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Long-term clinical outcomes of mechanical versus bioprosthetic aortic valve replacement in older patients

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KEYWORDS

- aortic valve replacement
- bioprosthetic valve
- mechanical valve

Abstract

Aims: To compare the long-term outcomes of mechanical valves as opposed to bioprosthetic valves in order to inform valve selection.

Methods and results: From January 1996 to December 2010, 561 patients aged 60 to 75 years undergoing AVR for the first time were evaluated (mechanical valve: N=251; bioprosthetic valve: N=310). The primary outcome was all-cause death, and secondary outcomes were reoperation, bleeding events, thromboembolism, endocarditis and major adverse prosthesis-related events (MAPE). MAPE were the composite of reoperation, bleeding, thromboembolism and endocarditis. Long-term outcomes were compared with the use of propensity scores to adjust for selection bias. After risk adjustment, both groups of patients showed a similar risk of death at 10 years (hazard ratio [HR] 1.25, 95% confidence interval [CI]: 0.85-1.85, p=0.26), reoperation (HR 2.94, 95% CI: 0.79-11.11, p=0.11) and thromboembolism (HR 0.38, 95% CI: 0.10-1.40, p=0.15). Compared with the patients given mechanical valves, those who received bioprosthetic valves were at a higher risk of endocarditis (HR 7.65, 95% CI: 1.74-33.52, p=0.007), but were, however, at a lower risk of bleeding (HR 0.25, 95% CI: 0.12-0.52, p<0.0001) and MAPE (HR 0.61, 95% CI: 0.39-0.96, p<0.033).

Conclusions: Compared with mechanical AVR, bioprosthetic AVR showed a similar long-term survival rate and favourable MAPE event rate.

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Abbreviations

AF	atrial fibrillation
AVR	aortic valve replacement
CABG	coronary artery bypass graft
CI	confidence interval
HR	hazard ratio
MAPE	major adverse prosthesis-related events
MI	myocardial infarction
NYHA	New York Heart Association
TAVR	transcatheter aortic valve replacement

Introduction

The current American Heart Association guidelines recommend mechanical valves for aortic valve replacement (AVR) in patients younger than 60 years, and bioprosthetic valves in patients older than 70 years. Either a bioprosthetic or a mechanical valve is recommended between 60 and 70 years[1]. This grey zone reflects the current trend towards increasing use of bioprostheses in progressively younger patients[2], and also the complexities and trade-offs of selecting an aortic valve prosthesis in older patients. Patients with mechanical valves require lifelong anticoagulation, and risk of bleeding events increases with advancing age. In contrast, risk of reoperation in patients with bioprosthetic valves increases with time and decreases with advancing age.

Two historic randomised clinical trials compared outcomes after valve replacement with first-generation bioprosthetic and mechanical valves[3,4]. Although these trials are notable for their prospective, randomised design, their major limitations are that comparisons were made between first-generation valves, and most of the study population in these trials was under 60 years of age. Furthermore, recent innovation in transcatheter aortic valve replacement (TAVR) is applicable to replace deteriorated biological prostheses, which may affect the strategy in case of reoperation for octogenarians and their late survival[5,6]. To address the limitations of the earlier randomised trials, a new randomised trial demonstrated a similar survival rate between bioprosthetic and mechanical valves but a higher incidence of bleeding events in mechanical valves and more frequent reoperation in bioprosthetic valves[7]. Recently, large registry data gave support to this with a similar result[2,8]. However, it is not clear whether this finding is applicable to other populations, including an Asian population. Thus, we conducted a long-term observational study to compare outcomes of mechanical and bioprosthetic valve replacement for patients aged more than 60 years in an Asian population.

Methods

STUDY DESIGN

Patients who underwent valve surgery at our institution were prospectively registered using a standard case-reporting form. Case report forms, including patient demographics, clinical presentation, echocardiographic data, and procedural data were stored in an electronic database. Clinical follow-up data of study patients were prospectively collected via clinical visits or telephone, and entered into the database at one month and six months after operation, and subsequently on an annual basis. From January 1996 to December 2010, a total of 773 patients undergoing AVR with a mechanical or bioprosthetic valve were consecutively enrolled in the present study. The criteria for exclusion from the study were defined as patients undergoing urgent surgery, or non-coronary artery bypass graft cardiac surgical procedures, those with a prior history of any valve replacement and who had received AVR for infective endocarditis **(Figure 1A)**. All patients provided informed consent, and the study was approved by the institutional review board.

CHOICE OF PROSTHESIS AND SURGICAL PROCEDURES

The selection of a mechanical or a bioprosthetic valve was made following a detailed preoperative discussion among the surgeon, the patient, and family members. The pros and cons of mechanical or bioprosthetic valves were described, including the need for anticoagulation after mechanical valve replacement or the possible need for reoperation after bioprosthetic valve replacement. The decision on mechanical or bioprosthesis selection was left entirely to the individual patient and his/her carers. The operation was conducted in the standard manner. Briefly, all patients underwent AVR through a median sternotomy. A standard cannulation was performed in the routine fashion. After having clamped the aorta and arrested the heart with antegrade/retrograde cold blood, or cold crystalloid cardioplegia added to topical cooling, the ascending aorta was opened and the valve was replaced, either by a bioprosthetic or a mechanical valve fixed to the aortic annulus.

ANTICOAGULATION

During the postoperative period, anticoagulated patients initially received unfractionated heparin until the international normalised ratio (INR) was within therapeutic range. Patients with mechanical prostheses were anticoagulated with warfarin according to our protocol to a target of INR 2.5 (range, 2.0 to 3.0). In patients who underwent bioprosthetic valve replacement, warfarin anticoagulation was used at the discretion of the surgeon for a period of three months after the operation. Warfarin was subsequently discontinued if sinus rhythm was maintained and no other indication for anticoagulation was present. Non-anticoagulated patients with bioprosthetic valves were kept on 100 mg of aspirin daily unless contraindicated.

OUTCOMES

The primary endpoint was the rate of death from any cause over the duration of follow-up. Secondary endpoints were aortic valve reoperation, bleeding events, thromboembolism and endocarditis. Major adverse prosthesis-related events (MAPE) were the composite of reoperation, bleeding events, thromboembolism and endocarditis. These complications were defined according to the guidelines for reporting mortality and morbidity after cardiac valve intervention[9]. Briefly, a bleeding event is any episode of major internal or external bleeding that causes death, hospitalisation, or

permanent injury, or necessitates transfusion. Thrombosis is any thrombus not caused by infection attached to or near an operated valve that occludes part of the blood flow path, interferes with valve function, or is sufficiently large to warrant treatment. Embolism is any embolic event that occurs in the absence of infection after the immediate period.

STATISTICAL ANALYSIS

Continuous variables are presented as the mean±standard deviation, and they were compared using the Student's t-test. Categorical variables are presented as counts or percentages, and they were compared using the chi-square test. A log-rank test was used to compare mortality and event rates between mechanical and bioprosthetic valves. A nonparametric Kaplan-Meier estimate was used to estimate the survival curve. To adjust for the difference in baseline characteristics between mechanical and bioprosthetic valves, the propensity score was estimated using the twang package in the R version 3.0.1 based on age, gender, body surface area, diabetes mellitus, hypertension, smoking status, previous myocardial infarction, previous stroke, New York Heart Association functional state, atrial fibrillation, chronic renal failure, left ventricular ejection fraction, and coronary artery bypass grafting. The propensity score matching was performed by matching between mechanical and bioprosthetic valve groups on the logit of the propensity score using a calliper of 0.2 SD of the logit of the propensity score[10]. Patients were censored at the time of their last follow-up visit or at the time of death if the outcome of interest had not occurred, and censoring was assumed to be independent of predictors and outcomes. Unadjusted hazard ratios and adjusted hazard ratios were derived from a Cox proportional hazards model with propensity score matching. Statistical significance was defined as p-value <0.05. Data were analysed using SPSS Statistics version 21.0 (IBM Corp., Armonk, NY, USA) and R version 3.0.1 (the R Foundation for Statistical Computing, Vienna, Austria).

Results

PATIENT CHARACTERISTICS

A total of 561 patients (mechanical valve, N=251; bioprosthetic valve, N=310) were analysed in this study, and 531 patients (95.4%) completed follow-up. Patient age was 67.5±4.5 years (range, 60 to 75 years) at the time of surgery **(Table 1)**. There were 319 (56.9%) male and 242 (43.1%) female patients. A total of 159 (28.3%) patients were in New York Heart Association (NYHA) functional Class III or IV. The total follow-up for the entire cohort was 3,167 patient-years, with a mean duration of 5.6 years (interquartile range: 2.2 to 8.3 years; maximum 15.6 years). The distribution of mechanical and bioprosthetic valves was constant across the age range **(Figure 1B)**. Compared with patients who received mechanical valves, those who received bioprosthetic valves had lower body surface area and ejection fraction, but a similar age and prevalence of most other comorbidities. It was noted that patients with bioprosthetic valves were more likely to undergo concomitant coronary artery bypass graft surgery (28.1% versus 21.1%) but the difference did not reach statistical significance. The dominant underlying lesion was either isolated aortic stenosis (252 patients; 44.9%) or mixed aortic stenosis and regurgitation (182 patients; 32.4%). Intraoperative characteristics were similar for patients with bioprosthetic versus mechanical valves, with a similar mean time on cardiopulmonary bypass and aorta cross clamp time **(Table 2)**.

Table 1. Baseline characteristics of the study population.

Variables	Overall				Propensity score-matched			
	Mechanical (N=251)	Bioprosthetic (N=310)	*p*-value	SD of mean	Mechanical (N=238)	Bioprosthetic (N=238)	*p*-value	SD of mean
Age (mean), years	67.4±4.6	67.6±4.3	0.57	4.5%	67.3±4.5	67.1±4.6	0.58	4.4%
Female, n (%)	101 (40.2%)	141 (45.5%)	0.21	10.7%	96 (40.3%)	85 (35.7%)	0.25	9.5%
Body mass index, kg/m^2	24.0±2.7	24.8±14.7	0.24	29.6%	24.1±2.8	24.4±3.0	0.34	10.3%
Body surface area, m^2	1.64±0.15	1.61±0.17	0.019	18.7%	1.65±0.15	1.67±0.14	0.11	13.8%
Smoking, n (%)	103 (41.0%)	106 (34.2%)	0.096	14.1%	99 (41.6%)	107 (45.0%)	0.40	6.9%
NYHA III/IV, n (%)	68 (27.1%)	91 (29.4%)	0.55	5.1%	67 (28.2%)	71 (29.8%)	0.68	3.5%
Hypertension, n (%)	103 (41.0%)	138 (44.5%)	0.41	7.1%	99 (41.6%)	100 (42.0%)	0.91	0.8%
Diabetes, n (%)	48 (19.1%)	70 (22.6%)	0.32	8.6%	44 (18.5%)	29 (12.2%)	0.06	17.5%
Previous MI, n (%)	3 (1.2%)	10 (3.2%)	0.11	13.7%	3 (1.3%)	2 (0.8%)	0.48	4.9%
Previous stroke, n (%)	9 (3.6%)	16 (5.2%)	0.37	7.8%	8 (3.4%)	12 (5.0%)	0.30	8.0%
Chronic AF, n (%)	20 (8.0%)	31 (10.0%)	0.41	7.0%	19 (8.0%)	14 (5.9%)	0.39	8.3%
Chronic renal failure, n (%)	6 (2.4%)	2 (0.6%)	0.15	14.8%	6 (2.5%)	2 (0.8%)	0.16	13.4%
Concurrent CABG, n (%)	53 (21.1%)	87 (28.1%)	0.054	16.3%	51 (21.4%)	42 (17.6%)	0.25	9.6%
Ejection fraction, %	53.2±12.2	51.1±13.6	0.08	16.3%	53.0±12.2	53.3±11.0	0.81	2.6%

AF: atrial fibrillation; CABG: coronary artery bypass graft; MI: myocardial infarction; NYHA: New York Heart Association functional class

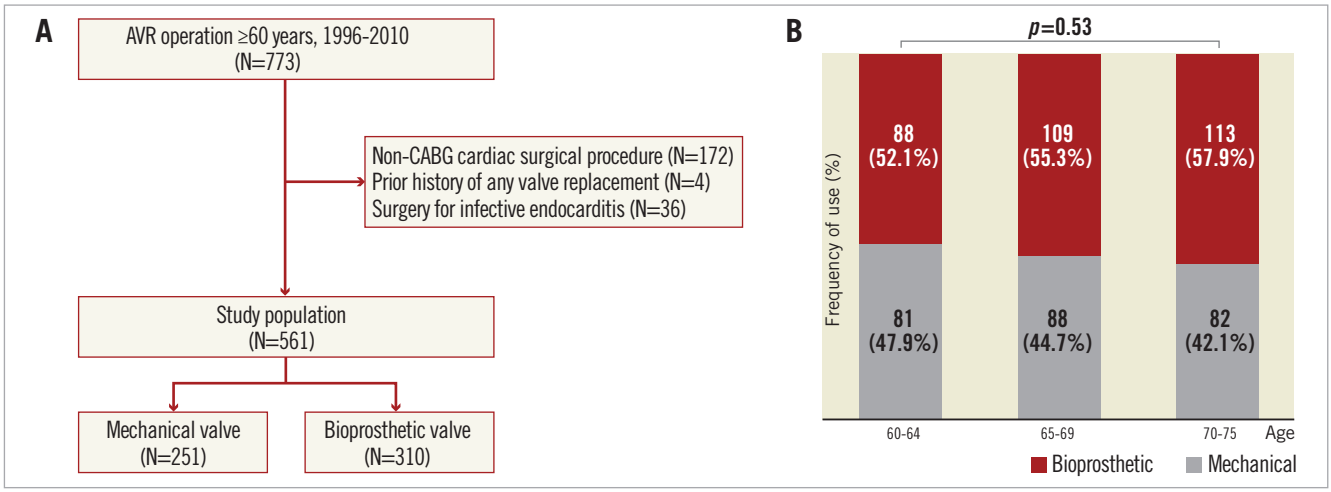

Figure 1. *Flow diagram detailing patient selection. AVR: aortic valve replacement; CABG: coronary artery bypass grafting*

CLINICAL OUTCOMES

There were no differences in early outcomes between mechanical and bioprosthetic valves **(Table 3)**. Four patients died after the index procedure in the mechanical group (1.6%), and eight patients died in the bioprosthetic group (2.6%, p=0.42).

In this registry, the 10-year cumulative mortality rate after AVR was 28.3% for patients who received mechanical valves and 31.6% for those who received bioprosthetic valves (unadjusted hazard ratio [HR] 1.30, 95% confidence interval [CI]: 0.91-1.86, p=0.15) **(Figure 2A, Table 4)**. After risk adjustment, patients who received bioprosthetic valves experienced a similar long-term survival rate to those who received mechanical valves (adjusted HR 1.25, 95% CI: 0.85-1.85, p=0.26) **(Figure 2B, Table 5)**.

The 10-year cumulative reoperation rates were 1.3% for patients who received mechanical valves and 5.8% for those who received bioprosthetic valves **(Table 4)**. The incidence of aortic valve reoperation was higher among patients who received bioprosthetic valves than among those who received mechanical valves although the difference did not reach statistical significance (unadjusted HR 2.70, 95% CI: 0.73-10.00; p=0.14). The result from the propensity score-matched cohort was similar (adjusted HR 2.94, 95% CI: 0.79-11.11, p=0.11) **(Figure 3A, Table 5)**.

The 10-year incidence of bleeding events was 24.5% for patients given mechanical valves and 6.9% for those given bioprosthetic valves as shown in (unadjusted HR 0.30, 95% CI: 0.16-0.54, p<0.0001) **(Table 4)**. After risk adjustment, patients who received bioprosthetic valves had a lower risk of bleeding (adjusted HR 0.25, 95% CI: 0.12-0.52, p<0.0001) **(Figure 3B)**. Among bleeding events, cerebral haemorrhage was lower in patients who received bioprosthetic valves (unadjusted HR 0.12, 95% CI: 0.01-0.97, p=0.046), but this statistically significant difference diminished after risk adjustment (adjusted HR 0.15, 95% CI: 0.02-1.22, p=0.08). Among

Table 3. Early outcomes.

Variables	Mechanical (N=251)	Bioprosthetic (N=310)	*p*-value
Death, n (%)	4 (1.6)	8 (2.6)	0.42
Thromboembolism, n (%)	0 (0.0)	0 (0.0)	>0.99
Pacemaker insertion, n (%)	1 (0.4)	2 (0.6)	0.69
Wound infection, n (%)	1 (0.4)	3 (1.0)	0.63
Pneumonia, n (%)	0 (0.0)	1 (0.3)	>0.99
Low cardiac output syndrome, n (%)	3 (1.2)	1 (0.3)	0.33
Length of stay, days	10.5±7.1	10.7±7.2	0.85

Table 2. Operative characteristics.

Variables	Mechanical (N=251)	Bioprosthetic (N=310)	*p*-value
Type of valve disease			
Aortic stenosis, n (%)	105 (41.8%)	147 (47.4%)	
Aortic regurgitation, n (%)	59 (23.5%)	68 (21.9%)	0.47
Mixed aortic stenosis and regurgitation, n (%)	87 (34.7%)	95 (30.6%)	
Cardiopulmonary bypass time, min	129±62	123±51	0.28
Aorta cross clamp time, min	80±37	80±32	0.97
Mechanical valves			
Carbomedics		54 (21.5%)	
Edwards MIRA		15 (6.0%)	
St. Jude Medical		143 (57.0%)	
Sorin Bicarbon		26 (10.4%)	
Others		13 (5.2%)	
Bioprosthetic valves			
St. Jude Medical Biocor		31 (10.0%)	
Carpentier Edwards		197 (63.5%)	
Medtronic Hancock®		63 (20.3%)	
Others		19 (6.1%)	

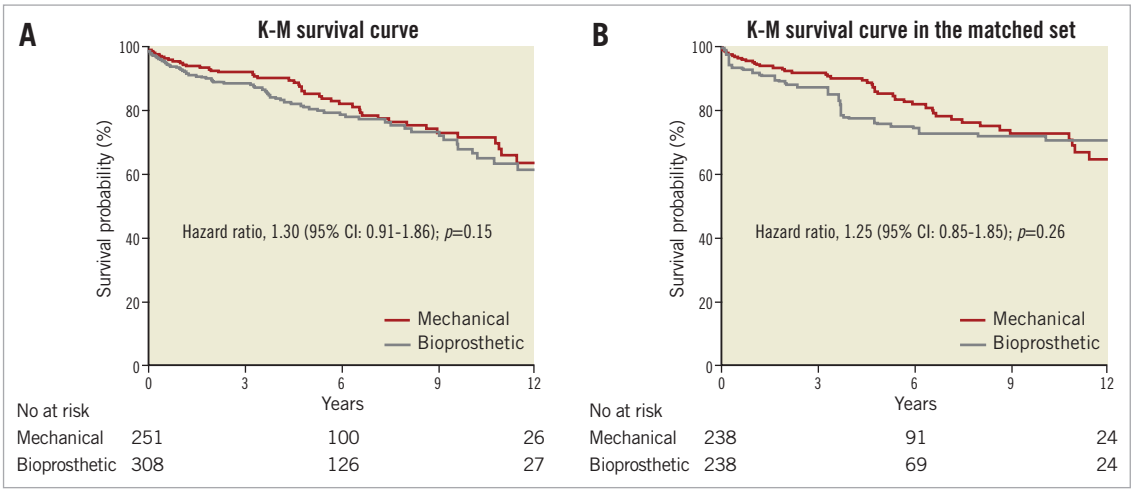

Figure 2. *Kaplan-Meier curves showing the unadjusted survival rate (A) and adjusted survival rate (B) according to valve type.*

51 patients who experienced bleeding events, 30 patients required hospitalisation (mechanical valve, n=22; bioprosthetic valve, n=8). There was a significant difference in the cumulative incidence of subsequent hospitalisation between the two groups (14.4% vs. 4.5%, p=0.009). Overall in-hospital duration was 12.0±19.7 days (mechanical valve, 14.2±23.4 days; bioprosthetic valve, 7.1±5.2 days, p=0.35). Among those who experienced bleeding events, 26 patients received a transfusion (mechanical valve, n=21; bioprosthetic valve, n=5). There was a significant difference in the cumulative incidence of receiving a transfusion (14.3% vs. 2.3%, p<0.001). There were no differences between the two groups in terms of units of transfused red blood cells, (3.3±1.8 units vs. 4.3±2.1 units, p=0.47), nor with fresh frozen plasma (3.5±1.8 units vs. 4.0±2.7 units, p=0.67). In line with total bleeding events, patients given a mechanical valve had a higher risk of hospitalisation due to a bleeding event (unadjusted HR 0.38, 95% CI: 0.18-0.81, p=0.012), as well as receiving a transfusion (unadjusted HR 0.23, 95% CI: 0.09-0.55, p=0.001).

The 10-year incidence of thromboembolism was similar between patients receiving mechanical and bioprosthetic valves (5.1% versus 6.5%; unadjusted HR, 1.03; 95% CI, 0.45 to 2.38; p=0.94) **(Table 4)**. There were no significant differences in the thromboembolism rate after risk adjustment (adjusted HR 0.38, 95% CI: 0.10-1.40, p=0.15) **(Figure 3C)**. In contrast, patients with bioprosthetic valves showed a trend towards more frequent endocarditis compared to those with mechanical valves (unadjusted HR 4.14, 95% CI: 0.91-18.87, p=0.067). This trend became evident after risk adjustment (adjusted HR 7.65, 95% CI: 1.74-33.52, p=0.007) **(Figure 3D)**.

By 12 years, MAPE had occurred in 29.6% of patients with mechanical valves and in 16.8% of patients with bioprosthetic valves (unadjusted HR 0.61, 95% CI: 0.40-0.92, p=0.017) **(Figure 3E)**. After risk adjustment, patients who received bioprosthetic valves had a lower risk of MAPE (adjusted HR 0.61, 95% CI: 0.39-0.96, p=0.033) **(Figure 3F)**.

SUBGROUP ANALYSIS OF LONG-TERM MORTALITY

Long-term mortality in the mechanical and bioprosthetic groups was compared by patient subgroup **(Figure 4)**. The risk of mortality

Table 4. Long-term outcomes.

Outcome	Mechanical valve (N=251)		Bioprosthetic valve (N=310)		*p*-value*
	Number of events	Incidence rate	Number of events	Incidence rate	
Death	44	28.3	64	31.6	0.15
Reoperation	3	2.4	7	5.8	0.12
Bleeding	38	24.5	13	6.9	<0.0001
Cerebral haemorrhage	6	4.8	1	1.4	0.017
Thromboembolisation	6	5.1	9	6.5	0.94
Thrombosis	0	0	0	0	>0.99
Embolism	6	5.1	9	6.5	0.94
Endocarditis	2	2.0	8	3.6	0.047
MAPE	52	29.6	40	16.8	0.016

**p*-value was estimated by log-rank test. MAPE: major adverse prosthesis-related events

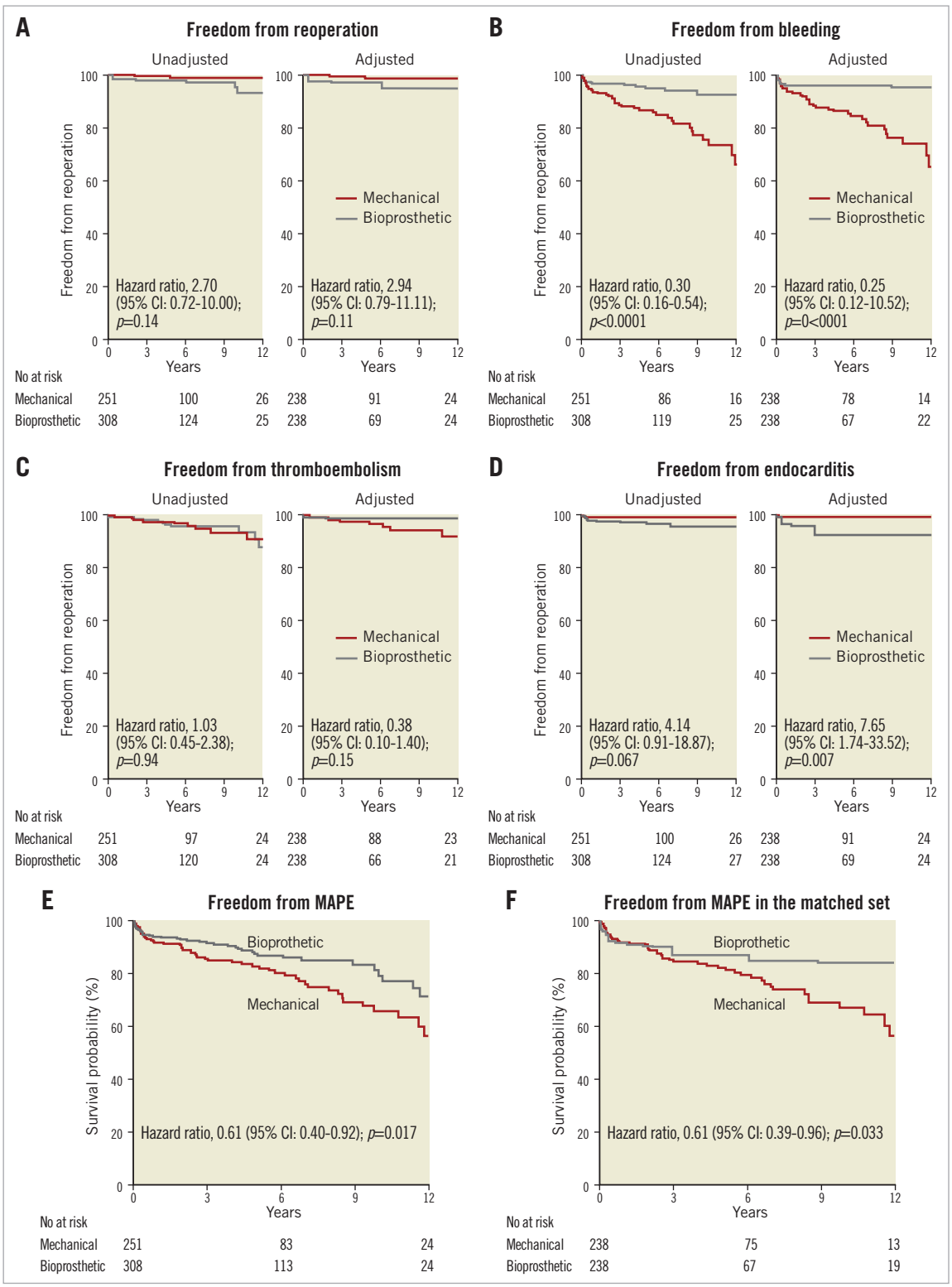

Figure 3. *Kaplan-Meier curves showing the unadjusted and adjusted rates of reoperation (A), bleeding (B), thromboembolism (C), and endocarditis (D), according to valve type. Unadjusted (E) and adjusted (F) MAPE rates. MAPE: major adverse prosthesis-related events (including reoperation, bleeding, thromboembolism or endocarditis)*

varied across patient characteristics. In general, the long-term mortality of patients who received bioprosthetic valves was similar to that of those who received mechanical valves. However, the long-term mortality of patients treated with bioprosthetic valves was higher in female and NYHA Class III/IV subgroups compared to those with mechanical valves.

Table 5. Adjusted hazard ratio between mechanical and bioprosthetic valve replacement.

	Unadjusted HR		Adjusted HR	
	HR (95% CI)	*p*-value	HR (95% CI)	*p*-value
Death	1.30 (0.91-1.86)	0.15	1.25 (0.85-1.85)	0.26
Reoperation	2.70 (0.72-10.00)	0.14	2.94 (0.79-11.11)	0.11
Bleeding	0.30 (0.16-0.54)	<0.0001	0.25 (0.12-0.52)	<0.0001
Cerebral haemorrhage	0.12 (0.01-0.97)	0.046	0.15 (0.02-1.22)	0.08
Thromboembolisation	1.03 (0.45-2.38)	0.94	0.38 (0.10-1.40)	0.15
Endocarditis	4.14 (0.9-18.87)	0.067	7.65 (1.74-33.52)	0.007
MAPE	0.61 (0.40-0.92)	0.017	0.61 (0.39-0.96)	0.033

MAPE: major adverse prosthesis-related events

Discussion

This observational study of 561 patients between 60 and 75 years of age who underwent AVR with mechanical valves and bioprosthetic valves demonstrates that: 1) overall mortality was similar for patients with mechanical and bioprosthetic valves; 2) bleeding events were more common in patients with mechanical valves but endocarditis was more frequent in those with bioprosthetic valves; 3) reoperation tended to occur more frequently in patients with bioprosthetic valves; and 4) overall composite events were more frequent in patients given mechanical valves.

In the Veterans Administration Study, patients who underwent AVR with mechanical valves had a significantly higher 15-year survival rate than those with bioprosthetic valves[3]. Brown et al, in a one-to-one study, matched patients aged 50 to 70 years undergoing AVR and found a 10-year survival of 68% in the mechanical valve group and 50% in the bioprosthetic valve group[11]. However, other studies demonstrated similar long-term survival. In the Edinburgh Heart Valve Trial, at 12 years there was a survival advantage in the mechanical valve group compared with the bioprosthetic valve group, but this advantage disappeared at 20 years[4]. Brennan et al compared outcomes of the Medicare-linked cohort study and found patients given a bioprosthesis had a similar adjusted risk for death[2]. Lung and Bland in a meta-analysis with regression analyses did not find significant differences in the survival rate between mechanical and bioprosthetic valves after correcting for age[12]. Our data was consistent with these previous studies. In the present study, 10-year mortality was 35.7% in patients with mechanical valves and 38.0% in those with bioprosthetic valves (p=0.15). Adjusted outcomes showed no difference in 10-year mortality between the two groups.

Previously, the advantages and disadvantages of mechanical or bioprosthetic valves have been well documented. The advantageous durability of mechanical valves is offset by the risk of thromboembolism and the need for long-term anticoagulation and its associated risk of bleeding. In contrast, bioprosthetic valves do not require long-term anticoagulation yet carry the risk of structural failure and reoperation. In our study, bleeding events were more common in patients with mechanical valves, but endocarditis was more frequent in those with bioprosthetic valves. Reoperation tended to occur more frequently in patients with bioprosthetic valves; however, thromboembolism did not show a difference between the two groups. Due to the large number of bleeding events, overall MAPE rates were higher for patients with mechanical valves. Although treating reoperation and bleeding events equally is controversial,

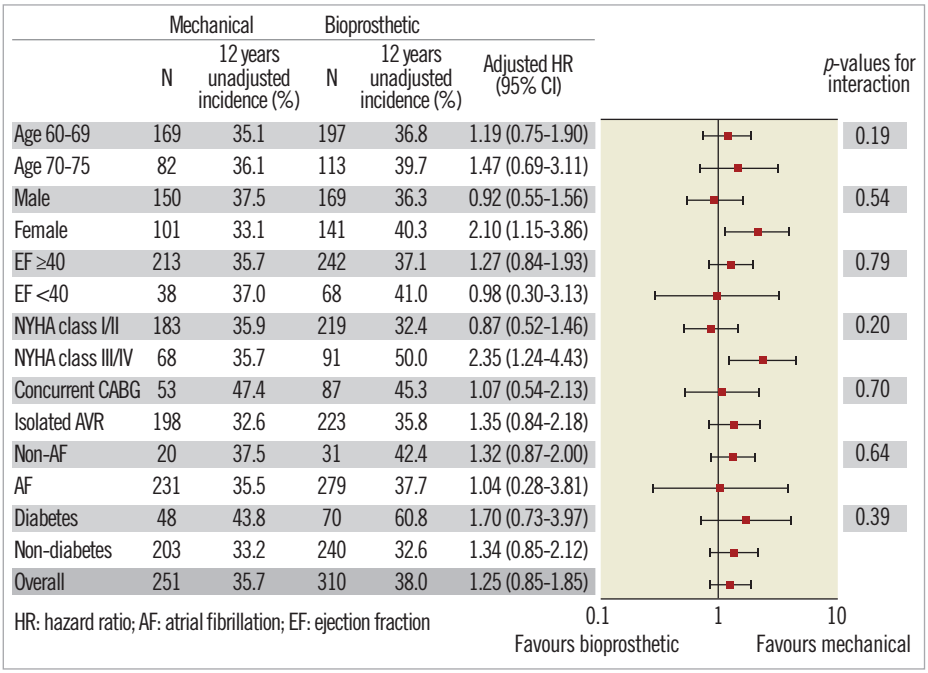

Figure 4. *Comparison of long-term mortality in mechanical and bioprosthetic groups by patient subgroup. AF: atrial fibrillation; EF: ejection fraction; HR: hazard ratio*

promising less invasive treatment for degenerated bioprostheses ("valve-in-valve" TAVR)[5,6] would allow us to consider the composite MAPE as non-negligible. In addition, the superior durability of current bioprostheses favours the selection of a bioprosthetic valve[13].

Bleeding, where the event rate ranges from 13.7% at 10 years to 24.4% at 15 years, is the Achilles heel of the mechanical valve[2,11]. In addition to the risk of bleeding, warfarin requires restrictions on food, alcohol and drugs, and lifelong coagulation monitoring. To overcome this complication of mechanical valves, new oral anticoagulation was applied in a randomised trial, but failed because of an excess of thromboembolic and bleeding events[14]. Thus, a quality of life study needs to be instigated on the choice of prosthesis.

There is a paucity of Asian data on the long-term outcomes of aortic valve replacement with mechanical and bioprosthetic valves. The risk of bleeding and thromboembolism has been shown to be different according to race, as was the chance of bioprosthetic valve degeneration. Therefore, our data will provide important information for the selection of prosthetic valves for AVR in an Asian population.

The physicians involved in the decision-making process should be very aware of patient outcomes with the use of different prostheses. An increasing risk of major adverse effects and lifestyle alteration, i.e., lifelong anticoagulation with warfarin after mechanical valve replacement, improved durability of new technologies but still relatively higher risk of reoperation after bioprosthetic valve replacement, the potential option of minimally invasive procedures in case of reoperation and, finally, the individual patient's preference should be fully discussed with the patient.

Study limitations

Our study has several important limitations. First, it was a single-centre observational study and may be subject to selection bias and confounding by unmeasured severity of illness which may be correlated with the use of different valves. Second, the number of patients and follow-up time duration were limited, and it is likely that reoperation after bioprosthetic valve replacement will increase. Finally, we could not reliably ascertain other important endpoints, such as cardiovascular symptoms, functional status or decrements in quality of life associated with the use of anticoagulation therapy for mechanical valves and the monitoring of anticoagulant dosages. Despite these limitations, the current analysis demonstrates clear findings in agreement with reported data, and provides important information to guide valve type selection for older patients in current daily practice.

Conclusions

The following observations should be made: 1) overall mortality was similar for patients with mechanical and bioprosthetic valves; 2) bleeding events were more common in patients with mechanical valves but endocarditis was more frequent in those with bioprosthetic valves; 3) overall composite events were more frequent in patients given mechanical valves.

Impact on daily practice

The trend in current practice seems to be more use of bioprosthetic AVR with the possibility to use TAVR if prosthetic valve stenosis or regurgitation occurs. Although this strategy needs further investigation, our study provides important information about the choice of prosthesis in older patients.

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Conflict of interest statement

The authors have no conflicts of interest to declare.

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