

# Aortic Valve Replacement in Octogenarians: Is Biologic Valve the Unique Solution?

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**Background.** This study analyzed morbidity, mortality, and quality of life after aortic valve replacement with mechanical and biologic prostheses in octogenarian patients.

**Methods.** A retrospective analysis was performed in 345 consecutive patients, mean age of  $82 \pm 2$  years (range, 80 to 92), who had aortic valve replacement from May 1991 to April 2005. A bioprosthesis (group I) was used in 200 patients (58%), and 145 (42%) received a mechanical prosthesis (group II). Associated cardiac procedures were done in 211 patients (61%), of which 71% were coronary artery bypass grafting. Patients had symptomatic aortic stenosis (84.3%) or associated aortic insufficiency; 88% were in New York Heart Association (NYHA) class III or IV. The mean preoperative aortic valve gradient was  $62 \pm 16$  mm Hg (range, 25 to 122 mm Hg). The mean left ventricular ejection fraction was good ( $0.52 \pm 0.12$ ); 30 patients (8.7%) had an ejection fraction of less than 0.30.

**Results.** The in-hospital mortality rate was 7.5% (26 patients); 17 (8.5%) in group I and 9 (6.2%) in group II ( $p = 0.536$ ). Significant predictors of operative mortality

were preoperative renal insufficiency (blood creatinine  $> 2.00$  mg/mL) and need for urgent operation. Mean follow-up, complete at 100%, was  $40 \pm 33$  months (range, 1 to 176 months). Long-term follow-up, using Kaplan-Meier analysis, showed an overall survival of 61% at 5 years and 21% at 10 years; survival by type of prosthesis was significantly higher with mechanical prostheses (log-rank  $p = 0.03$ ). Freedom from cerebrovascular events (thromboembolic/hemorrhagic) at 5 and 10 years was 89% and 62% in the mechanical group and 92% and 77% in the biologic group ( $p = 0.76$ ). Postoperative NYHA functional class was I or II in 96% of patients. Quality-of-life scores were excellent considering the age of the patients. No differences were found between the two groups.

**Conclusions.** Surgical treatment for symptomatic aortic stenosis in octogenarians has an acceptable operative risk with excellent long-term results and good quality of life. In this cohort, survival rate is slightly but significantly higher with mechanical prostheses.

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The long-term performance of biologic and mechanical prosthesis for aortic valve replacement (AVR) has been extensively evaluated [1–3]. The age of patients who undergo AVR varies considerably in the reported series, and although surgical treatment for severe symptomatic aortic stenosis in the elderly is widely accepted as an elective treatment [4–6], there is still some reluctance to offer AVR [7–12]. In addition, in very old patients, differences in valve-related morbidity and mortality for biologic and mechanical aortic prosthesis are not well known. Anticoagulation is fraught with caution because it may be associated with complications, particularly in the elderly [10–12].

Our institution, Policlinico San Donato, has seen a constant and progressive increase in octogenarian patients referred for cardiac operations. The aim of this study was to assess mortality, morbidity, and quality of

life in octogenarians operated on for AVR and to compare results using biologic or mechanical prosthesis.

## Patients and Methods

Between 1991 and 2005, 345 consecutive octogenarians (mean age, 82; range 80 to 92 years), affected by symptomatic aortic valve stenosis, underwent AVR at our institution. Aortic valve insufficiency was associated in 53 patients (15.3%), and 150 (43.5%) had concomitant coronary artery disease. Renal insufficiency, defined as blood creatinine level exceeding 2.00 mg/dL, was present in 35 patients (10.1%); peripheral vascular disease, defined as documented concomitant supraaortic vessels disease or limb vessels disease or abdominal aortic disease, or a combination, was detected in 62 patients (18%). Severe cardiac insufficiency, defined as an ejection fraction (EF) of less than 0.30, was present in 31 patients (8.7%). The mean aortic valve gradient was  $62 \pm 16$  mm Hg. Preoperatively, 88% of patients were in New York Heart Association (NYHA) class III or IV. Dyspnea on effort and angina were predominant symptoms. Preoperative data

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Table 1. Baseline Patient Characteristics by Group

Characteristic	Group I (n = 200) <sup>a</sup> No. (%) or Mean ± SD	Group II (n = 145) <sup>b</sup> No. (%) or Mean ± SD	p Value
Sex			
Men	89 (44)	61 (42)	
Women	111 (56)	84 (58)	0.202
Age, years	82 ± 2	82 ± 2	0.967
Aortic gradient	61 ± 15	63 ± 18	0.190
Renal insufficiency	18 (9)	17 (12)	0.471
PVD	39 (19)	24 (16)	0.489
Atrial fibrillation	41 (20)	26 (18)	0.244
NYHA class			
II	27 (13)	16 (11)	0.468
III	95 (47)	83 (57)	0.073
IV	78 (39)	46 (32)	0.164
EF	0.52 ± 0.12	0.52 ± 0.12	0.780
EF < 0.30	15 (7.5)	16 (11)	0.257
Urgency	5 (2.5)	4 (2.7)	0.881

<sup>a</sup> Group I had a biologic prosthesis. <sup>b</sup> Group II had a mechanical prosthesis.

EF = ejection fraction; PVD = peripheral vascular disease.

were obtained by a retrospective review of clinical records.

In 200 patients (57.9%), AVR was done with a bioprosthesis (group I), and 145 patients (42.1%) received a mechanical prosthesis (group II). Table 1 summarizes baseline demographic and clinical characteristics by group. During the 14-year period of this study, both stented and stentless bioprosthesis were used; mechanical prosthesis were bileaflets in all patients.

All the procedures were performed with extracorporeal circulation and moderate hypothermia (30° to 32° C) with intermittent crystalloid antegrade cardioplegia. The mean sizes of the prosthesis were 23 ± 1.8 mm for biologic, 22 ± 1.6 mm for stentless, and 20 ± 2.0 mm for mechanical (*p* = 0.0001). Associated cardiac procedures were done in 211 patients (61%), and 26 (7.5%) had more than one associated procedure (Table 2).

Table 2. Associated Procedures by Group

Procedure	Group I (n = 200), No. (%) <sup>a</sup>	Group II (n = 145), No. (%) <sup>b</sup>	p Value
CABG	78 (39)	72 (49)	0.04
Mitral valve replacement	6 (3)	11 (7.6)	0.07
Mitral valve repair	16 (8)	6 (4)	0.147
Tricuspid valve repair	7 (3.5)	7 (4.8)	0.537
Reduction ascending aortoplasty	4 (2)	2 (1.4)	0.663
Atrial septal closure	1 (0.5)	1 (0.6)	0.818

<sup>a</sup> Group I had a biologic prosthesis. <sup>b</sup> Group II had a mechanical prosthesis.

CABG = coronary artery bypass grafting.

Table 3. Operative Complications by Prosthesis Type

Complication	Group I (n = 200), <sup>a</sup> No (%)	Group II (n = 145), <sup>b</sup> No (%)	p Value
Bleeding	4 (2)	3 (1.5)	0.964
Atrial fibrillation	48 (24)	28 (19)	0.299
Low cardiac output	10 (5)	7 (4.8)	0.941
Renal failure	8 (4)	3 (2)	0.313
Respiratory failure	11 (5.5)	4 (2.7)	0.217

<sup>a</sup> Group I had a biologic prosthesis. <sup>b</sup> Group II had a mechanical prosthesis.

Follow-up data were obtained by telephone contact with patients, family members, or referring physician. During the interview, the Medical Outcomes Study Short-Form 36 (SF-36) Health Survey questionnaire for health-related quality-of-life assessment was administered. The regional death registry was also used to ensure completeness of mortality data. Our local ethical committee approved this retrospective study, and individual patient consent was waived.

The baseline characteristics of groups I and II were assessed by *t* tests for continuous variables and  $\chi^2$  for categorical variables. Morbidity and mortality were calculated by Kaplan-Meier actuarial methods and compared with the log-rank statistic. A value of *p* < 0.05 was considered statistically significant for all variables. Values are presented as mean ± standard deviation. Analysis was done with SPSS software (SPSS Inc, Chicago, IL).

## Results

The percentage of patients who had concomitant coronary artery bypass grafting (CABG) was higher in the mechanical group (*p* = 0.04; Table 2). The mean number of grafts was 2.3 ± 1.2 in the mechanical group and 1.8 ± 0.9 in the biologic group (*p* = 0.002). Three patients in the mechanical group had previous cardiac interventions, including 2 previous biologic valves and one previous CABG.

All the mechanical group patients received warfarin after surgery, and 26 (17.9%) received anticoagulation preoperatively for atrial fibrillation. In the biologic valve group, 41 patients (20.5%) were receiving anticoagulation before the operation, and an additional 12 patients (6%)

Table 4. Causes of Hospital Death by Groups

Cause of Death	Group I (n = 200), No. (%) <sup>a</sup>	Group II (n = 145), No. (%) <sup>b</sup>	p Value
Sepsis	2 (1)	2 (1.4)	0.745
Cardiogenic shock	7 (3.5)	3 (2.1)	0.434
Cerebrovascular accident	2 (1)	1 (0.6)	0.759
Others	6 (3.0)	3 (2.0)	0.592
Total	17 (8.5)	9 (6.1)	0.425

<sup>a</sup> Group I had a biologic prosthesis. <sup>b</sup> Group II had a mechanical prosthesis.

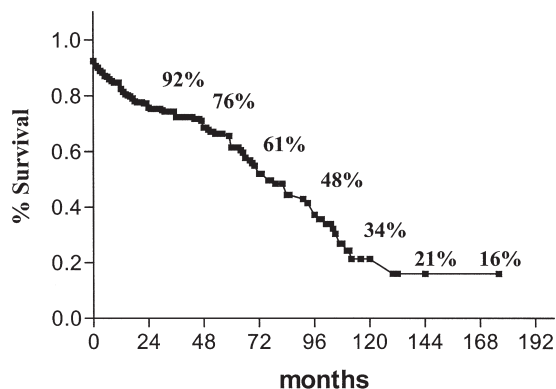


Fig 1. Kaplan-Meier actuarial overall-cause mortality survival in the entire population.

started anticoagulation treatment during follow-up for de novo atrial fibrillation, cerebrovascular disease, or other causes. Policlinico San Donato is a national referral hospital for cardiovascular surgery; therefore, during follow-up patients were monitored by several different anticoagulation centers across the country where the patients live.

**Hospital Mortality and Morbidity**

The in-hospital mortality rate, defined as mortality within 30 days postoperatively, was 7.5% (26 patients), consisting of 17 patients (8.5%) in group I and 9 (6.2%) in group II ( $p = 0.536$ ).

Major complications that occurred in the operative period were surgical revision for bleeding in 7 patients (2%) and low cardiac output in 17 (4.9%). An intraaortic

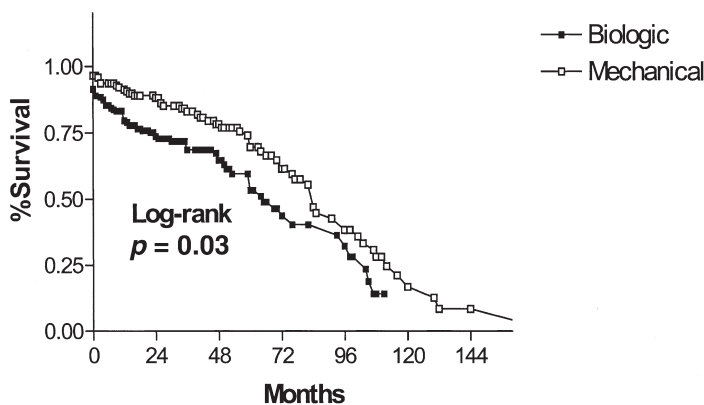
balloon pump was used in 6 patients (1.7%) and pulmonary complications with prolonged (>72 hours) mechanical ventilation occurred in 15 patients (4.5%). Worsening of renal function occurred in 11 (3.2%), but hemofiltration was not required (Table 3).

At univariate analysis we found that the preoperative variables associated with hospital mortality were renal insufficiency ( $p = 0.001$ ), EF ( $p = 0.02$ ), EF less than 0.30 ( $p = 0.05$ ), urgent operation, defined as clinical instability, pulmonary edema, and complex ventricular arrhythmias ( $p = 0.001$ ). At multivariate logistic regression analysis, preoperative renal insufficiency and urgency resulted significant predictors of in-hospital mortality (Exp [B] 7.775 [95% confidence limit (CL), 2.6 to 23.2] and 11.3 [95% CL, 2.1 to 59.1]), respectively ( $p < 0.001$ ). Operative mortality in clinically stable patients with an EF exceeding 0.30 and no renal insufficiency was 2.7% and decreased to 1.6% in case of absent associated procedures. Causes of operative death are reported in Table 4. Unstable patients also presented with a significantly higher incidence of postoperative renal and respiratory failure ( $p < 0.005$ ) and a lower preoperative EF.

**Follow-Up**

Mean follow-up was  $40 \pm 33$  months (range, 1 to 176 months); follow-up was completed in 100%. The NYHA functional class improved from  $3.3 \pm 0.7$  to  $1.2 \pm 0.5$  ( $p < 0.001$ ) in the biologic group, and from  $3.2 \pm 0.6$  to  $1.2 \pm 0.5$  in the mechanical valve group ( $p < 0.001$ ). At follow-up, 78% of patients were in NYHA class I, 18% in class II, and 4% in class III. Of the 319 survivors, late death occurred in 104 (32.6%). Stroke was the cause of death in 20 patients (11 mechanical, 9 biologic;  $p = 0.221$ ). Kaplan-Meier analysis shows a global survival rate of 61% at 5 years, 21% at 10 years, and 16% at 14 years (Fig 1). Long-term survival was fairly significantly better in the mechanical group (Fig 2). A trend favoring mechanical valves was also observed for cardiac related deaths (Fig 3). No

Fig 2. Survival by type of prosthesis. Kaplan-Meier actuarial survival in patients with mechanical (open squares) and biologic (solid square) aortic valve prostheses. Mechanical group shows a significant advantage in survival that starts at the first years (log-rank  $p = 0.03$ ).



Months	0	12	24	36	48	60	72	84	96	108	120	144
Pts at risk												
Biologic	200	148	103	67	50	30	20	13	10	4	.	.
Mechanical	145	124	102	77	63	50	39	26	20	12	7	2

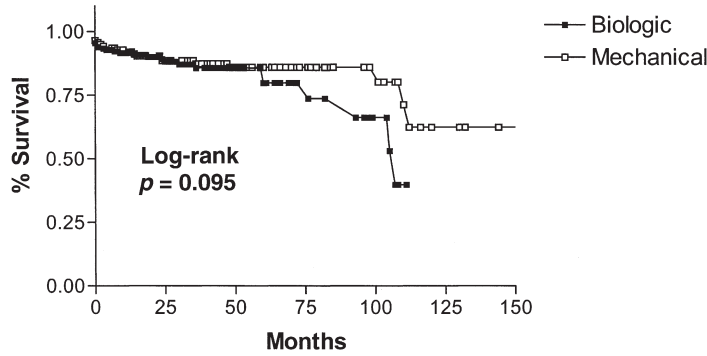


Fig 3. Kaplan-Meier actuarial survival in patients with mechanical (open squares) and biologic (solid squares) aortic valve prostheses related to cardiac deaths. Although not significantly different, there is a trend towards a survival advantage in mechanical group (log-rank  $p = 0.095$ ).

Months	0	12	24	36	48	60	72	84	96	108	120	144
<b>Pts at risk</b>												
Biologic	200	140	101	67	50	29	17	11	9	3	.	.
Mechanical	145	119	99	76	62	49	38	27	20	12	5	2

differences resulted according to associated CABG (Fig 4). Sex-related survival was higher in women ( $p = 0.006$ ).

During follow-up, 29 major cerebrovascular events (CVE) were observed; 22 patients had a thromboembolic event, 14 in the mechanical group and 8 in the biologic group ( $\chi^2, 0.03$ ). Seven patients had a hemorrhagic event, 2 in the biologic group and 5 in the mechanical group. There were 20 CVE related deaths, 9 patients in the biologic group and 11 in the mechanical group ( $p = 0.241$ ). Freedom from CVE was 89% and 62% at 5 and 10 years in the mechanical and 92% and 77% in the biologic group ( $p = 0.76$ ). Fig 5 reports SF-36 score according to valve type, reflecting a good health-related quality of life. No differences were observed between patients with biologic and mechanical prostheses.

**Comment**

Cardiac surgery in the elderly is increasing and will increase even further in the coming decades as health care in general improves and the number of elderly patients requiring aortic valve replacement increases. Studies have

evaluated the surgical results in elderly patients, although the term *elderly* is often used to describe different populations. For example, Tseng and colleagues [4] defined as elderly a population older than 70 years, whereas Florath and colleagues [5] defined elderly as being older than 65 years. However, age in itself is considered a risk factor for mortality-morbidity by scoring methods.

Safety surveys by age group have been performed over the years, and many reports document the safety of cardiac interventions even in octogenarians, excluding urgent or emergency clinical status [7, 9-14]. In such conditions, the presence of comorbidities is associated with poor outcome [15, 16]. Further reported predictors of in-hospital mortality were NYHA functional class III and IV, concomitant aortic valve insufficiency, small body surface, and an EF of less than 0.40 [14-16]. In our analysis, an EF of less than 0.30 was associated with a higher mortality rate, and urgent operation and preoperative renal insufficiency were independent predictors of in-hospital death.

Avoidance of major traumatic operations and prolonged hospital stay are important in the recovery of

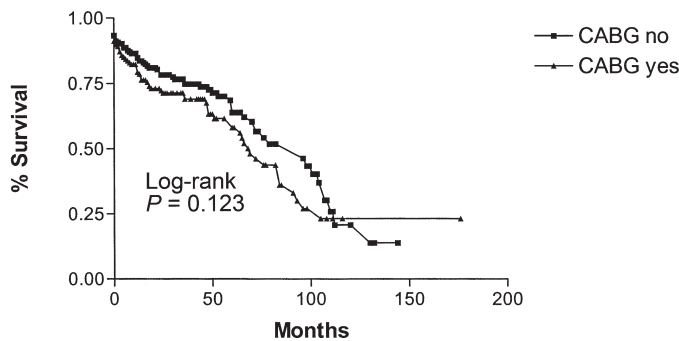
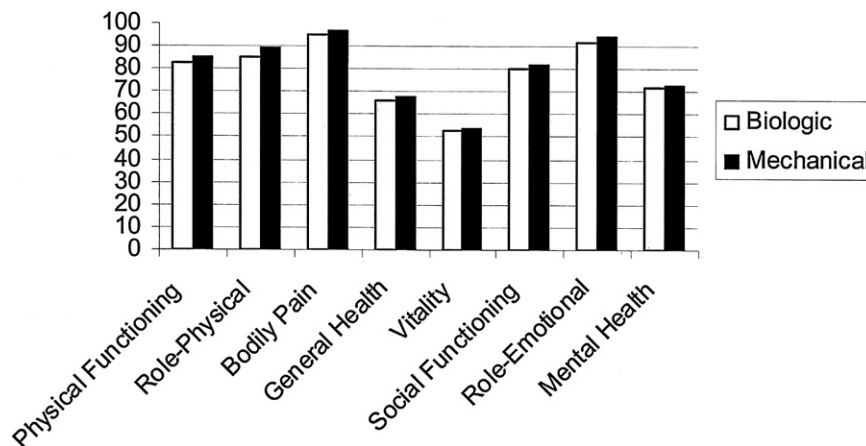


Fig 4. Kaplan-Meier actuarial survival in patients with (triangles) or without (squares) associated coronary artery bypass grafting (CABG). The difference between biologic and mechanical valves is not significant (log-rank  $p = 0.123$ ).

Months	0	12	24	36	48	60	72	84	96	108	120	144
<b>Pts at risk</b>												
Biologic	193	150	117	83	67	44	32	21	19	9	4	1
Mechanical	150	112	84	61	49	35	24	18	10	6	3	1

Fig 5. Scores for the domains of the Medical Outcomes Survey Short-Form 36 Health Survey that assesses major health concepts in patients with biologic (open boxes) and mechanical (filled boxes) prostheses.



these patients and to reduce the hospital costs; thus, minimally invasive surgery and, more recently, percutaneous AVR are advocated. However, no patient in our study was treated with percutaneous AVR. This technique, although promising, has been adopted in few centers, and results need to be validated [10].

Biologic valves are considered the optimal choice in patients aged older than 70 years, as indicated in the 1998 American Heart Association/American College of Cardiology guidelines [17], and the age has more recently been even lowered to 60 or 65 years [18]. However, it has been reported that the type of valve devices implanted in patients older than 65 was a bioprosthesis only in 50% of cases [10]. The choice of mechanical prostheses in elderly patients is often due to different factors, including chronic atrial fibrillation, the use of anticoagulation for other diseases, less need of reoperation, and preference of the cardiologist or surgeon [17–20]. Our surgical preference for mechanical valves was mostly related to technical reasons such as small and calcific aortic annulus or aortic root, or both, especially in case of a stentless biologic valve implant. As a consequence, the mean size of the prosthesis was  $23 \pm 1.8$  mm in the biologic,  $22 \pm 1.6$  mm in the stentless, and  $20 \pm 2.0$  mm in the mechanical group ( $p = 0.0001$ ).

The use of mechanical or biologic valves was not motivated by patient clinical preoperative status because the patients were comparable and there were no significant differences between the two groups. Rather, patients in the mechanical group had a higher incidence of NYHA class III and they had more frequent associated cardiac procedures (Tables 1 and 2).

In octogenarian patients with aortic valve procedures, early- and long-term results have significantly improved due to technical optimization, better myocardial protection, and postoperative management. Nowadays, the hospital mortality rate is between 2% and 10% [1–9, 13–15]. The in-hospital mortality rate in our series was 7.5%, and overall survival was good, with survival at 1, 3, 5, and 10 years of 82%, 74%, 61%, and 21%, respectively (Fig 1).

It is still debated if CABG associated with AVR increases operative death [8, 21]. In our cohort, CABG was

associated with AVR if coronary lesions were present on preoperative coronary angiography, regardless of ischemic symptoms and signs, and was not associated with higher in-hospital and late death (Fig 4). Coronary lesions are frequently detected in very old patients, but when ischemic signs are absent, CABG associated with AVR may not increase operative risk and may even be beneficial in order to protect from intraoperative and late adverse ischemic cardiac events [8].

We observed less CVEs in patients with a bioprosthesis aortic valve, in agreement with other studies [8, 20, 21]. Overall, the incidence of major CVE was low (9%) in both mechanical and biologic valves, similar to 10.4% in an age-matched population in the same era [22]. We also noted that despite a higher incidence of CVE, our octogenarian patients with mechanical valves had a higher survival rate ( $p = 0.03$ ; Fig 2) and a trend for reduced cardiac-related death (Fig 3). For these reasons, the choice to implant a mechanical aortic valve could be reasonable and justified in some instances.

Previous experiences focusing on health-related quality of life after cardiac operations in octogenarians reported a good quality of life, with SF-36 scores that were similar to scores in the general population of patients aged older than 65 years [23]. In our cohort, the SF-36 scores confirmed a good or excellent functional status and quality of life, with an equal or better score for those that had a mechanical aortic prosthesis (Fig 5).

The NYHA class also improved significantly in our population, but we think that NYHA classification, based on symptoms of dyspnea on exercise, is not applicable to octogenarians, whose physical activity is necessarily limited. Almost one-fifth of survivors had their 90-year birthday during follow-up, and 82% of them had mechanical valves.

The major limitation of the present study is that it is retrospective and not randomized. However, the two groups are comparable because we could not identify any factor being significantly different with respect to the risk profile. The lowest value of  $p$  was 0.191 for transaortic gradient, which does not allow us to draw any further analysis and to proceed with the next steps of a propensity score. In fact, the propensity score is useful if the

“baseline” groups are not homogeneous to make them comparable.

A second important limitation is that it is difficult to know the exact cause of death by telephone interview with the family members, especially in such an old population. Because of our study issue, we focused on stroke as the cause of death, and other causes, especially noncardiac ones, might have not been appropriately assessed, even at the regional death registry.

In conclusion, this study shows that the survival rate and health-related quality of life are excellent in octogenarians who undergo AVR for aortic stenosis with biologic or mechanical valves. The modest but significant advantage of mechanical valves starting from the first years of follow-up can be related to warfarin therapy and not to structural deterioration of the bioprosthesis. Because our findings are somewhat different from those of other series that do not show survival benefit with one type of valve over another, we do hope that our study will stimulate others to either confirm or refute our conclusions. Our study indicates that in this population, in whom the true “philosophic” objective is to favor “good years with good life,” satisfactory results can at least be obtained with either type of valve prosthesis.

## References

1. Hammermeister K, Sethy GK, Henderson WG, Oprian C, Rahimtoola SH. Outcomes 15 years after valve replacement with a mechanical versus a bioprosthetic valve: final report of the Veterans Affairs randomized trial. *J Am Coll Cardiol* 2000;36:1152–8.
2. Hammermeister KE, Sethy GK, Henderson WG, Oprian C, Kim T, Rahimtoola S. A comparison of outcomes in men 11 years after heart-valve replacement with a mechanical valve or bioprosthesis. *Veterans Affairs Cooperative Study on Valvular Heart Disease*. *N Engl J Med* 1993;328:1289–96.
3. Bloomfield P, Wheatley DJ, Prescott RJ, Miller HC. Twelve-year comparison of a Bjork Shiley mechanical heart valve with porcine bioprostheses. *N Engl J Med* 1991;324:573–9.
4. Tseng E, Lee C, Cameron DE, et al. Aortic valve replacement in the elderly: risk factors and long term results. *Ann Surg* 1997;225:793–804.
5. Florath I, Albert A, Rosendahl U, Alexander T, Ennker IC, Ennker J. Mid term outcome and quality of life after aortic valve replacement in elderly people: mechanical versus stentless biological valves. *Heart* 2005;91:1023–9.
6. Asimakopoulos G, Edwards MB, Taylor KM. Aortic valve replacement in patients 80 year of age and older: survival and cause of deaths based on 1100 cases. Collective results from the UK Heart Valve Registry. *Circulation* 1997;96:3403–8.
7. Craver JM, Puskas JD, Weintraub WW, et al. 601 octogenarians undergoing cardiac surgery: outcome and comparison with younger age groups. *Ann Thorac Surg* 1999;67:1104–10.
8. Langanay T, De Latour B, Ligier K, et al. Surgery for aortic stenosis in octogenarians: influence of coronary disease and other comorbidities on hospital mortality. *Heart Valve Dis* 2004;13:545–53.
9. Mistiaen W, Van Cauwelaert P, Muylaert P, Wuyst F, Harisson F, Bortier H. Risk factors and survival after aortic valve replacement in octogenarians. *Heart Valve Dis* 2004;13:538–44.
10. Cohn LH, Narayanasami N. Aortic valve replacement in elderly patients what are the limits? *Curr Opin Cardiol* 2007;22:92–5.
11. Chukwuemeka A, Borger MA, Ivanov J, Armstrong S, Feindel CM, David TE. Valve surgery in octogenarians: a safe option with good medium-term results. *J Heart Valve Dis* 2006;15:191–6.
12. Varadarajan P, Kapoor N, Bansal RC, Pai RG. Survival in elderly patients with severe aortic stenosis is dramatically improved by aortic valve replacement: Results from a cohort of 277 patients aged > or =80 years. *Eur J Cardiothorac Surg* 2006;30:722–7.
13. Unic D, Leacche M, Paul S, et al. Early and late results of isolated and combined heart valve surgery in patients > or =80 years of age. *Am J Cardiol* 2005;95:1500–3.
14. Kohl P, Kerzman A, Honore C, Comte L, Limet R. Aortic valve surgery in octogenarians: predictive factors for operative and long-term results. *Eur J Cardiothorac Surg* 2007;31:600–6.
15. Avery GJ, Ley SJ, Hill JD, Hershon JJ, Dick SE. Cardiac surgery in the octogenarian: evaluation of risk, cost, and outcome. *Ann Thorac Surg* 2001;71:591–6.
16. Zaidi AM, Fitzpatrick AP, Keenan DJ, Odom NJ, Grotte GJ. Good outcomes from cardiac surgery in the over 70s. *Heart* 1999;82:134–7.
17. Bonow RO, Carabello B, de Leon AC, et al. ACC/AHA Guidelines for the Management of Patients With Valvular Heart Disease. Executive Summary. A report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (Committee on Management of Patients With Valvular Heart Disease). *J Heart Valve Dis* 1998;7:672–707.
18. Bonow RO, Carabello BA, Kanu C, et al. ACC/AHA 2006 guidelines for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines (writing committee to revise the 1998 Guidelines for the Management of Patients With Valvular Heart Disease): developed in collaboration with the Society of Cardiovascular Anesthesiologists: endorsed by the Society for Cardiovascular Angiography and Interventions and the Society of Thoracic Surgeons. *Circulation* 2006 Aug 1;114:e84–231.
19. Collart F, Feier H, Kerbaul F, et al. Primary valvular surgery in octogenarians: perioperative outcome. *Heart Valve Dis* 2005;14:238–42.
20. Chan V, Jamieson WR, Germann E, et al. Performance of bioprostheses and mechanical prostheses assessed by composites of valve-related complications to 15 years after aortic valve replacement. *J Thorac Cardiovasc Surg* 2006;131:1267–73.
21. Jamieson WRE, Edwards FH, Schwartz M, et al. Risk stratification for cardiac valve replacement. National cardiac surgery database. *Ann Thorac Surg* 1999;67:943–51.
22. Di Carlo A, Baldereschi M, Gandolfo C, et al. ILSA working group: stroke in an elderly population: incidence and impact on survival daily function. The Italian Longitudinal Study On Aging. *Cerebrovasc Dis* 2003;16:141–50.
23. Fruitman DS, MacDougall CE, Ross DB. Cardiac surgery in octogenarians: can elderly patients benefit? Quality of life after cardiac surgery. *Ann Thorac Surg* 1999;68:2129–35.

## INVITED COMMENTARY

de Vincentiis and colleagues [1] present a report on a retrospective series of 345 patients greater than 80 years of age who underwent aortic valve replacement. The

operative mortality is low (7.5%) considering that more than half of these patients underwent concomitant other cardiac procedures and the postoperative quality of life