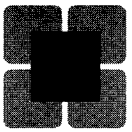

Cardiac rhythm and conduction disturbances in patients undergoing mitral valve surgery

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■ The occurrence and course of supraventricular rhythm and atrioventricular conduction disturbances were retrospectively compared in 206 patients with isolated mitral valve disease undergoing either valve replacement or ring annuloplasty (mitral repair) between January 1, 1985 and December 31, 1986. The replacement and repair groups were the same size and had approximately equal numbers of patients in sinus rhythm and atrial fibrillation preoperatively. The type of mitral valve operation did not affect the short-term outcome in terms of cardiac rhythm. For both groups, the incidence of patients crossing from sinus rhythm to atrial fibrillation and vice versa on the pre-discharge electrocardiography was equal, and both groups had a low incidence of clinically significant atrioventricular block.

□ INDEX TERMS: MITRAL VALVE INSUFFICIENCY; HEART VALVE PROSTHESIS; ATRIAL FIBRILLATION; HEART BLOCK □ CLEVE CLIN J MED 1991; 58:397–399

MITRAL VALVE repair is becoming the procedure of choice for selected patients with mitral insufficiency. Mitral repair is reported to have multiple advantages over mitral replacement, including reduced operative mortality, reduced perioperative morbidity, improved long-term overall survival, and longer event-free survival.[1–3] Leaving the mitral apparatus intact also improves left ventricular hemodynamics, perhaps by preserving left ventricular geometry.[4] Data are lacking regarding the occurrence of rhythm and conduction disturbances in patients undergoing mitral valve replacement or repair. In this article, we report results of a retrospective study comparing the incidence of supraventricular rhythm and conduction disturbances in patients with isolated mitral valve disease undergoing valve replacement or mitral reconstruction.

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METHODS

The charts of all patients with isolated mitral valve disease undergoing mitral replacement or mitral ring annuloplasty at the Cleveland Clinic Foundation between January 1, 1985 and December 31, 1986 were reviewed. Patients were excluded from analysis if they had significant coronary artery disease (confirmed by angiography), significant congenital or acquired valvular lesions (confirmed by angiography or echocardiography), or preoperative permanent pacemakers. Data pertaining to age, sex, coexisting conditions, type of operation per-

TABLE 1
CLINICAL CHARACTERISTICS
OF THE TWO SURGICAL GROUPS

	Replacement (n = 104)	Repair (n = 102)
Age (mean ±SD) (years)	58.3 ±13.8	56.3 ±14.4
Sex (M/F)	30.8%/69.2%	39.2%/60.8%
Coexisting conditions		
Hypertension	10.7%	10.2%
Diabetes mellitus	3.9%	1.5%
Congestive heart failure	18.5%	22.3%
Functional class 1	0%	3.7%
2	48.2%	29.6%
3	7.4%	3.7%
4	5.7%	1.9%
Peripheral atherosclerosis	3.4%	0.5%
Chronic obstructive pulmonary disease	5.8%	5.8%

TABLE 2
PROCEDURES ASSOCIATED
WITH MITRAL RING ANNULOPLASTY

Procedure	Frequency (n/102)
Open mitral commissurotomy	23
Chordal shortening	10
Chordal transfer	8
Leaflet resection	48
Debridement	6
Pericardial patch	2

formed, duration of time on cardiopulmonary bypass, etiology of mitral valvular disease, and valve type used (in those receiving mitral replacement) were recorded for each patient. Cardiac rhythm and conduction disturbance data were collected from the patients' preoperative and pre-discharge electrocardiograms.

RESULTS

There were 206 patients with isolated mitral valve disease who underwent either mitral valve replacement (n=104) or mitral ring annuloplasty (n=102). The two groups did not differ significantly in mean age, sex, or coexisting conditions (*Table 1*).

Of the mitral valve replacements, 63.5% were Carpentier-Edwards bioprostheses, 30.5% were St. Jude valves, 2.9% were Tascon valves, 1.9% were Starr-Edwards valves, and 1.0% were Ionescu-Shiley pericardial bioprostheses. All mitral valve repairs used the Carpentier-Edwards ring.

No significant difference (χ^2 analysis) was noted in the mean duration of cardiopulmonary bypass in mitral replacement (86.33 ± 23.27 minutes) vs mitral repair (84.22 ± 23.79 minutes). Procedures performed with mitral ring annuloplasty are given in *Table 2*. *Table 3* shows the etiologies of valve disease in the two groups.

In the replacement group, preoperative rhythms were: sinus, 43%; atrial fibrillation, 54%; and junctional, atrial flutter, or atrial ectopic rhythm, 3%. Of the patients in this group who were in sinus rhythm preoperatively, 18% had atrial fibrillation on the pre-discharge electrocardiogram, while 17% of those who were in atrial fibrillation preoperatively had sinus rhythm on the pre-discharge electrocardiogram.

Similar proportions were seen in the ring annuloplasty group. Preoperative rhythms were: sinus, 49%; atrial fibrillation, 49%; and junctional, atrial flutter, or atrial ectopic rhythm, 2%. Of the patients in this group who were in sinus rhythm preoperatively, 18% had atrial fibrillation on the pre-discharge electrocardiogram, and 22% of those in atrial fibrillation preoperatively had sinus rhythm on the pre-discharge electrocardiogram.

Table 4 shows the development of new conduction disturbance in the two groups. Complete atrioventricular block developed in three patients, one undergoing mitral replacement, and two in the mitral repair group. Changes in supraventricular rhythm or the development of atrioventricular conduction defects were not different between the two groups.

DISCUSSION

The 206 patients were evenly divided between mitral replacement and repair. Most of those undergoing mitral replacement received bioprosthetic valves; the majority of mechanical prostheses used were the bi-leaflet tilting disc type. Twice as many mitral replacement patients were diagnosed as having rheumatic heart disease when compared with those undergoing mitral repair, and patients with endocarditis were more likely to undergo mitral replacement. Chordal rupture, annular dilatation, and degenerative disease (myxomatous degeneration) were more than twice as frequent in the mitral ring annuloplasty group, reflecting the difference in the substrate felt to be suitable for mitral valve repair. Since significant coronary artery atherosclerosis was an exclusion criterion, papillary muscle dysfunction from coronary artery disease was not represented as an etiology for mitral insufficiency.

Both the replacement and repair groups had ap-

TABLE 3
ETIOLOGIES OF MITRAL VALVE DISEASE

Etiology	Replacement	Repair
Rheumatic heart disease	75	36
Connective tissue disease	0	1
Endocarditis	11	3
Chordal rupture	7	41
Annular dilatation	0	7
Degenerative disease	26	33

Since some patients had more than one cause for mitral valve dysfunction, the numbers given total to more than the number of patients in each group

TABLE 4
INCIDENCE OF NEW CONDUCTION DISTURBANCES

New conduction disturbance	Replacement	Repair
First atrioventricular block	19	12
Second atrioventricular block	1	0
Complete atrioventricular block	1	2
Right bundle branch block	4	3
Left bundle branch block	5	4
Left anterior fascicular block	6	3
Other	0	3
Total	36	27
Resolution of new conduction disturbance	10	8

proximately equal numbers of patients in sinus rhythm and atrial fibrillation preoperatively. This is consistent with the data published by Perier and associates concerning preoperative cardiac rhythms in a group of patients with mixed mitral valve pathology.[2]

Within both groups, the incidence of patients crossing from sinus rhythm to atrial fibrillation and vice versa on the pre-discharge electrocardiogram was equal. Published results of the effect of mitral surgery on cardiac rhythm have varied. In a long-term follow-up of patients after mitral valve surgery, Vijayanagan et al[5] found a significantly higher rate of conversion to sinus rhythm from atrial fibrillation (33%) and fewer patients developing new atrial fibrillation (9.3%) than noted in our review. Perhaps their later follow-up gave more time for postoperative conversion to sinus rhythm, thus accounting for this difference.

In a review of patients treated surgically for mitral regurgitation caused by floppy mitral valves, Yacoub et al[1] found a significantly higher incidence of new atrial fibrillation at long-term follow-up in patients undergoing mitral replacement compared to those having mitral repair. In our review, the type of operation on the mitral valve did not affect the short-term outcome in terms of cardiac rhythm.

Baseline parameters associated with establishing and maintaining sinus rhythm after mitral surgery (particularly for mitral stenosis) include: smaller left atrial size, greater functional capacity, shorter duration of symptoms, preoperative sinus rhythm, and better fractional shortening of the left ventricle.[6] Variations in these parameters and others not yet defined may account for the lack of agreement among published reports of the effect of mitral surgery on cardiac rhythm.

Clinically important conduction disturbances (second or complete atrioventricular block) occurred with equal frequency in both groups. The low incidence of complete atrioventricular block following mitral surgery agrees with that found by Keefe and associates.[7] There was no difference in the development of new atrioventricular block or conduction disturbances between the two groups.

CONCLUSION

The short-term preservation of sinus rhythm, development of new atrial fibrillation, and conversion of atrial fibrillation to sinus rhythm were not affected by the type of operation on the mitral valve in a group of patients with isolated mitral valve disease, and valve replacement and ring annuloplasty can be performed in these patients with a low incidence of clinically significant atrioventricular block.

REFERENCES

1. Yacoub N, Halim M, Radley-Smith R, McKay R, Nijueld A, Towers N. Surgical treatment of mitral regurgitation caused by floppy valves: repair versus replacement. Circulation 1981; **64[Suppl II]:**210–216.
2. Perier P, Deloche A, Chauvand S, et al. Comparative evaluation of mitral repairs and replacement with Starr, Bjork, and porcine valve prosthesis. Circulation 1984; **70[Suppl I]:**187–192.
3. Sand NE, Naftel DC, Blackstone EH, Kirklin JW. A comparison of repair and replacement for mitral valve incompetence. J Thorac Cardiovasc Surg 1987; **94:**208–219.
4. David TE, Uden DE, Strauss HS. The importance of the mitral apparatus in left ventricular function after correct on of mitral regurgitation. Circulation 1983; **68[Suppl II]:**76–82.
5. Vijayanagar R, Bognolo D, Eckstein P, Jeffery D, Toole J, Natarajan P, Willard E. Surgical treatment of mitral valve disease: pathologic findings and atrial dysrhythmia. South Med J 1983; **76:**703–735.
6. Flugelman MY, Hasin Y, Katznelson N, Kriwisky M, Shefer A, Gotsman MS. Restoration and maintenance of sinus rhythm after mitral valve surgery for mitral stenosis. Am J Cardiol 1984; 54:617–619.
7. Keefe DL, Griffin JC, Harrison DC, Stinson EB. Atrioventricular conduction abnormalities in patients undergoing isolated aortic or mitral valve replacement. PACE 1985; **8:**393–398.