

Surgical outcomes following mitral valve surgery

เจริญเกียรติ ฤกษ์เกลี้ยง¹
อภิรักษ์ เชษฐเผ่าพันธ์²
วรวิทย์ จิตติถาวร²
ประเสริฐ วศินานุกร¹

Abstract:

Surgical outcomes following mitral valve surgery

Rergkliang C, Chetpaophan A, Chittithavorn V, Vasinanukorn P.

Division of Cardiovascular and Thoracic Surgery, Department of Surgery,

Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand

Songkla Med J 2005;23(3):131-136

Objective: To report the surgical outcomes after mitral valve surgery at Songklanagarind Hospital

Design: Retrospective descriptive study

Materials and methods: The medical records of all patients who underwent mitral valve surgery between January 2001 and December 2003 at Songklanagarind Hospital were reviewed. The following data was examined: preoperative clinical characteristics, echocardiographic reports, operative technique, postoperative course and short-term clinical outcomes.

Results: There were 122 patients, with a mean age of 38.17 ± 15.73 years (range 10-72 years). The New York Heart Association classes (NYHA class) I, II, III and IV were 2 (1.6%), 36 (29.5%), 57 (46.7%) and 27 (22.1%), respectively.

¹M.D., Assist. Prof., ²M.D. Lecture Division of Cardiovascular and Thoracic Surgery, Department of Surgery, Faculty of Medicine, Prince of Songkla University, Hat Yai, Songkhla, 90110, Thailand

รับต้นฉบับวันที่ 26 สิงหาคม 2547 รับลงตีพิมพ์วันที่ 6 พฤษภาคม 2548

Seventy-one patients (58.2%) had atrial fibrillation and 51 (41.8%) had sinus rhythm. Mitral stenosis was predominant in our patients (53.3%), and the most common etiology was rheumatic heart disease (84.4%). Mitral valve replacement was the most common procedure (64.8%). The 30-day mortality rate was 2.4% (3 patients). The mean follow-up was 10.89 ± 5.08 months (range 4-32 months) and there were 2 deaths during follow-up. Most of the survivors were in NYHA class I (85%).

Conclusion: We achieved a good surgical outcome in mitral valve surgery from our initial experience.

Key words: mitral valve disease, surgery, outcome

บทคัดย่อ:

วัตถุประสงค์: เพื่อรายงานผลการผ่าตัดรักษาผู้ป่วยโรคลิ้นหัวใจไมตรัลในโรงพยาบาลสงขลานครินทร์

รูปแบบวิจัย: พรรณนาแบบย้อนหลัง

วัสดุและวิธีการ: รวบรวมข้อมูลจากเวชระเบียนผู้ป่วยที่เข้ารับการรักษาโดยการผ่าตัดลิ้นหัวใจไมตรัลในโรงพยาบาลสงขลานครินทร์ ตั้งแต่เดือนมกราคม พ.ศ. 2544 จนถึงเดือนธันวาคม พ.ศ. 2546 โดยรวบรวมข้อมูลเกี่ยวกับลักษณะทางคลินิกของผู้ป่วยก่อนการผ่าตัด, ชนิดของการผ่าตัด, อัตราการเกิดภาวะแทรกซ้อน, อัตราการเสียชีวิต และผลการผ่าตัดในระยะสั้น

ผลการศึกษา: ผู้ป่วยทั้งหมด 122 ราย อายุเฉลี่ยของผู้ป่วยเท่ากับ 38.17 ± 15.33 ปี (พิสัย 10-72 ปี) จำแนกผู้ป่วยตาม NYHA class I, II, III และ IV คือ 2 (ร้อยละ 1.6), 36 (ร้อยละ 29.5), 57 (ร้อยละ 46.7) และ 27 (ร้อยละ 22.1) ตามลำดับ ผู้ป่วย 71 ราย (ร้อยละ 58.2) มีจังหวะการเต้นของหัวใจเป็นแบบ atrial fibrillation ผู้ป่วยส่วนใหญ่มีลิ้นหัวใจไมตรัลแบบตีบ (ร้อยละ 53.3) และสาเหตุของโรคลิ้นหัวใจไมตรัลส่วนใหญ่เกิดจากโรคไขว้หมากติ (ร้อยละ 84.4) การผ่าตัดส่วนใหญ่ คือ การเปลี่ยนลิ้นหัวใจไมตรัลโดยใช้ลิ้นหัวใจเทียม (ร้อยละ 64.8) อัตราการเสียชีวิตใน 30 วันแรกของการผ่าตัดคิดเป็นร้อยละ 2.4 และมีผู้ป่วยอีก 2 รายเสียชีวิตในภายหลังระหว่างการติดตามผลการรักษา ระยะเวลาในการติดตามผลการรักษาโดยเฉลี่ย 10.89 ± 5.08 เดือน (พิสัย 4-32 เดือน) ผู้ป่วยส่วนใหญ่อยู่ใน NYHA class I (ร้อยละ 85) ภายหลังการผ่าตัด

สรุป: จากประสบการณ์การผ่าตัดลิ้นหัวใจไมตรัลในระยะแรกในโรงพยาบาลสงขลานครินทร์ ได้ผลการรักษาเป็นที่น่าพอใจ

คำสำคัญ: โรคลิ้นหัวใจไมตรัล, การผ่าตัด, ผลการผ่าตัด

Introduction

Surgical treatment of severe mitral valve disease has become a standard therapy.^{1,2} Operative mortality rates for mitral valve surgery have been reported at from 1% to 15% depending upon the preoperative risk factors.^{1,3,4} Among the survivors, the long-term outcomes are very favorable.^{1,5,6} We first performed open heart surgery in August 2001 and mitral valve surgery has become a common operative procedure.⁷ The purpose of this study was to report the surgical outcomes after mitral valve surgery at Songklanagarind Hospital.

Materials and methods

The medical records of all patients undergoing mitral valve surgery with or without tricuspid valve repair between January 2001 and December 2003 were reviewed. Patients who required coronary artery bypass surgery were excluded from this study. Preoperative clinical characteristics, echocardiographic reports, operative variables, postoperative courses and short-term clinical outcomes were reviewed.

The operation was performed using a standard technique for cardiopulmonary bypass. Mild systemic hypothermia was used in all patients (32-34°C). Myocardial protection was

achieved by antegrade cold blood cardioplegia with topical myocardial cooling. The mitral valve was approached via a lateral left atrial incision when only a mitral valve procedure was addressed and a trans-septal approach was used when concomitant tricuspid valve repair was required.

Results

One hundred and twenty-two patients underwent mitral valve surgery with or without tricuspid valve repair between January 2001 and December 2003 at Songklanagarind Hospital. Forty-one patients (33.6%) were male and 81 patients (66.4%) were female. The mean age was 38.17 ± 15.73 years (range 10–72 years). The clinical characteristics are summarized in Table 1.

Table 1 Clinical characteristics

Clinical characteristics	N (%)
NYHA Class*	
I	2 (1.6)
II	36 (29.5)
III	57 (46.7)
IV	27 (22.1)
Pre-operative cardiac rhythm	
SR**	51 (41.8)
AF***	71 (58.2)
History of stroke	
Yes	10 (8.2)
No	112 (91.8)
Diagnosis	
MS****	65 (53.3)
MR*****	39 (32.0)
Mixed MS/MR	14 (11.5)
Prosthetic complication	4 (3.2)

*NYHA = New York Heart Association

**SR = Sinus rhythm

***AF = Atrial fibrillation

****MS = Mitral stenosis

*****MR = Mitral regurgitation

Rheumatic heart disease was the most common etiology in our patients (103/84.4%). Native valve endocarditis was found in 8 patients (6.6%). Seven patients (5.7%) had a myxomatous or degenerative valve disease and 4 patients (3.2%) had a prosthetic valve complication (2 with prosthetic valve thrombosis and 2 with prosthetic valve endocarditis).

Nineteen patients (15.6%) required inotropic medication before the operation and 1 patient was supported by an intra-aortic balloon pump (IABP) preoperatively.

The mean left ventricular ejection fraction (LVEF) was $49.80 \pm 21.66\%$ (range 40% to 70%) and the mean estimated systolic pulmonary artery pressure was 35.42 ± 33.75 mmHg (range 30.0 to 115.0 mmHg).

The most common operative procedure was a mitral valve replacement (64.8%). Mitral valve repair was done in 16 patients (13.1%). The variation of operative procedures is shown in Table 2.

Table 2 Operative procedures

Procedure	N (%)
MVR*	79 (64.8)
MVR + TV** Repair	18 (14.7)
MV*** Repair	14 (11.5)
MV Repair + TV Repair	2 (1.6)
Redo MVR	9 (7.4)
Total	122 (100)

*MVR = Mitral valve replacement

**TV = Tricuspid valve

***MV = Mitral valve

Mechanical valves (bileaflets prosthesis in all cases) were more often implanted than bioprostheses: in 99 (93.4%) patients and 7 (6.6%) patients, respectively. Mitral valve repair was done using a variety of techniques and supported with a posterior annuloplasty band (Homemade Dacron C-band). One patient in the repair group had a complication of severe hemolysis after the operation and a re-operation was done on post-operative day 7. The mean cardiopulmonary bypass time was 75.8 ± 21.0 min (range 33 to 156 min)

and aortic cross clamp time was 51.8 ± 13.6 min (range 21 to 91 min).

The mean postoperative ventilatory support was 18.2 ± 43.7 hours (range 2-400 hours) and the distribution of ventilation times is shown in Figure 1. The mean ICU length of stay and postoperative length of stay were 1.98 ± 2.38 days (range 1-22 days) and 9.12 ± 7.54 days (range 2-60 days), respectively (Figures 2 and 3).

Postoperative arrhythmia requiring intervention occurred in 22 patients (18.0%). Sixteen had atrial fibrillation with a rapid ventricular response and amiodarone infusion was used to slow the ventricular response rate. A temporary pacemaker was used to treat bradycardia in 6 patients. Low cardiac output syndrome was observed in 19 patients (15.6%). The other postoperative complications are shown in Table 3.

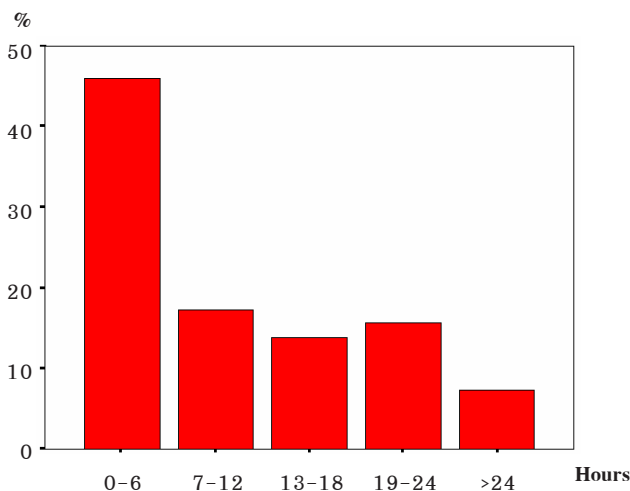


Figure 1 Distribution of postoperative ventilator time

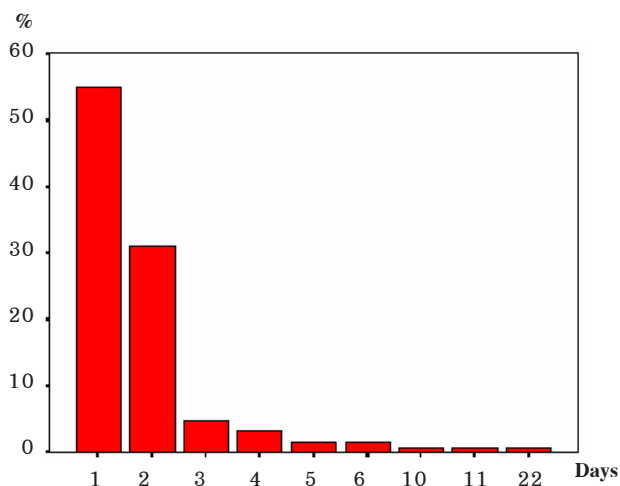


Figure 2 Duration of ICU stay

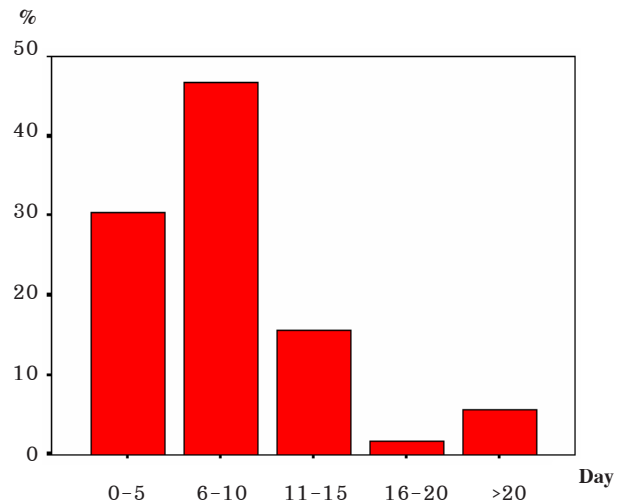


Figure 3 Length of postoperative hospital stay

Table 3 Postoperative complications

Complication	N (%)
Arrhythmia	22 (18.0)
Low cardiac output	19 (15.6)
Stroke	2 (1.6)
Pneumonia	1 (0.8)
Acute renal failure	1 (0.8)
Re-operation for bleeding	1 (0.8)
Re-operation for hemolysis	1 (0.8)

The 30-day mortality rate was 2.4% (3 patients). The first patient was a sudden death on postoperative day 2 after an uneventful bileaflets mechanical valve replacement. Prosthetic valve dysfunction or arrhythmia was suspected (an autopsy was not done for religious reasons). The second patient died on post-operative day 7 from low cardiac output, sepsis and acute renal failure. The third patient died from delayed cardiac tamponade (3rd week post-operation).

The mean follow up was 10.89 ± 5.08 months (range 4-32 months). There were 2 deaths from infective endocarditis and cerebral hemorrhage. One patient had severe hemolysis following mitral valve repair and a re-operation was done for mitral valve replacement (2 months after the initial operation). Two patients had a prosthetic valve thrombosis and both of them underwent a successful re-operation. Most of the survivors were in NYHA class I (100/85%) and the remainders were in NYHA class II (17/15%).

Discussion

Surgical treatment for severe mitral valve abnormalities has become a standard therapy.^{1,2} The primary aim is to improve the overall functional capacity and health of patients.

During the past 50 years, there has been a dramatic shift in the causes of mitral valve disease in the United States, with a marked decline in the incidence of rheumatic heart disease and an increase in age-related degenerative valve disease.¹ However, rheumatic heart disease remains the major cause in our surgical group, with 103 patients (84.4%) in our series having a rheumatic heart disease. Only 7 patients (5.7%) had a degenerative valve disease.

The clinical characteristics in our series, namely the distribution of NYHA classes and the history of stroke, was comparable with the report from the Society of Thoracic Surgery Database (STS Database),^{3,8} but the mean age of our patients was younger (38.17 years versus 59.9 years) because the majority of cases in our series had rheumatic heart disease. The incidence of atrial fibrillation and the incidence of patients requiring inotropic support preoperatively were also slightly higher in our patients when compared with the report from the STS Database.⁸ These findings may be due to a lack of cardiologists and cardiac surgeons in our region and delay in referral for surgery.

Mitral valve replacement was the most common procedure in our series because 64.8% of our patients had severe mitral stenosis or severe mixed lesion. Mitral valve repair was done in only 16 patients (13.1%), although this procedure has become the preferred operation for mitral regurgitation.^{9,10} Several advantages over mitral valve replacement have been confirmed, in terms of early and late mortality and morbidity.¹¹ However, mitral valve repair in the rheumatic process is a complex procedure, especially in patients who have severe valvular, annular or subvalvular pathology. Good surgical results of mitral valve repair are usually reported in degenerative valve disease,^{9,10,12} with the most important requirement in achieving good results being the surgeon's experience.

Two patients in our mitral valve repair group had severe hemolysis postoperatively (one week and two months post-operation), both young girls with rheumatic heart disease.

The mechanism of hemolysis in these particular cases may have been due to a repair failure as they both had grade 3+ mitral regurgitation as assessed by transthoracic echocardiography. In the re-operation, we did not find any dehiscence from previous repair work. We concur with Lam et al.¹³ that hemolysis is a mode of failure for mitral valve repair. If the intraoperative transesophageal echocardiography had been available, re-operation for these two patients could have been avoided.

The 30-day mortality rate was 2.4%, which is comparable with other findings (1-15%).^{1,3,4} The causes of death were cardiac complications (sudden death, low cardiac output and cardiac tamponade), which was similar to the other series.¹⁴ There were many risk factors for operative mortality, including emergency surgery, re-operation, renal failure, active endocarditis, an advanced NYHA class and being female.^{1,3,4,8}

Postoperative cardiac complications (arrhythmia and low cardiac output) in our series usually occurred in patients who had an advanced NYHA class and preoperative atrial fibrillation. We also recommend that surgery should be offered in symptomatic patients before the onset of atrial fibrillation.^{1,2}

The occurrence of stroke remains a potentially devastating complication after a cardiac operation, with an incidence rate following mitral valve surgery reported from 2-8.8%.^{8,15} Independent predictors of stroke are a history of stroke, re-operation, diabetes, preoperative infection, urgent surgery, peripheral vasculopathy, hypertension, and increased cardiopulmonary bypass (CPB) time.¹⁵ We had a slightly lower incidence of stroke (1.6%), due perhaps to the low incidence of diabetes and peripheral vasculopathy, a younger average age and a shorter CPB time in our series.

The two most serious complications following heart valve replacement are infective endocarditis and prosthetic valve thrombosis.^{14,16} Two patients in our series had early prosthetic valve endocarditis and both died from intracerebral hemorrhage with an intracerebral mycotic aneurysm rupture being suspected. A prosthetic valve thrombosis may occur in up to 3 per 100 patient-years and is usually associated with inadequate anticoagulation.¹⁴ We had 2 cases of prosthetic valve thrombosis

and both had a history of poor compliance in anticoagulant usage. Although the operative mortality in re-operations for prosthetic valve thrombosis is high,¹⁷ both of our patients were operated on successfully.

The functional capacity of our patients during the short-term follow up was also good, but the long-term results must be carefully followed.

Conclusion

Our initial experience with mitral valve surgery at Songklanagarind Hospital has shown a good outcome.

References

1. Cochran RP, Verrier ED. Valvular heart disease: the surgical approach. In: Otto CM, editor. Valvular heart disease. Philadelphia: WB Saunders; 1999:151-77.
2. Jessurun ER, van Hemel NM, Kelder JC, Elbers S, de la Riviere AB, Defauw JAM, et al. Mitral valve surgery and atrial fibrillation: is atrial fibrillation surgery also needed? *Eur J Cardio Thorac Surg* 2000;17:530-37.
3. Jamieson WRE, Edwards FH, Schwartz M, Bero JW, Clark RE, Grover FL. Risk stratification for cardiac valve replacement. National Cardiac Surgery Database. *Ann Thorac Surg* 1999;67:943-51.
4. Rogues F, Nashef SAM, Michel P, Gauducheau E, de Vincentiis C, Baudet E, et al. Risk factors and outcomes in European cardiac surgery: analysis of the Euro SCORE multinational database of 19030 patients. *Eur J Cardio Thorac Surg* 1999;15:816-23.
5. Stahle E, Kvidal P, Nystrom SO, Bergstrom R. Long-term relative survival after primary heart valve replacement. *Eur J Cardio Thorac Surg* 1997;11:81-91.
6. Goldsmith IRA, Lip GYH, Patel RL. A prospective study of changes in the quality of life for patients following mitral valve repair and replacement. *Eur J Cardio Thorac Surg* 2001;20:949-55.
7. Rergkliang C, Chetpaophan A, Chittitaworn V, Vasina-nukorn P. Open heart surgery: initial experience at Songklanagarind Hospital. *Songkla Med J* 2004;22:47-53.
8. Edwards FH, Peterson ED, Coombs LP, DeLong ER, Jamieson WRE, Shroyer ALW, et al. Prediction of operative mortality after valve replacement surgery. *JACC* 2001;37:885-92.
9. Carpentier A. Cardiac valve surgery. The "French correction" *J Thorac Cardiovasc Surg* 1983;86:323-7.
10. Deloche A, Jebara VA, Relland JY, Chauvard S, Fabiani JN, Perier P, et al. Valve repair with Carpentier techniques: the second decade. *J Thorac Cardiovasc Surg* 1990;99:990-1002.
11. Secombe JF, Schaff HV. Mitral valve repair: current techniques and indications. In: Franco KL, Verrier ED, editors. Advanced therapy in cardiac surgery. Hamilton BC: Decker; 1999:220-31.
12. David TE, Armstrong S, Sun Z, Daniel L. Late results of mitral valve repair for mitral regurgitation due to degenerative disease. *Ann Thorac Surg* 1993;56:7-14.
13. Lam B-K, Cosgrove III DM, Bhudia SK, Gillinov AM. Hemolysis after mitral valve repair: mechanisms and treatment. *Ann Thorac Surg* 2004;77:191-5.
14. Kouchoukos NT, Blackstone EH, Doty DB, Hanley FL, Karp RB. Mitral valve disease with or without tricuspid valve disease. In: Kirklin/ Barratt-Boyes. editor. *Cardiac Surgery* 3rd ed. Philadelphia: Churchill Livingstone; 2003:483-553.
15. Bucerius J, Gummert JF, Borger MA, Walther T, Doll N, Onnasch JF, et al. Stroke after cardiac surgery: a risk factors analysis of 16,184 consecutive adult patients. *Ann Thorac Surg* 2003;75:472-8.
16. Gordon SM, Serkey JM, Longworth DL, Lytle BW, Cosgrove III DM. Early onset prosthetic valve endocarditis: The Cleveland Clinic experience 1992-1997. *Ann Thorac Surg* 2000;69:1388-92.
17. Jone JM, O'Kane H, Gladstone DJ, Sarsam MAI, Campalani G, MacGowan SW, et al. Repeat heart valve surgery: risk factors for operative mortality. *J Thorac Cardiovasc Surg* 2001;122:913-8.