

## 승모판 폐쇄부전에 대한 승모판 성형술의 임상적 연구

, <sup>1</sup> 가<sup>2</sup>김상익<sup>1</sup> · 오상준<sup>1</sup> · 박국양<sup>2</sup>

### A Clinical Study of Mitral Valve Repair for the Treatment of Mitral Valve Insufficiency

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#### ABSTRACT

**Background and Objectives :** Mitral valve repair is the main procedure for the treatment of mitral valve insufficiency. The aims of this study were to review the applied techniques, and to evaluate postoperative residual mitral valve insufficiency, to compare preoperative and postoperative cardiac functions and dimensions, to compare the effects of rigid and flexible ring annuloplasty, and to assess overall freedom from valve failure-related reoperation. **Subjects and Methods :** From March 1996 to September 1999, 34 patients underwent mitral valve repair for the treatment of mitral valve insufficiency at our department. This group comprised ten males and twenty four females, aged 8 to 65 years. The causes of mitral valve insufficiency were of degenerative origin in 12 patients, rheumatic in 10, congenital in 9, cardiomyopathic in 2, and ischemic in 1. The applied valve repair techniques included annuloplasty, quadrangular resection, leaflet slicing, cleft repair, chordae shortening, chordae transfer, secondary chordae resection, new chordae formation, papillary muscle splitting, commissuroplasty, and commissurotomy. **Results :** There was no early or late mortality. We encountered 8 residual mitral valve insufficiencies (more than grade II), 2 of which worsened and eventually required correction by valve replacement. There were no statistical differences seen between the effects of rigid and flexible ring annuloplasty on left ventricular function either before or 1 year following annuloplasty. The cardiac dimensions decreased significantly. The actuarial freedom from valve failure-related reoperation was 93.01% at 43 months. **Conclusion :** Mitral valve repair with preserved valvular apparatus showed that the repaired valves functioned well and cardiac dimensions recovered satisfactorily. There were no statistical differences between the effects of rigid and flexible ring annuloplasty on cardiac functions and dimensions either before or 1 year following annuloplasty. (*Korean Circulation J 2001;31(12):1240-1247*)

**KEY WORDS :** Mitral valve insufficiency ; Mitral valve repair.

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1961 Albert Starr<sup>1)</sup>

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대상 및 방법

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34 ( : = 1 : 2.4) . 36.2 ( : 8 65 ) (Table 1).

, Carpentier I 11 , II 16 , III 7 (Table 2). 92 ( 2.7 )가 (Table 3).

(25 28 ) 가 126.9 ± 27.4 ( : 58

Table 1. Age distribution

Age	Male	Female	Total
<10	1	1	2
10 - 20	3	3	6
20 - 30	0	5	5
30 - 40	1	5	6
40 - 50	1	5	6
50 - 60	4	0	4
60<		5	5
Total	10	24	34

189 ) 76.4 ± 23.0 ( : 29 140 ) . (interatrial groove) 2 3 cm 2/ 3 . Carpentier retractor (gauze)

saline test nerve hook 87 ( 2.6 ) (Table 4).

2.9 가 , 2.7 가

Table 2. Causes of mitral valve regurgitation and Carpentier's functional classification

Causes	Types			Total
	I	II	III	
Rheumatic	2	2	6	10 ( 29.4%)
Degenerative	1	10	1	12 ( 35.3%)
Congenital	5	4		9 ( 26.5%)
Cardiomyopathic	2			2 ( 5.9%)
Ischemic	1			1 ( 2.9%)
Total	11 (32.4%)	16 (47.0%)	7 (20.6%)	34 (100.0%)

Table 3. Anatomical lesions of mitral valve disease (average number of lesions/patient : 2.7)

Findings			No.
	Anterior	Posterior	
Leaflets			
Thickening	12	10	22
Prolapse	7	8	15
Cleft	6	4	10
Calcification	1		1
Chordae			
Rupture	3	7	10
Elongation	8		8
Papillary muscle			
Fusion			1
Commissure			
Fusion			1
Annulus			
Dilatation			24
Total			92

**Table 4.** Surgical procedures (average number of procedures/patient : 2.6)

Procedures	Causes						Total
	Degenera	Rheumat	Congeni	Cardiom	Ischem		
Annuloplasty	12 (11)	9 (9)	5 (2)	2 (2)	1	29 (24)	
Commissuroplasty	1	1	2			4	
Commissurotomy		2				2	
Cleft repair	1	4	4			9	
Leaflet slicing	1	4	1	1		7	
Quadrangular resection	7	1				8	
Central fixation			1			1	
Chordae shortening	3	2	4			9	
Chordae transfer	4	2	1	1		8	
Resection of secondary chordae	2	2		1		5	
New chordae formation	1					1	
Splitting of papillary muscle		2	2			4	
Total	32	29	20	5		87	

Degenera : degenerative, Rheumat : rheumatic, Congeni : congenital, Cardiom : cardiomyopathic, Ischem : ischemic

**Table 5.** Associated procedures in mitral valve surgery

Associated procedure	No.
Tricuspid annuloplasty	16
Closure of Atrial septal defect	7
Aortic valve replacement	2
Aortic valvuloplasty	2
Patch aortoplasty	1
Coronary artery bypass grafting	1
Bullectomy	1
Direct closure of LV to RA shunt	1

LA : left atrium, LV : left ventricle, RA : right atrium

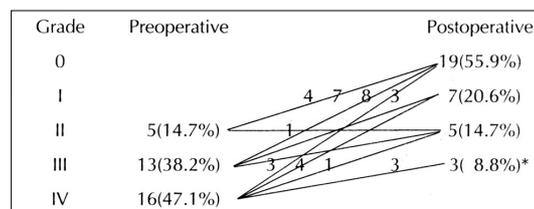
**Table 6.** Prosthetic rings used in annuloplasty

Carpentier rings		Duran rings	
Size (mm)	No.	Size (mm)	No.
36	2	33	3
34	3	31	9
32	3	29	1
28	1	27	1
		25	1
Total	9		15

(Table 5). 24 (Carpentier - Edwards ring : 9, Duran ring : 15)

(Table 6) 11, 9, 2, 2

48 INR (international normalized ratio) 1.5 2.0



**Fig. 1.** Changes of mitral regurgitation grade by echocardiogram. \* : 2 mitral valves of them were replaced by prostheses.

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Mann - Whitney U test chi - square or Fisher's exact test  
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paired t - test  
Kaplan - Meier

가 p 0.05

결과

13.2 ± 6.7

**Table 7.** Preoperative and postoperative echocardiographic and electrocardiographic data of the 24 patients studied

Variables	Flexible ring (15)	Rigid ring (9)	p*
Pre-LVEDD (cm)	64.07 ± 10.13	65.50 ± 5.98	NS
LVESD (cm)	44.13 ± 8.68	45.75 ± 3.62	NS
LAD (cm)	48.80 ± 10.46	52.75 ± 10.91	NS
EF (%)	54.67 ± 7.16	54.00 ± 9.27	NS
Sinus rhythm	(10)	(7)	NS†
MR grade	II (2), III (4), IV (9)	III (3), IV (6)	NS†
Post-LVEDD (cm)	53.13 ± 9.09	51.88 ± 6.22	NS
LVESD (cm)	36.33 ± 9.51	39.88 ± 7.08	NS
LAD (cm)	42.47 ± 10.80	44.25 ± 6.41	NS
EF (%)	56.27 ± 8.11	50.63 ± 12.41	NS
Sinus rhythm	(12)	(8)	NS†
MR grade	0 (11), I (3), III (1)	0 (6), II (2), III (1)	NS†
D-LVEDD (cm)	11.07 ± 8.86	13.62 ± 5.01	NS
LVESD (cm)	8.47 ± 7.05	5.88 ± 7.92	NS
LAD (cm)	6.33 ± 7.20	8.50 ± 11.56	NS
EF (%)	1.60 ± 6.93	-3.37 ± 8.11	NS

Data are shown as the mean ± standard deviation. Numbers in parentheses are number of patients

\* : Statistical significance test was done by Mann-Whitney U-test (NS : not significant)

† : Statistical significance test was done by chi-square or Fisher's exact test (NS : not significant)

Pre : preoperative (before ring annulo[plasty], Post : postoperative (1 year after ring annulo[plasty], D : Difference between preoperative and postoperative data, LVEDD : left ventricular end-diastolic dimension, LVESD : left ventricular end-systolic dimension, LAD : left atrial dimension, EF : ejection fraction, MR : mitral regurgitation

22.7 ( : 3 43 ) . (grade II ) 8 (23.5%) , , 1 3 2 , 1 4 1 grade II 8 grade III(2) (Fig. 1). grade II 4 C - E ring 3 , Duran ring 1 (10) 4

**Table 8.** Changes of mitral regurgitation ( MR Gr. II) according to 3 major causes (before and after mitral valve repair)\*

Variables	Pre-operative	Post-operative	Re-operation	Mean MR Gr.
Degenerative	12	1		3.4 ± 0.7
Rheumatic	10	2	1	2.5 ± 1.1
Congenital	9	5	1†	1.4 ± 0.7

Data are number of patients. Mean MR Gr. : ( pre-operative - postoperative MR Gr.)/number of patients, MR Gr. : mitral regurgitation grade. \* : statistical significance test was done by Kruskal-Wallis test and multiple comparisons among 3 groups (p : 0.001), † : mitral valve replacement (William syndrome)

1 , 가 (Table 7). , , (grade II ) 가 (Table 8, 9). 1

(p<0.01). (ejection fraction) (Table 10). 43

( ) 93.01% (Fig. 2).

고 찰 1961 60 1970 Carpentier<sup>1)2)</sup>가

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**Table 9.** Patient profile with more than postoperative MR grade II

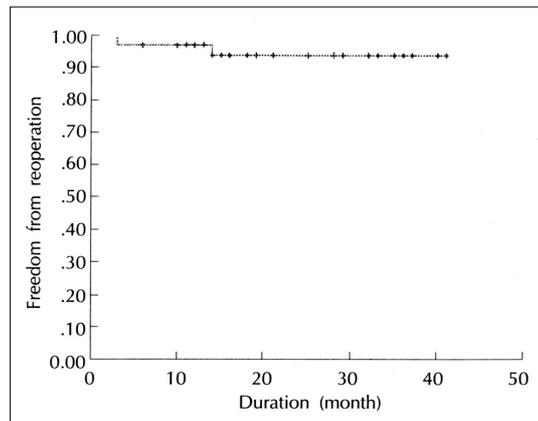
Causes	Age Sex	Pathology	Preop. MR	Postop. MR
Congenital	30/F	Primum ASD, thickening of leaflet cleft	Grade III	Grade II
Congenital	13/M	Supravalvar AS (William syndrome), annular dilatation, ant. leaflet prolapse and chordal elongation	Grade IV	Grade III Redo-MVR
Congenital	9/M	Secundum ASD, ant. leaflet prolapse and thickening	Grade III	Grade II
Congenital	10/F	Postop. state of CAVSD, thickening of leaflet cleft	Grade IV	Grade II*
Congenital	39/F	Postop. state of CAVSD, thickening of leaflet cleft	Grade III	Grade II*
Rheumatic	48/F	Leaflet thickening and calcification, leaflet cleft	Grade III	Grade II
Rheumatic	26/F	Fusion of posteromedial commissure, thickening of post. leaflet, annular dilatation	Grade IV	Grade III Redo-MVR
Degenerative	40/F	Thickening and cleft of post. leaflet, annular dilatation	Grade IV	Grade II

\* : redo-mitral valve repair, Preop. MR : preoperative mitral regurgitation grade, Postop. MR : postoperative mitral regurgitation grade, Redo-MVR : redo-mitral valve replacement, ASD : atrial septal defect, AS : aortic stenosis, CAVSD : complete atrioventricular septal defect, ant : anterior, post : posterior

**Table 10.** Echocardiographic changes in mitral valve disease (before and 1 year after mitral valve repair)

Variables	Preoperative	Postoperative	p*
LVEDD (mm)	62.7 ± 10.8	53.3 ± 10.4	<0.01
LVESD (mm)	43.9 ± 10.7	37.8 ± 13.2	<0.01
LAD (mm)	51.2 ± 10.0	43.6 ± 9.3	<0.01
EF (%)	55.2 ± 9.9	53.9 ± 11.7	0.695 (NS)
Mean MR Gr.	3.32	0.77	0.000 <sup>†</sup>

Data are shown as the mean ± SD. \* : statistical significance test was done by paired t-test, † : statistical significance test was done by chi-square test, LVEDD : left ventricular end-diastolic dimension, LVESD : left ventricular end-systolic dimension, LAD : left atrial dimension, EF : ejection fraction, mean MR Gr. : mean mitral regurgitation grade, NS : not significant



**Fig. 2.** Freedom from valve failure-related reoperation in 34 patients who underwent mitral valve repair (93.01% during 43 months).

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