device delivery were performed by a cardiothoracic surgeon. The technique used to perform TA-TAVI using an Edwards SAPIEN (ES) prosthetic valve (Edwards Lifesciences Inc., Irvine, CA, USA) has been previously described in detail [4]. Briefly, under general anaesthetic, a mini-thoracotomy was made over the left ventricular apex, usually in the fifth or sixth intercostal space. Exposure of the apex was achieved with soft tissue retractors and pericardial stay sutures (Fig. 1). Pledgetted orthogonal mattress sutures large enough to accommodate the largest Ascendra sheath (33F) were placed through the full thickness of the left ventricle in a bare area cranial and lateral to the true apex. Valvuloplasty was performed during epicardial pacing at 180 beats per minute using an ES 3 cm, 20cc balloon for all cases. The ES prosthesis was then positioned 1/3 below the base of the aortic sinuses, ideally such that the valve stent aligned with the fibrous hinge of the anterior leaflet of the mitral valve. Once accurate positioning was confirmed using echocardiography and fluoroscopy, the valve was deployed under similar pacing. The delivery sheath was removed with systolic pressure below 100 mmHg, and haemostasis achieved.

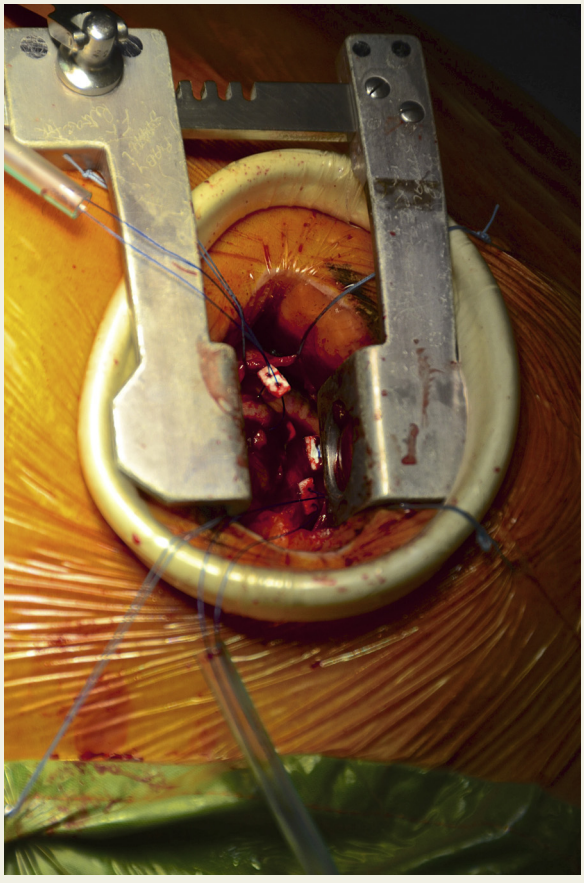

Figure 1 Exposure of the left ventricular apex via mini-thoracotomy in the 6th intercostal space, using soft tissue retractors and pericardial stay sutures. Large, pledgetted orthogonal mattress sutures have been placed in the ventricle.