What Prosthesis Should Be Used at Valve Re-Replacement After Structural Valve Deterioration of a Bioprosthesis?

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Background. **The fate of bioprostheses (BP) and mechanical prostheses (MP) after valve re-replacement for bioprostheses is not well-documented. This research compares the late fate of these two valve types after valve re-replacement for structural valve deterioration (SVD) of a bioprosthesis.**

Methods. **Between 1975 and 2000, 298 patients had successful aortic valve re-replacements (AVRR) (BP n = 149, average age = 67.1 ± 12.3 years; MP 149, 58.9 ± 10.9) and 442 patients had successful mitral valve re-replacements (MVRR) (BP 155, 65.8 ± 14.1; MP 287, 60.8 ± 11.7) after SVD of a previous BP. Follow-up was five years in all groups.**

Results. **(1) Aortic position (AVRR): Survival favored MP over BP overall, at 10 years (70.3 ± 5.4% vs 56.7 ± 5.7%, $p = 0.0220$). This survival advantage was seen to be significant only in patients less than 60 years of age (at 10 years, 85.3 ± 4.9% vs 59.2 ± 9.8%, $p = 0.038$). No significant difference in survival between the two valve types was observed in patient age groups greater than 60 years of age. Freedoms from valve-specific complications, including reoperation for SVD-thrombosis, major thromboembolism and hemorrhage, and valve-related mortality were not significantly different between the two groups overall. (2) Mitral position (MVRR): Survival favored MP over BP overall (58.6 ± 4.2% vs 42.1 ± 5.2%, $p = 0.0011$), and in patients greater than 70 years of age (32.8 ± 8.9% vs 16.7 ± 7.1%, $p = 0.008$). Freedoms from valve-specific complications and valve-related mortality favored MP over BP.**

Conclusions. **There was no clinical performance difference between mechanical and bioprosthetic valves in patients greater than 60 years of age upon AVRR. Mechanical valves generally outperformed bioprosthetic valves in all age groups in MVRR.**

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Reoperation for structural valve deterioration of bioprostheses is an increasingly frequent indication for surgery due to increasing valve replacement operations and increasing long-term survival of patients. It is therefore important to have valid clinical protocols for valve reoperation.

There is extensive literature comparing the performances of mechanical and bioprosthetic valves [1–6]. Mechanical valves are thrombogenic so that patients require indefinite anticoagulation thereby predisposing to hemorrhagic complications [1–6]. Bioprostheses, on the other hand, have limited durability and the risks of reoperation are considerable [1–9]. At valve replacement surgery, the risks of bioprosthetic valves are weighed against those of mechanical valves.

Upon reoperation, other considerations arise, such as whether a structurally failed bioprosthetic valve is a contraindication for another, and whether a second bioprosthesis will outlast the life expectancy of an elderly patient. The risks and early consequences of reoperation after valve deterioration of bioprosthetic valves were reported previously in two studies that assessed reoperation in the aortic and mitral positions [8, 9]. Late performances of mechanical and bioprosthetic valves after reoperation have yet to be adequately addressed in current literature.

The purpose of this report is to determine the long-term fate of bioprosthetic and mechanical valves in different age groups after reoperation for structural failure of a previously inserted bioprosthetic valve. This will provide information to assist the surgeon to choose the best prosthesis in this particular situation.

Patients and Methods

This is a retrospective study of prospectively collected data from the University of British Columbia Cardiac Valve Database. The database has received annual renewal from the University of British Columbia Research Ethics Board, which has a formal consenting process of patients. It includes all patients who had a single valve re-replacement (second operation) for structural valve deterioration (SVD) of a bioprosthetic valve at the University of British Columbia between 1975 and 2000. There

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Table 1. Patient Distribution in Age Groups

Age Group (Years)	Aortic Valve Re-replacement		Mitral Valve Re-replacement	
	Biological (No. of Patients)	Mechanical (No. of Patients)	Biological (No. of Patients)	Mechanical (No. of Patients)
<60	35	68	44	117
60–64	14	32	13	48
65–69	23	27	17	55
≥70	77	22	81	67
Overall	149	149	155	287

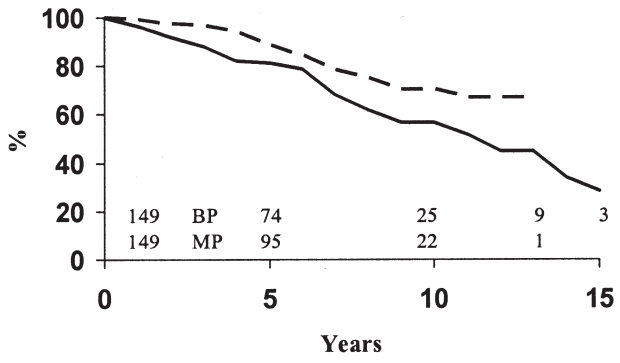
were 481 mitral re-replacements. In the corresponding aortic population, 322 re-replacements were performed. Patients having multiple replacements, patients undergoing their second (or further) valve re-replacement (third or more operation), and patients who did not survive re-replacement surgery were excluded from this study.

The end points compared were survival and major valve-related complications, including structural valve deterioration, thromboembolism, and hemorrhage, further reoperation, and valve-related mortality. The "Guidelines for Reporting Morbidity and Mortality After Cardiac Valvular Operations" [10] was used to define the complications.

Actuarial analyses of survival were performed by the Kaplan-Meier method and are presented with standard error of the estimate. Actuarial curves were compared using the log-rank statistical test where p values less than 0.05 are considered significant. For the other end points, both actual as well as actuarial analyses were used. It should be noted that it is not appropriate to statistically compare actual curves.

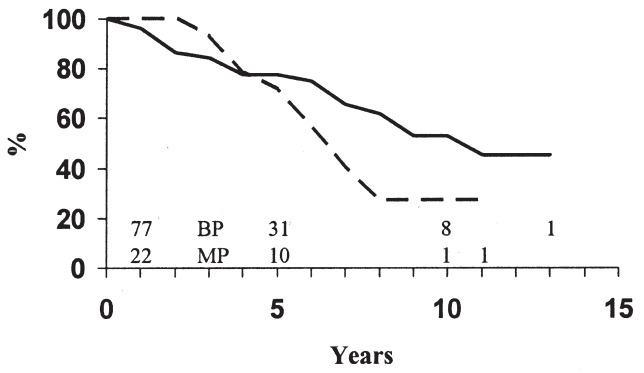
Follow-up was for an average of 5.2 ± 4.6 (bioprostheses) and 5.9 ± 3.6 (mechanical prostheses) years after aortic reoperation and 4.8 ± 5.0 (bioprostheses) and 5.8 ± 3.8 (mechanical prostheses) years after mitral reoperation. Follow-up was 98.5% complete.

Cardiac rhythm was documented before the re-replacement for SVD and(or) after the re-replacement for SVD, whether the patient received a mechanical prosthesis or bioprosthesis. The antithrombotic medication, whether anticoagulation or antiplatelet therapy, was documented after the reoperation for SVD. All mechanical prostheses patients were expected to be on anticoagulation management. Prior to 1989, the aortic bioprosthesis replacement patients were generally managed with anticoagulation up to 3 months if they were in sinus rhythm and continually if they were in atrial fibrillation or had other risk factors for thromboembolism. After 1989, our practice gradually changed with the use of only antiplatelet therapy for aortic bioprostheses if the cardiac rhythm was that of sinus. The combination of anticoagulant and antiplatelet therapy was not generally used. The interna-



	%±SE		
	8yrs	10yrs	15yrs
BP	62.0±5.4	56.7±5.7	28.4±8.8
MP	74.9±4.7	70.3±5.4	67.0±6.1(13yrs)
	p=0.022	MP>BP	

Fig 1. Survival after aortic valve re-replacement patients overall. (— = bioprostheses [BP]; – – – = mechanical prostheses [MP].)



	%±SE		
	8yrs	10yrs	13yrs
BP	62.0±7.9	53.1±9.0	45.5±10.4
MP	27.2±14.3	27.2±14.3	27.2±14.3 (11yrs)
		p=0.166(NS)	

Fig 2. Survival after aortic valve re-replacement patients greater than 70 years of age. (— = bioprostheses [BP]; – – – = mechanical prostheses [MP].)