CLINICAL RESULTS OF MITRAL VALVE RECONSTRUCTION*

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In a period of 8 years a total of 5746 open heart procedures were performed. 1210 of these were mitral valve operations and 84.2% (1018) consisted of valve replacement, while 15.8% (192) were reconstruction. The mean age of the patients was 38.7 years. 34.2% of the patients were female. Majority of the patients were in NYHA class III. Rheumatic fever was the cousative factor in 81.3% of the cases. In 42.1% of the patients the valvular lesion was both stensis and insufficiency mixed, while in 38.6% mitral stenosis. 36.5% of the patients had another associated surgical procedure other than mitral reconstruction.

Hospital mortality in isolated mitral reconstruction was 3.3%, while late mortality was 2.5%. Early mortality in the combined group was 5.7%.

Functional recovery was achieved in the majority of the 84% patients. In 110 of 147 surviving patients, mean calculated mitral valve area was 2.6±0.008cm², which was 0.9±0.2 cm² preoperatively (p<0.01). Mitral valve reconstruction offers a reasonable treatment for mitral valve disease and a better alternative to MVR, especially in suited cases.

Key words: Mitral valve reconstruction, mitral subvalvular apparatus.

Following the enthusiasm of prosthetic valves, the reconstructive techniques in mitral valve surgery had been neglected, and even have abondoned for a long time. It did not take too much time to recognize the high morbidity, and long term problems with prosthetic valves; and the second era of reconstructive mitral surgery began with pioneering of many cardiac surgeons.

Material and Methods

Between February 1985 and 1993, a total of 5746 open heart operations were performed. 1210 of these were mitral valve procedures, and 84.2% (1018) consisted of MVR; while 15.8% (192) had mitral valve reconstruction. Reconstruction was not been able to be performed in heavily calcified, deformed and thickened, or unflexible poor qualified valves.

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Table I: Operative findings in 192 mitral reconstructive procedures.

	No of cases	%
Commissural fusion	131	68.2
Chordal shortening, thickening	125	65.1
Annular dilatation	56	29.1
Elongated chorda-papillary muscle	18	9.3
Leaflet prolapsus	13	6.7
Ruptured chorda	3	1.5
Partial calcification	2	1
Left atrial thrombus	19	9.8
Left atrial myxoma	4	2

Preoperative investigation included echocardiography in all patients, cardiac cathaterization in 19.9% of the patients with severe valvular disease, pulmonary hypertension or suspicion of any associated congenital lesion. Coronary angiography was performed in 17.4% of patients who were expected to have concomitant coronary artery disease. In most of the patients noninvasive screening was sufficient.

The youngest patient was 11, and the oldest 72 years old with a mean age 38.7±8 years. Female patients consisted 34.2% of the study group. Most of the patients were cummulated in the third decade.

Restriction of physical activity was the main complaint in most patients. 18.2% (35) of the patients were in NYHA functional class II, 69.8% (134) in class III, and 11.9% (23) in class IV. 71% of the patients had atrial fibrilation, 3.7% had previous thromboembolic episode and 62% of the patients had a cardio thoracic index greater than 50%.

Causes of mitral disease were acute rheumatic fever in 81.3% (156), degenerative valvular disease in 9.9% (19), ischemic heart disease in 5.7% (11) of the patients. Congenital and other causes consisted 3.1% (6) of the study grup. In 38.6% of the patients the dominant lesion was stenosis, while in 19.3% mitral regurgitation, and the rest (42.1% had mixed lesion).

Standart cardiopulmonary techniques were utilized in almost all of the patients. Four patients were operated with continuous aortic root perfusion, and under direct vision of the valve on the beating heart.

In 11 patients continuous normothermic antegrade and retrograde coronary perfusion was performed. Operative findings are given in Table I. Operative procedures are shown in Table II. In 70 (36.6%) of the patients concomitant procedures was performed which is presented in Table III.

Table II: Operative techniques performed

	No of cases	%
Commissurotomy	131	68.2
Carpentier ring annuloplasty	62	32.2
Wooler, DeVega, or Kay annuloplasty	37	19.2
Papillary splitting	14	7.3
Fenestration of fused chordea	11	5.8
Chordeal shortening	7	3.6
Partial resection of posterior leaflet	4	2
Decalcification	2	1
Left atrial thrombectomy	19	19.9
Left atrial plication	8	4.2
Left atrial appendix ligation	121	63.7

Table III: Associated procedures with mitral valve reconstruction

Procedure	No	%
AVR	19	10
Tricuspid annuloplasty	17	8.8
CABG	14	7.3
Aortic reconstruction	8	4.2
ASD repair	5	2.6
Myxoma excision	4	2.1
AVR+Tricuspid annuloplasty	3	1.6

Table V: Early postoperative complications in mitral reconstruction associated with other procedures

	No	%
Graft occlusion, perop AMI	2	1
Renal failure	1	0.5
Ventricular fibrillation	2	1
AV block	3	1.5
Severe pulmonary dysfunction	4	2
Sternal wound infection	3	1.5

Results

Postoperative complications in isolated mitral reconstruction and associated procedures are shown in Table IV and V. Hospital mortality in isolated mitral reconstruction was 3.3% (4/122). Late mortality was 2.5% (3/118) with an overall mortality of 5.7% (Table VI). Eight patients were reoperated in the whole series (Table VII).

Causes of hospital and late mortality in the group of mitral reconstruction and combined procedures are shown in Table VIII. Early mortality in this group was 5.7% (4/70) and late mortality was 9% (6/66).

84% of the living patients were followed up between 2 to 95 months, with a mean of 38±12 months, a total of 245.8 patient years.

Preoperative and postoperative functional status of the patients, who were followed up are shown in Table IX. As seen, most of the patients are in Class I and II compared with the preoperative functional classification.

In 110 of 147 surviving patients during the follow up period, echocardiographic controls were performed. The calculated mean mitral valve area was 2.6±0.08 cm^2, in reconstructed mitral valves which was 0.9±0.2 cm^2 preoperatively ($p<0.01$).

32 (29%) patients had grade I or II, 7 (6.3%) had grade III mitral requrgitation. Three (2.7%) patients had grade IV mitral regurgitation. 8 (5.4%) of these patients were reoperated and MVR was performed.

Discussion

The first mitral valve reconstruction performed with cardiopulmonary bypass by Lillehei has caused a great enthusiasm, and many surgeons

Table IV: Early postoperative complications in isolated mitral valve reconstruction

	No	%
Inadequate reconstruction, reoperation	3	1.5
Chordal rupture; reoperation	1	0.5
Thromboembolism	3	1.5
Air embolism	4	2
Mediastinitis	1	0.5
Sternal wound infection	4	2
AV-block	3	1.5
Pericardial tamponade	2	1

Table VI: Mortality in isolated mitral reconstruction

HOSPITAL MORTALITY: 3.3%	
Cardiac failure	1
Irreversible brain damage	1
Mediastinitis	2
LATE MORTALITY: 2.5%	
Congestive heart failure	1
Unknown	2
CUMULATIVE MORTALITY: 5.7%	7

Table VII: Reoperation in isolated mitral valve reconstruction

EARLY (0-30 days)	
Inadequate reconstruction	3
Chordal rupture	1
LATE (6 months-5.5 years)	
Restenosis	2
Severe mitral regurgitation	2

have accepted the concept of reconstruction in a short period [1-4]. The pioneering studies of Carpentier in 1971, and the advent of ring annuloplasty has been a milestone in reconstructive mitral surgery[2].

The total mortality in this serie shows correlation with other groups [5-12]. Reoperation rate is also in correlation with other series [3,9,11,13].

A perfect cardiac valve prosthesis should have good hemodynamic characteristics, should be nonthrombogenic, should not degenerate and cause no hemolysis, should have easy insertion properties and should not be an annoyence to the patient. Although the cardiac valve prosthesis have reached a high state of development, the ideal prosthetic valve has still not been achieved. We do believe that in mitral valve surgery, valve replacement should be performed only when reconstruction is not feasible. Calcified and extensively fibrosed valves should not be repaired. Nevertheless, some valves with calcified zones, but with sufficient leaflet surface and good flexibility may be succesfully decalsified and repaired.

Table VIII: Mortality in mitral reconstructions with other associated procedures

HOSPITAL MORTALITY: 5.7%	
Low cardiac output	2
Renal failure	2
LATE MORTALITY: 9 %	
Acute MI	1
Congestive heart failure	2
Thrombosis of aortic prosthesis	2
Prosthetic valve endocarditis	1

Table IX: Functional improvement in 84% of patients controlled long term

	Preoperative n=192	Postoperative n= 147
Class I	—	60.4%
Class II	18.0%	25.5%
Class III	69.8%	14.1%
Class IV	11.9%	—

Technically the surgeon should deal with the subvalvular tissues patiently, otherwise it could not be possible to achieve a satisfactory result. Currently myocardial protection is quite safe among prolonged cross-clamp periods with renewed cardioplegic knowledge.

Although a functional reconstruction is the main purpose rather than an anatomical repair, great care should be taken to the preservation of the anterior leaflet's tissue. Among the annuloplasty techniques, our preference is ring annuloplasty with its easy application and better results. Increased anatomic valve orifice, no anticoagulation, preservation of the valvular apparatus which contributes importantly to the magnitude and uniformity of regional left ventricular tonus that is essential in global left ventricular systolic performence makes mitral valve reconstruction an attractive choice.

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