

## 최근 승모판 질환에서의 개심술 성적 및 경향

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## Recent Trends and Outcome of Mitral Valve Surgery

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## ABSTRACT

**Background and Objectives** : Recently, in mitral valve surgery, valvuloplasty or valve repair was successfully introduced to improve postoperative left ventricular function and to decrease operative mortality. However, the real impact of this technique on daily practice in Korea was not systematically assessed. **Materials and Method** : The operative methods, postoperative death, follow-up results and their contributing factors were analysed among patients who underwent mitral valve surgery at our institution. **Results** : 1) From June 1989 to December 1996, 416 patients (186 males, mean age  $48 \pm 13$  years) underwent mitral valve surgery. Dominant mitral stenosis (MS) was the main pathology in 167 patients ; dominant mitral regurgitation (MR) and balanced mitral stenoin insufficiency (MSR) in 197 and 52 respectively. 2) In MS, valve replacement was performed in 91% whereas commissurotomy in 9%. However, in MR, the rates of valve repair surgery has increased up to 60% of the total surgical procedures for the past three years. 3) The overall operative mortality was 4% (18/416). It was significantly lower in valve repair compared with valve replacement (0% vs. 6% ;  $p = 0.003$ ). In MS, factors associated with high mortality were longer cardiopulmonary bypass and aortic cross clamp time. In MR, high mortality was associated with diabetes, endocarditis, valve replacement and longer cardiopulmonary bypass time. 4) The 7-year late survival among operative survivors was  $95 \pm 2\%$  in MS, which was significantly higher than that in MR ( $80 \pm 6\%$ ,  $p = 0.04$ ). 5) In MR, the 4-year cardiac event-free survival among operative survivors (absence of cardiac death, reoperation, bleeding, endocarditis, thromboembolism, or development of heart failure) was significantly higher in valve repair group than in valve replacement ( $84 \pm 7$  vs.  $76 \pm 5\%$  ;  $p = 0.03$ ). **Conclusion** : The overall outcomes of recent mitral valve surgery were satisfactory. In MR, valve repair surgery seemed to be an established method to decrease operative mortality and long-term complications. (Korean Circulation J 1998;28(7):1059-1068)

**KEY WORDS** : Mitral valve surgery · Mortality · Survival.

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4

(NYHA)

통계 분석 (2%) (Table 1).

2 Fisher's exact test ,  
Student t - test Mann - Whitney U test 416 225  
(54%),  
logistic regression (odds ratio) 83 (20%),  
, event - free 86 (21%) , ,  
survival curve Kaplan - Meier 22 (5%) .  
Cox regression 294 (71%) ,  
test p valve가 Saint Jude valve 253 , Carpentier - Edward valve  
0.05 35 , Duran valve 6 가  
122 (29%) , ,

결 과

환자들의 기본 특성  
48 ± 13 (18 85 )  
186 , 231 .  
131 (31%), 285 (69%)  
, NYHA 12  
(3%), 110 (27%), 222 (53%),  
72 (17%) .  
(predominant mitral  
stenosis, MS ) 167 ,  
(predominant mitral regurgitation, MR )  
197  
(balanced stenoin sufficiency, MSR  
) 52 .

수술 방식  
surotomy) .  
MS  
MSR 8%  
15% , MR  
51%  
(Table 2). MS

Table 1. Etiology of mitral valvular lesion (n = 416)

Etiology	MS group (n = 167)	MR group (n = 197)	MSR group (n = 52)
Rheumatic, n (%)	151 (90)	61 (31)	51 (98)
Degenerative, n (%)	1	88 (45)	1 ( 2)
Endocarditis, n (%)	1	24 (12)	
Re-do operation, n (%)	11 ( 7)	10 ( 5)	
post-PMV trauma, n (%)	0	9 ( 5)	
Others, n (%)	1	5 ( 2)	

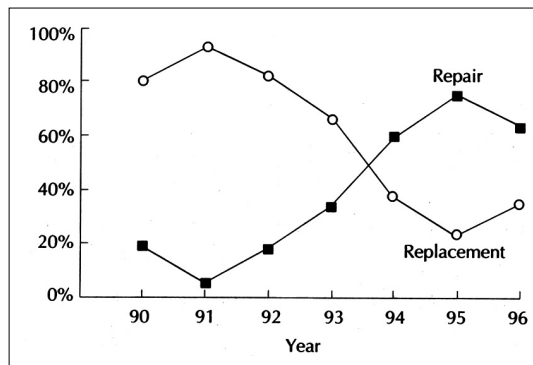
MS : predominant mitral stenosis ; MR : predominant mitral regurgitation ; MSR : balanced mitral stenoin - sufficiency ; PMV : percutaneous mitral valvuloplasty

Table 2. Operation method according to valve lesion (n = 416)

Operation method	MS group (n = 167)	MR group (n = 197)	MSR group (n = 52)
Repair, n (%)	13 ( 8)	101 (51)	8 (15)
Replacement, n (%)	154 (92)	96 (49)	44 (85)
Mechanical valve, n	138	75	40
Tissue valve, n	14	21	4

MS : predominant mitral stenosis ; MR : predominant mitral regurgitation ; MSR : balanced mitral stenoin sufficiency

승모판 질환의 선행 원인  
MS MSR  
90%(151/167) 98%  
(51/52) 가 ,  
88 (45%)  
61 (31%)  
(Table 1).  
25 (6%)  
, 24 가  
21 (5%)  
11 10



**Fig. 1.** Incidences of valve repair and valve replacement surgery for mitral regurgitation for the past 7 years.

가 , MR 1993

가

60% (Fig. 1).

294

259 , 35

(Table 2).

MR

,

,

,

가 (Table 3).

가 12

113 11%

.

수술 사망을 및 이에 영향을 미치는 인자

4% 18

, 18

,

가 가 (p = 0.003)(Table 4).

18 (cardiac death) 8 (pump failure)

5 ,

1 ,

1 . Noncardiac death 10

3 , 2 ,

**Table 3.** Baseline patient characteristics in predominant mitral regurgitation group

	Valve repair	Valve replacement	P
Age, yr	47 ± 16	47 ± 15	NS
Atrial fibrillation, n (%)	54 (53)	48 (50)	NS
DM, n = 10	4	6	NS
Dyspnea class, n (%)			NS
NYHA	2 ( 2)	2 ( 2)	
	24 (24)	23 (24)	
	64 (63)	47 (49)	
	11 (11)	24 (25)	
Etiology			
Rheumatic	26	35	NS
Degenerative	48	40	NS
Endocarditis	9	14	NS
LA size, mm	57 ± 10	58 ± 11	NS
LV ejection fraction, %	61 ± 9	61 ± 11	NS
LV systolic dimension, mm	42 ± 8	40 ± 9	NS
End-systolic volume, ml	66 ± 47	66 ± 35	NS
MR grade			NS
	16	29	
	73	50	
TR pressure gradient, mmHg	45 ± 19	49 ± 19	NS
Bypass time, min	132 ± 36	146 ± 79	NS
Pump time, min	81 ± 26	83 ± 51	NS

NYHA : New York Heart Association ; LA : left atrium ; LV : left ventricle ; MR : mitral regurgitation ; TR : tricuspid regurgitation ; NS : not significant

**Table 4.** Operative mortality according to operation method

	Replacement (n = 294)	Repair (n = 122)
Cardiac death, n	8	0
Postoperative bleeding, n	3	0
Stroke, n	2	0
Renal failure, n	1	0
Hepatic failure, n	1	0
Sepsis, n	3	0
Total*, n	18	0

\*p value = 0.003

1 , 1 3

(Table 4).

27 (9%) 30

, 3 (2%) 3

가 (p=0.001) =0.006)  
(Table 5). (p=0.003).  
MS (n=167) 10 가 , (p=0.0325, OR=3.70,  
MS 가 95% CI = 1.12 12.27),  
(p=0.0249, OR = 7.20, 95% CI = 1.42  
( p=0.001, p=0.044), 36.6) (p =  
0.0042, OR = 1.0171, 95% CI = 1.005 1.0289)  
(p=0.015 ; odds ratio=1.0195 ; 95%  
confidence interval = 1.007 1.031)(Table 6).  
MR (n=197) 7 가 , 장기 생존  
MR 가 416 ( 1  
(p=0.043), ) 18 398  
(p=0.035) 392 (99%) 1  
(p = 34±23 ( ;  
0.012), (p 1 98 ) . 392 MS 155 ,  
Table 5. Operative complications according to operation  
method MR 188 , MSR 49 .  
18 (56%) 가 MS 5  
(3%), MR 11 (6%), MSR 2 (4%)  
가 . MR 11  
9 (9/88, 10%)  
2 (2/101, 2%)  
(p=0.3). cardiac  
death 9 4 , 3 , 1  
1 , noncardiac death 9  
4 , 1  
3 .  
3 , 5 , 7 95.5±  
1.4%, 90.9±2.4%, 87.6±3.2% . MS  
3 , 5 , 7 97.3±1.4%, 95.4

Table 5. Operative complications according to operation  
method

	Replacement (n = 294)	Repair (n = 122)
Reexploration for bleeding, n	14	2
Pacemaker insertion, n	2	0
Ischemic stroke, n	1	0
Ventricular tachycardia, n	1	0
Acute renal failure, n	1	0
Hepatitis, n	2	0
Intubation granuloma, n	1	0
Wound infection, n	2	1
Pump failure, n	4	0
Others, n	2	0
Total*, n	30	3

\*p value = 0.001

Table 6. Determinants of operative mortality in predominant mitral stenosis patients

	Expired n = 10	Survived n = 167	p value
Age, yr	50 ± 10	48 ± 11	NS
Atrial fibrillation, n (%)	9 (90)	141 (90)	NS
LA size, mm	63 ± 11	59 ± 10	NS
Mitral valve area, cm <sup>2</sup>	0.7 ± 0.2	0.8 ± 0.2	NS
LV ejection fraction, %	61 ± 6	57 ± 9	NS
LV systolic dimension, mm	34 ± 8	36 ± 7	NS
TR pressure gradient , mmHg	38 ± 14	48 ± 22	NS
Cardiopulmonary bypass time,* min	250 ± 132	137 ± 53	0.001
Aortic cross clamp time, min	118 ± 45	84 ± 40	0.044

LA : left atrium ; LV : left ventricle ; TR : tricuspid regurgitation ; NS : not significant.

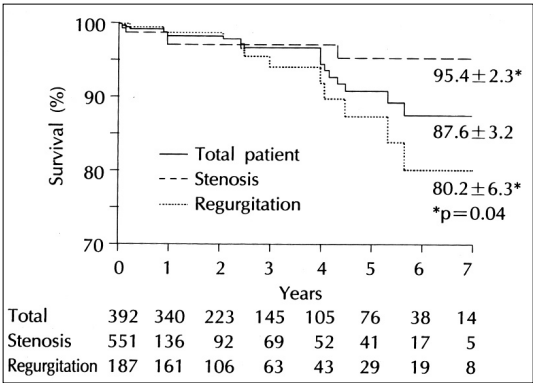
\*p<0.05 in multivariate analysis

**Table 7.** Determinants of operative mortality in predominant mitral regurgitation patients

	Expired n = 7	Survived n = 190	p value
Age, yr	47 ± 20	47 ± 15	NS
DM,* n = 8	2	8	NS
Etiology			
Degenerative, n = 88	1	87	
Rheumatic, n = 61	0	61	NS
Endocarditis,* n = 23	3	20	0.035
PMV trauma,* n = 7	2	5	0.012
Atrial fibrillation, n (%)	3 (43)	90 (48)	NS
LA size, mm	60 ± 10	57 ± 11	NS
LV ejection fraction, %	57 ± 5	61 ± 10	NS
LV systolic dimension, mm	39 ± 8	41 ± 9	NS
TR pressure gradient , mmHg	44 ± 5	47 ± 9	NS
Operation method			
Repair, n	0	101	
Replacement, n	7	89	0.006
Cardiopulmonary bypass time,* min	260 ± 137	134 ± 52	0.003
Aortic cross clamp time, min	134 ± 75	80 ± 37	0.048

PMV : percutaneous mitral valvuloplasty ; LA : left atrium ; LV : left ventricle ; TR : tricuspid regurgitation ; NS : not significant

\*p< 0.05 in multivariate analysis



**Fig. 2.** Plots of late survival among operative survivors after mitral valve surgery.

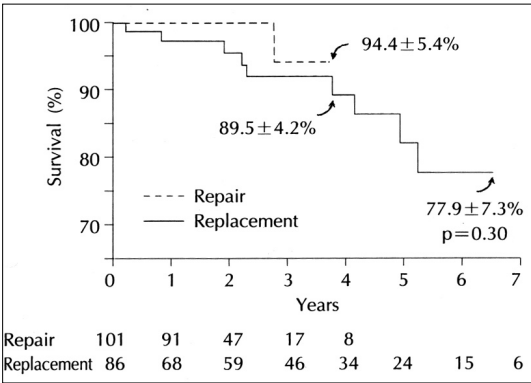
± 2.3%, 95.4 ± 2.3% , MR 3 , 5 , 7  
94.1 ± 2.4%, 87.5 ± 4.3%, 80.2 ± 6.3%

(p = 0.044, OR = 2.248, 95% CI = 1.02 4.95) (Fig. 2).

MS MR 가

MR 4

94.4 ± 5.4%, 4  
89.5 ± 4.2%



**Fig. 3.** Plots of late survival among operative survivors after surgical correction of mitral regurgitation (valve repair vs. replacement).

(p = 0.3) (Fig. 3).

Cardiac event-free survival

MR (cardiac death),

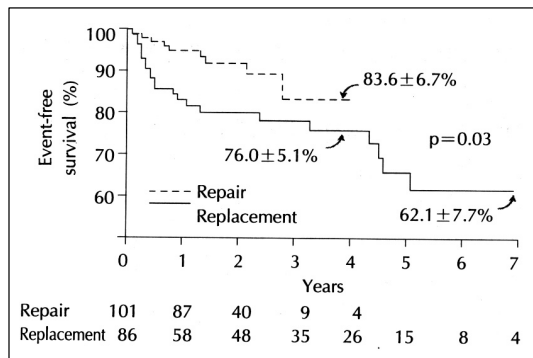
, , NYHA

cardiac event

, 4 cardiac event - free survival rate

76.0 ± 5.1%, 83.6 ± 6.7%

cardiac event



**Fig. 4.** Plots of cardiac event-free survival among operative survivors after mitral valve surgery for mitral regurgitation.

가 (p = 0.033, hazard ratio = 1.54, 95% CI = 1.045 - 2.299) (Fig. 4).

## 고 찰

10  
가 가 가 . ,

29 - 35)

가

가

36)

(percutaneous balloon valvulo -  
plasty)  
(open commissurotomy) 가

가 2 - 15)23 - 28)  
가  
가 (1)  
(myxomatous dege -  
nerative change)  
(chordae rupture)  
3 4 가  
가 ; (2)  
4% ,  
0%  
; (3) 7  
(87.6 ± 3.2%) ; (4) ca -  
rdiac event  
(4 cardiac event - free survival rate ; 83.6 ± 6.7 %  
vs. 76.0 ± 5.1%, p = 0.033).

가

( 가 ),  
37)  
,

10

10

15% ,  
(low caidiac output syndrome)  
( , )

NYHA

가

가 . 가 가 , 가 4.3%, 가 3.6% 0% 5% , , 가 가 7 (80.2 ± 6.3% vs. 95.4 ± 2.3% ; p = 0.04), 4 94.4 ± 5.4% 3 가 15)35)39 - 41) 4 가 , 1950 가 Lillehei 42) Merendino 43) cardiac death, NYHA 3 cardiac event cardiac event 가 7 가 44 - 46) 가 1960 McGoon 47) Kay 48) (reduction annuloplasty) (le - aflet plication) , (stab - ility) 가 (predictability) 1970 Carpentier 49 - 51) 가

## 요 약

(remodelling annuloplasty)

연구배경 :

가

가 52)

가

방 법 :



결 과 :

1) 1989 6 1996 12  
 15 416 ( 186 , 48 ± 13  
 ) (MS  
 ) 167 , (MR  
 ) 197 ,  
 (MSR ) 52 .  
 2) MS 91% ,  
 9% , MR  
 가 3  
 60% .  
 3) 4%  
 (18/16) ,  
 (0% vs. 6% ; p=0.003).  
 MS  
 MR  
 , ,  
 4) 7 MS  
 가 MR (95 ± 2% vs. 80 ±  
 6% ; p=0.04).  
 5) MR 4 cardiac event - free  
 survival( , , , ,  
 )  
 가  
 (84 ± 7% vs. 76 ± 5% ; p=0.03).

결 론 :

중심 단어 :

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