

Repeat Mitral Valve Replacement: 30-Years' Experience

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Prosthetic heart valve dysfunction is an acquired condition that carries a significant risk of emergency surgery. However, the long-term natural history of the condition is not well understood. Between 1974 and 2006, 1535 isolated mitral valve replacements were performed at our hospital (in-hospital mortality 5%). In total, 369 patients needed a second operation (in-hospital mortality 8.1%), while 80 (age 59.8[11.4] years) needed a third. The reasons for the third intervention were structural deterioration (67.5%), paravalvular leak (20%), and endocarditis (6.3%). Some 15 patients died in hospital (18.8%). After a mean follow-up period of 17.8 years, 21 patients needed another intervention (ie, a fourth intervention). The actuarial reoperation-free rate at 20 years was 40.1% [13.8%]. The late mortality rate was 58.5% (18-year survival rate 15.4% [5.4%]). Indications for repeat mitral valve replacement must be judged on an individual basis given the high risk associated with surgery.

Key words: *Valvular reoperation. Mitral valve dysfunction. Repeat valvular surgery.*

Reintervenciones múltiples sobre la válvula mitral: 30 años de experiencia

La disfunción protésica es una enfermedad adquirida con significativo riesgo quirúrgico inmediato, aunque la historia natural a largo plazo es poco conocida. Entre 1974 y 2006 se realizaron 1.535 recambios mitrales aislados (mortalidad hospitalaria, 5%). Un total de 369 pacientes requirieron una segunda intervención (mortalidad hospitalaria, 8,1%) y 80, una tercera (59,8 ± 11,4 años). Las causas de la tercera intervención fueron deterioro estructural (67,5%), dehiscencia periprotésica (20%) y endocarditis (6,3%). La mortalidad hospitalaria fue 15 (18,8%) pacientes. Tras un seguimiento medio de 17,8 años, 21 pacientes precisaron nueva intervención (cuarta intervención) y la curva actuarial libre de reoperación fue del 40,1% ± 13,8% a 20 años. La mortalidad tardía fue del 58,5% (supervivencia a 18 años, 15,4% ± 5,4%). La indicación de una reintervención reiterativa mitral debe evaluarse de forma individualizada, dado el alto riesgo quirúrgico asociado.

Palabras clave: *Reintervención valvular. Disfunción mitral. Cirugía valvular reiterativa.*

INTRODUCTION

The mortality associated with repeat valve repair is 4.7% to 6.8% for scheduled surgery^{1,2} and as high as 25% to 41% for emergency reoperations, as in the case of prosthetic heart valve thrombosis.³ However, the long-term natural history of patients who require various reoperations for prosthetic mitral valve dysfunction is not well understood. The purpose of

this retrospective study is to analyze the early and long-term outcome of patients who require repeat operations for prosthetic mitral valve dysfunction.

METHODS

Between 1974 and 2006, 1535 isolated mitral valve replacements (MVR) were performed in our hospital (879 bioprosthetic, 656 mechanical). The mean age of patients at the time of the first operation was 56.2 (13.9) years and the causes were rheumatic valve disease (57.7%), degenerative disease (35.9%), or other (6.4%). The in-hospital mortality in this group was 5% (cardiac, 50; infectious, 7; respiratory, 3; renal, 2; hemorrhagic, 5; neurologic, 3).

During follow-up, 369 (24%) patients required a second MVR operation (119 bioprosthetic, 250

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Clinical Characteristics of the Various Repeat Operations

	1st Operation	2nd Operation	3rd Operation	4th Operation
Patients, n	1535	369	80	19
Age, mean (SD), y	56.2 (13.9)	58.1 (11.2)	59.8 (11.4)	62 (8)
Ischemia time, min	53.8 (26.7)	62.6 (31.4)	74 (34)	81.3 (48.5)
On-pump time, min	81.2 (37.7)	93 (41.2)	117 (50.9)	139.2 (68.04)
Reason for operation				
Structural deterioration	–	82.7%	72.5%	42.1%
Valvular leak	–	9%	20%	42.1%
Endocarditis	–	5.1%	6.3%	15.8%
In-hospital mortality	5%	8.1%	18.8%	42.1%
Mortality for elective/urgent surgery	4.7%/20.7%	7.3%/30.8%	17.3%/40%	40%/44.4%

SD indicates standard deviation.

mechanical), after an average of 7.9 years. At that time, the mean age was 58.1 (11.2) years. The main reasons for the second operation were structural deterioration of the bioprosthesis (82.7%), paravalvular leak (9%), infective endocarditis (5.1%), and prosthetic thrombosis (3.2%). In-hospital mortality was 8.1% (cardiac, 20; infectious, 4; respiratory, 3; renal 2; hemorrhagic, 1). The study included 80 patients (45 women, 35 men) who required a third mitral valve operation an average of 5.5 years after the previous operation and 13.4 years after the first operation involving the native valve. All patients underwent surgery consecutively and no one was excluded for clinical, emergency, or other reasons. The mean age was 59.8 (11.4) years. At the time of the third MVR, 39% of patients were in functional class IV and 61% in class II-III. Left ventricular function on ventriculography was <35% in 11.1%, 35%-50% in 66.7%, and >50% in 22.2%. Mean pulmonary artery systolic pressure was 65.2 (25) mm Hg. The surgical indication was established as structural deterioration (72.5%), paravalvular leak (20%), infective endocarditis (6.3%), and prosthetic thrombosis (1.2%). Two etiologic groups were considered: structural deterioration of the bioprosthesis (n=58) and annular disease (endocarditis or paravalvular leak, n=21). The main perioperative data are shown in Table.

The operation was performed as usual, with on-pump circulation and moderate hypothermia. Myocardial protection consisted of anterograde crystalloid cardioplegia before 1991 and anterograde and/or retrograde hematic cardioplegia thereafter. In the first operation on the native valve, the ischemia time was 53.8 (26.7) minutes and the on-pump time was 93 (41.2) minutes. In the second operation, the times were 62.6 (31.4) and 81.2 (37.7) minutes, respectively, and in the third, 74 (34) and 117 (50.9) minutes. The procedure consisted of a new valve replacement with a mechanical prosthesis in 49 patients and biological prosthesis in 31.

The procedures were associated with aortic valve replacement in 12 and tricuspid valve annuloplasty in 16.

Follow-up

Follow-up was handled by the outpatient service and by contact with the patients or their relatives. The information was completed by contacting the hospitals and consulting the databases of the health services of the various autonomous communities of origin, the admission and clinical documentation services, and in some cases, the health centers. All patients were followed up after the third operation, although 2 patients were lost to follow-up at 7.8 and 14.2 years. The maximum follow-up possible was 5398 months and the actual follow-up obtained was 5306 months; hence, the follow-up was complete at 98.3%, with a mean follow-up of 17.8 (range, 2-32) years.

Statistical Analysis

The values are expressed as the mean (SD). The Student *t* test was used to compare quantitative variables, and survival and event-free curves were calculated using the actuarial method. Stata Intercooled, version 6 (Stata Corporation, College Station, Texas, United States), was used for the statistical calculations.

RESULTS**In-hospital Mortality**

Fifteen patients died in hospital (18.8%) after the third operation. This figure is statistically significant ($P<.05$) when compared to the in-hospital mortality

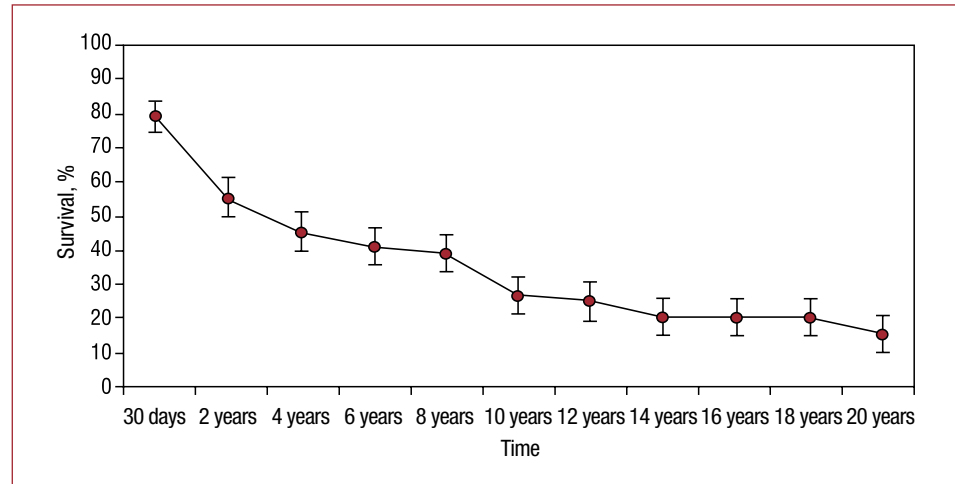


Figure 1. Actuarial survival rate for the group of patients with 3 mitral operations.

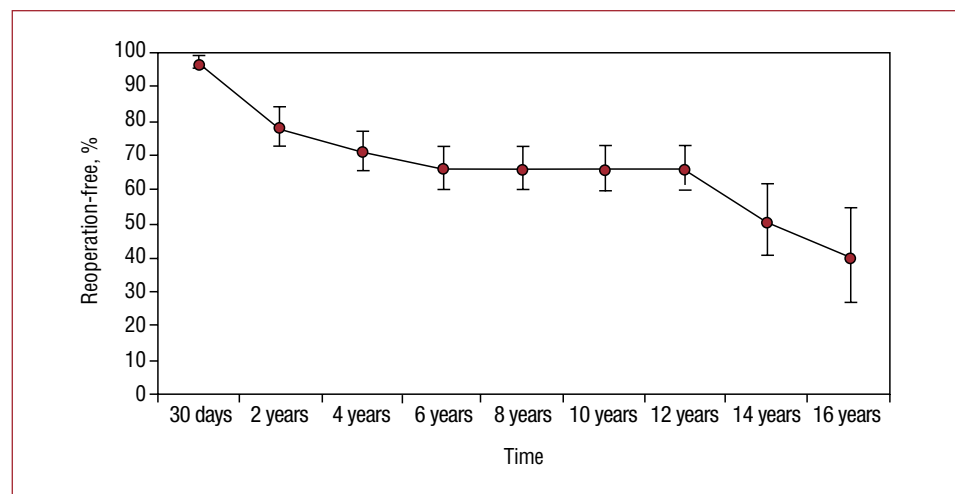


Figure 2. Actuarial reoperation-free rate for the group of patients with 3 mitral operations.

of the first and the second operation (5% and 8.1%, respectively). The cause of death was cardiac in 8 patients, hemorrhagic in 3, infectious in 2, and neurologic in 2. Late mortality comprised 38 (58.5%) deaths, mainly cardiovascular (35 patients), including 8 in successive reoperations; 2 were due to cancer and 1 to a traffic accident. In-hospital mortality was 17.8% and late mortality 55.4% when the lesion was structural deterioration of a bioprosthesis, and 14.3% (nonsignificant) and 61.9% ($P=.07$) when the etiology was annular disease (endocarditis or valvular leak). The actuarial survival rate was 40.7% (5.7%) at 6 years, 24.6% (5.4%) at 12 years, and 15.4% (5.4%) at 18 years (Figure 1).

Subsequent Reoperations

Of the 65 survivors, 19 (29.2%) required a fourth mitral operation, 42.1% for structural deterioration, 42.1% for paravalvular leak, and 15.8% for

endocarditis; in-hospital mortality was 42.1% and late mortality 26.3%. The actuarial reoperation-free rate (Figure 2) was 65.8% (6.8%) at 6 years, 50.3% (10.9%) at 14 years, and 40.1% (13.8%) at 20 years. A statistically significant relationship was observed between the need for reoperation and etiology. New reoperations were required for structural deterioration of the bioprosthesis in 21.4%, and for annular disease (endocarditis or valvular leak) in 42.9% ($P=.035$).

DISCUSSION

Prosthetic valve dysfunction is an acquired condition that presents in up to 10% of patients after the first MVR.^{1,2} A decrease in early mortality from 7%-20%¹⁻³ to 4%-5% has been reported in recent publications.³ The long-term natural history, however, is not well defined. Nonetheless, it is understood that the outcome for patients with repeat

reoperations is not necessarily satisfactory.³ The literature on repeat reoperations is scanty and often mixes several types of reoperations. The main reason for the initial reoperation for prosthetic dysfunction is structural deterioration of the bioprosthesis. The widespread use of bioprostheses in our series can be explained by the difficulties encountered to ensure adequate anticoagulation in our population during the earlier years of this experience.⁴ Repeat replacements were associated with high mortality in our experience, with early mortality at 18.8% and late mortality at 58.5% over a mean follow-up of 18 years. Certain approach routes, such as left thoracotomy or the Heart Port technique, can help reduce high early mortality. In addition, 19 patients required a fourth operation, with an actuarial reoperation rate of 40% at 16 years. The risk in the first elective reoperation is low and, therefore, the indication of bioprosthesis has been extended to populations of young patients.³ However, in-hospital mortality progressively increases with each new reoperation. This study showed that the mean age of the patient groups was very similar in the successive operations, likely because the durability of the bioprosthesis is lower in young patients and in the mitral position, as we have reported previously.⁵ In subsequent reoperations, annulus involvement (endocarditis or valvular leak) gradually becomes

more important than the structural deterioration of the bioprosthesis, and is associated with higher mortality. In conclusion, repeat prosthetic mitral valve dysfunction has a poor early and late prognosis and high associated mortality. Annular disease (valvular leak or endocarditis) results in a high incidence of reoperations. The indication for a repeat valve surgery should be assessed on an individual basis because the associated surgical risk is very high.

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