

Long-Term Outcomes of the Carpentier-Edwards Pericardial Valve Prosthesis in the Aortic Position: Effect of Patient Age

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Pericardial bioprosthetic heart valves were introduced into clinical practice more than 30 years ago (1). Unfortunately, the long-term results were initially disappointing, particularly with regard to the limited durability of the prosthesis (2,3). Clinical use of the Carpentier-Edwards pericardial (CEp) valve started in 1981, and a variety of new techniques of valve construction and anti-calcification treatments were applied in order to reduce the incidence of prosthesis failure (4). Subsequently, very satisfying long-term results have been achieved during the past years with the CEp valve (5-7). The study aim was to report the long-term outcome, of up to 18 years, with the CEp aortic valve at two Italian hospitals.

Materials and methods

Study group and follow up features

Between 1984 and 2000, 327 patients underwent first-time aortic valve replacement (AVR) with the CEp prosthesis (Baxter Scientific Corp., Santa Ana, CA, USA) at the Department of Cardiac Surgery of Centro Cardiologico Fondazione Monzino IRCCS, Milan, Italy, and at the Department of Cardiac Surgery of University Federico II, Naples, Italy. Patients who underwent combined mitral surgery or aortic repair for type A dissection were excluded from the analysis. Twenty-nine patients were lost to follow up, and therefore the study group comprised 298 patients (follow up was 91.1% complete). The mean follow up was 71.8 ± 48.8 months, and a cumulative follow up of 1,785 patient-years (pt-yr) was available for analysis.

Follow up information was obtained by telephone interviews between January and June 2003. The mean age at implantation was 67.2 ± 10.6 years (range: 19 to

83 years). Among the patients, 215 (72.1%) were aged ≥65 years, and 155 (52.0%) were females. In addition, 132 patients (44.2%) were in NYHA functional classes III or IV. Indications for AVR were aortic stenosis in 142 patients (47.6%), aortic insufficiency in 64 (21.4%), and a mixed lesion in 92 (31.0%); native valve endocarditis was diagnosed in 12 patients (4.0%).

Statistical analysis

Published guidelines were followed for reporting morbidity and mortality after heart valve operations (8). Death and complication-free survivals were estimated by means of Kaplan-Meier actuarial analysis. Also, the actual rate was calculated for freedom from prosthesis replacement (9). Linearized rates were expressed as percentage per pt-yr. The log rank test was used to compare actuarial estimates of survival, and a p-value <0.05 was considered to be statistically significant. Statistical analysis was carried out using software SPSS 8.0 (SPSS Inc., Chicago, IL, USA). An instantaneous hazard function for prosthesis replacement was obtained as previously described (10).

Results

In-hospital outcome

Isolated valve replacement was performed in 215 patients (72.1%); 68 patients (22.8%) received combined coronary artery bypass grafting, and in the remaining 15 cases (5.0%) a repair for degenerative aneurysm of the ascending aorta was performed. The label size of the implanted prostheses was distributed as follows: 19 mm in 80 patients (26.8%), 21 mm in 97 (32.6%), 23 mm in 67 (22.5%), 25 mm in 25 (8.4%), 27 mm in 18 (6.0%), and 29 mm in 11 (3.7%). Twelve patients died in hospital (4.0%). Warfarin sodium or acenocumarol was prescribed for the first three months after surgery. Further continuation of anticoagulant therapy was determined by coexisting conditions, such as chronic atrial fibrillation. Otherwise, the anticoagulant was substituted by an antiplatelet drug.

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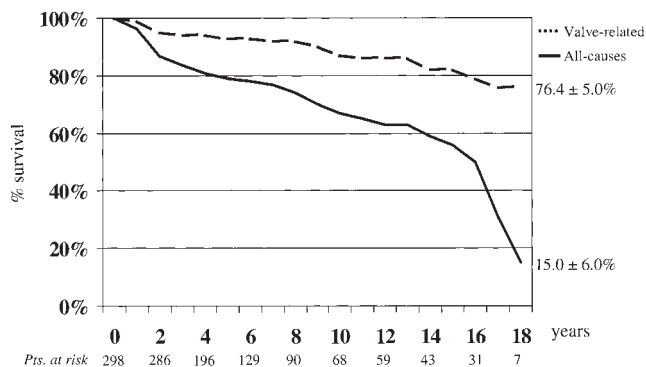


Figure 1: Actuarial freedom from all causes and valve-related death.

Follow up

Ninety-one late deaths occurred; hence the actuarial survival rates at 5, 10, 15 and 18 years were $79.8 \pm 2.4\%$, $67.2 \pm 4.1\%$, $56.3 \pm 4.9\%$ and $15.0 \pm 6.0\%$, respectively (Fig. 1). Freedom from prosthesis-related death at 18 years was $79.7 \pm 8.6\%$ and $75.8 \pm 7.6\%$ in patients aged ≥ 65 years and in younger patients, respectively ($p = 0.75$). However, freedom from prosthesis-unrelated death at 18 years was $19.7 \pm 11.8\%$ and $55.8 \pm 8.2\%$ in patients aged ≥ 65 years and < 65 years, respectively ($p = 0.004$). There were 59 late events defined as the following: thromboembolism ($n = 20$), hemorrhage ($n = 5$), endocarditis ($n = 6$) and prosthesis explantation ($n = 28$). The 18-year actuarial freedom from thromboembolism, hemorrhage and endocarditis was $74 \pm 10.5\%$, $92.1 \pm 3.5\%$ and $97.6 \pm 1.1\%$, respectively (Fig. 2). Freedom from these complications did not differ between older and younger patients. Actual and actuarial freedom from prosthesis replacement at 18 years were 74.8% and $52.9\% \pm 9.9\%$, respectively. Actuarial freedom from prosthesis replacement at 18 years was

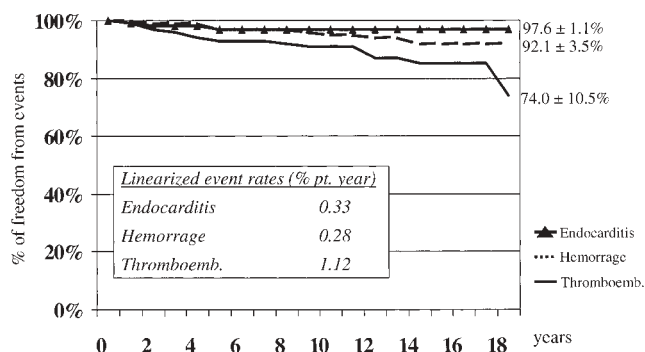


Figure 2: Actuarial freedom from thromboembolism, hemorrhage and endocarditis. Linearized event rates are also reported.

higher in patients aged ≥ 65 years than in younger patients ($83.7 \pm 8.9\%$ versus $35.8 \pm 10.7\%$, respectively; $p = 0.006$) (Fig. 3). The instantaneous hazard for prosthesis replacement following structural valve deterioration, which increases considerably in patients aged less than 65 years after 10 years beyond surgery, is detailed in Figure 4.

Discussion

Two main issues in the clinical use of the heart valve bioprostheses are the incidence of prosthesis-related complications and the long-term durability. The outcomes evaluated in the present study are in agreement with the excellent long-term results reported by other groups (5-7). In our experience, the CEp valve demonstrated a very low incidence of hemorrhage and endocarditis, and freedom from thromboembolism at 18 years was 74%. No significant difference was observed in terms of prosthesis-related deaths between patients aged ≥ 65 years and younger patients. However, the

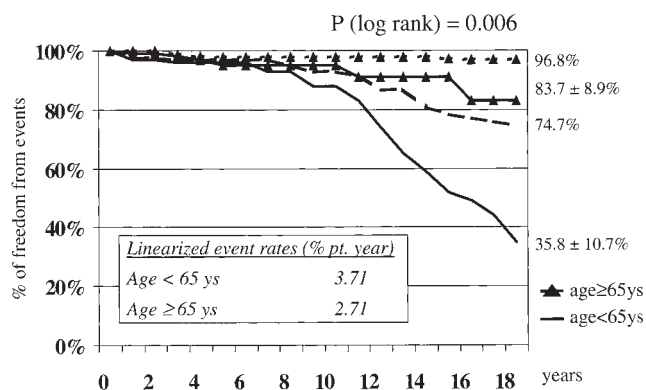


Figure 3: Actuarial (continuous lines) and actual (dashed lines) freedom from prosthesis replacement for structural valve degeneration. Linearized event rates are also reported (#).

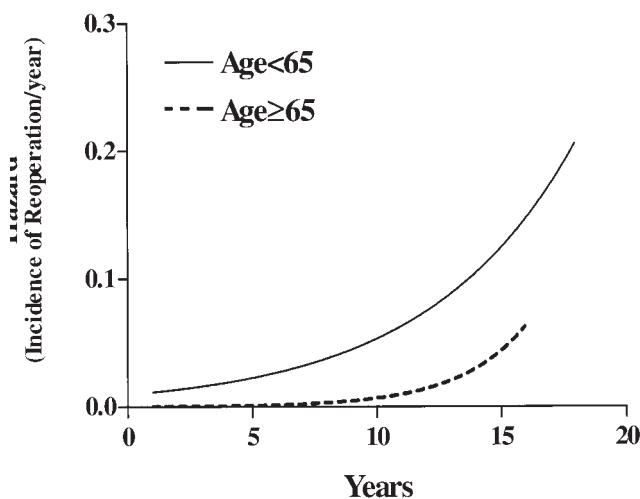


Figure 4: Instantaneous hazard for prosthesis replacement following structural valve deterioration.

majority of late deaths was associated with prosthesis-unrelated mortality that was, as expected, significantly higher among older patients. In fact, the high prevalence in the advanced ages of severe comorbidities may severely limit the life expectancy. Moreover, the durability of the CEp valve was excellent, particularly in patients aged ≥ 65 years, in terms of both actuarial and actual results (Fig. 3). The durability seems to be well matched to the life expectancy of elderly patients. In younger patients, however, the risk of prosthesis replacement for structural deterioration increased considerably at 10 years after surgery (Fig. 4).

In conclusion, the evidence obtained supported the indication for AVR with a CEp valve in the following subgroups of patients, namely those aged ≥ 65 years, and those younger patients with a reduced life expectancy because of severe comorbidities or for whom chronic anticoagulant therapy is either contraindicated or not advisable.

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