

VALVE REPLACEMENT WITH OR WITHOUT CHORDAL PRESERVATION IN RHEUMATIC MITRAL INCOMPETENCE: MID-TERM FOLLOW-UP RESULTS

By

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ABSTRACT

A total of 133 consecutive patients with chronic rheumatic mitral incompetence were operated upon with mitral valve replacement (MVR) in Cardio-Thoracic Surgery Department at Mansoura University Hospitals. Seventy-seven patients (57.9%) were females and 56 (42.1%) were males, with age ranging from 16 to 41 years (mean 28.6 ± 5.3 years). Patients were studied preoperatively, early postoperatively (within three months), and at the most recent follow-up (mean of 40.3 months).

Seventy-one patients (53.4%) underwent conventional MVR (group I), and 62 (46.6%) underwent MVR with chordal preservation (group II). Preoperatively, there were no difference among both groups in age, gender,

NYHA (New York Heart Association) functional class, ejection fraction (EF), fractional shortening (FS), left ventricular end-systolic diameter (LVESD), left ventricular end-diastolic diameter (LVEDD), and left atrial diameter (LAD). There were four perioperative deaths (5.6%) and six late deaths among the 71 patients with conventional MVR, while in chordal preservation patients there were two perioperative deaths and three late deaths. At 5 years, the cumulative proportion survival for group I was 83.5% and for group II was 91.5% ($P = 0.03$ and Log Rank = 4.31). All preoperative parameters showed better improvement as measured early and at mid-term postoperatively in group II with statistically significant differences than in group I.

Patients in group II were divided

into two subgroups according to either partial (posterior) or total (posterior and anterior) chordal preservation was achieved (group III and IV respectively). Comparison of 43 patients in group III with 19 patients in group IV revealed statistically significant improvement in the group IV than in group III regarding the mid-term follow-up EF ($P = 0.006$), early postoperative FS ($P = 0.007$), and mid-term follow-up FS ($P = 0.006$). Other parameters shows no significant difference between the two groups including cumulative survival rate ($P = 0.6$ and Log Rank = 0.22).

These data demonstrate that postoperative survival, NYHA functional class, and left ventricular function are better in patients who undergo mitral valve replacement with chordal preservation than in patients in whom the chordae are excised. These improvements continue from the early to the mid-term postoperative follow-up. Total chordal preservation is better than posterior chordal preservation in some aspects.

INTRODUCTION

Despite improvement in myocardial protection, prosthetic valves, operative techniques, and postoperative

care, the prevalence of postoperative left ventricular dysfunction after mitral valve replacement (MVR) in patients with chronic mitral regurgitation remains high in comparison with other cardiac operations (1). On the other hand, mitral reconstructive technique for chronic mitral regurgitation carries a lower operative mortality and morbidity and better long-term survival than does MVR (2-4). Preservation of the mitral subvalvular apparatus has been demonstrated in several studies to improve postoperative left ventricular (LV) systolic performance in patients with mitral valve replacement (MVR) and recently gained popularity (5-9). Initially introduced by Lillehei and associates (10) in 1964 as a method of decreasing the prevalence of postoperative low-output syndrome, chordae sparing MVR did not gain wide acceptance largely because of reports by Bjork, Bjork, and Malers (11) and Rastelli and associates (12), who refused its possible beneficial effects. However, in 1983 Hetzer and associates (13) revived the technique of posterior leaflet retention and suggested that the continuity between the papillary muscles and mitral annulus was important for preservation of the left ventricular function after MVR.

Several studies have shown that mitral valve replacement with total chordal preservation (MVR-TCP) improves left ventricular function when compared with total chordal transection (6,7,14). Few clinical studies, however, have compared this technique to that involving only posterior chordal preservation (MVR-PCP) (15,16). This study compares conventional MVR with chordae sparing MVR as a primary procedure for chronic severe rheumatic mitral regurgitation and no concomitant cardiac disease. Also this study compares partial with complete chordal preservation methods of MVR. Most publications deal with the early postoperative course (17,18), while only a few describe the late outcome of these patients (19). The aim of this study was to ensure that these beneficial effects could be preserved in the mid-term postoperative course after MVR.

PATIENTS AND METHODS

Between January 1994 and December 1999, 133 patients underwent MVR for chronic rheumatic mitral regurgitation at Mansoura University Hospitals. The records of all patients were reviewed. Preoperative evaluation based mainly on Colour Doppler echocardiography which demonstrat-

ed that all patients had severe MR with left ventricular enlargement. Echocardiographic measurements included ejection fraction (EF), fractional shortening (FS), left ventricular end diastolic diameter (LVEDD), left ventricular end systolic diameter (LVESD), and left atrial diameter (LAD).

The study population was limited to 1) patients who had no clinical evidence of coronary artery disease, 2) patients who had a mean gradient across the mitral valve no greater than 10 mm Hg, 3) patients without severe pulmonary hypertension, 4) patients who had no previous open or closed cardiac operation, 5) patients who had no other forms of cardiac disease that warranted concomitant corrective procedures either at the initial MVR or during the subsequent follow-up, and 6) patients who did not require reoperation because of prosthetic dysfunction within the follow-up period.

To compare between the conventional MVR and MVR with chordal preservation patients were divided into two main groups. Group I includes seventy-one patients who underwent MVR with excision of the na-

tive valve and chordae tendineae (conventional replacement), and group II includes forty-three patients who underwent MVR with chordal preservation.

Group II was then divided into two subgroups (III and IV respectively) according to whether the chordal preservation is partial (posterior chordal preservation) or complete (posterior and anterior chordal preservation). There were 43 patients in group III and 19 in group IV.

In the conventional MVR group (group I), both mitral valve leaflets were excised together with the attached chordae tendinae till the head of the corresponding papillary muscle. Ticon 2/0 transverse mattress sutures with or without teflon pledgets were inserted circumferentially across the mitral valve anulus from the atrial to the ventricular side, then through the sewing ring from inside out. In the posterior chordae preservation group (group III) the same suture techniques in group I was used, but the posterior mitral valve leaflet with the attached chordae tendineae were left intact, the Ticon transverse mattress sutures were passed through the mitral valve annulus from the atrial side to the

ventricular side, then through the corresponding segment of the free margin of the posterior cusp of the mitral valve. The technique proceeded typically as in group I. On setting the valve prosthesis, the sutures by this configuration had collected the posterior cusp backward in-between the prosthesis and the valve annulus. In the group with both chordal preservation (group IV), in addition to what was done in group III, we had preserved a wedge of the edge of the anterior cusp that carries the attachment of the main chorda to the anterior papillary muscle and attaching this wedge to the annulus of the mitral ring at the anterior commissure. The same was done with a wedge of the cusp at the posterior papillary muscle attachment.

All patients in this series were studied preoperatively, early postoperatively (within 3 months from the operation), and at the most recent follow up which ranged from 10 to 81 months (mean of 40.3 ± 16.5 months). Each study includes mainly clinical examination, electrocardiography, chest x-ray, and echocardiography. Comparison between group I and group II was done to detect the difference between the conventional

difference between the conventional MVR and MVR with chordal preservation in general, then comparison between the two groups of chordal preservation (group III and group IV) was done to find the difference between partial and total chordal preservation.

All available data were tabulated and analysed using the Statistical Package for Social Science (SPSS). Values are expressed as the mean \pm Standard deviation (SD). Chi-square test was used for analysis of categorical data. For continuous variables, statistical analysis was performed using Student's test. A $p < 0.05$ was considered statistically significant. Survival was estimated by the actuarial method and the calculated cumulative percentages of different patient groups were compared by the Logrank test.

RESULTS

A total of 133 patients underwent mitral valve replacement for chronic rheumatic mitral incompetence over 6-year period ending in December 1999, in the Departement of Cardio-Thoracic Surgery at Mansoura University Hospitals. Seventy-seven of the patients (57.9%) were females and 56 (42.1%) were males, with age ranging from 16 to 41 years (mean

28.6 ± 5.3 years).

The results of this study concentrate on two subjects. The first is the comparative assessment of chordal preservation, in general, versus chordal resection during mitral valve replacement. The second is the comparative assessment of total versus partial chordal preservation.

I- ASSESSMENT OF CHORDAL PRESERVATION VERSUS RESECTION : Seventy-one patients (53.4%) underwent conventional MVR (group I) and 62 (46.6%) underwent MVR with chordal preservation either partial or total (group II). There were no statistically significant difference in the two groups of patients regarding pre-operative data including age, sex, NYHA functional class, and the hemodynamic parameters as measured by echo-Doppler study (EF, FS, LVEDD, LVESD, and LAD) (Table 1).

There was no significant difference between the two groups regarding the mean aortic cross clamp time which was 59.7 ± 7.9 minutes in the first group versus 62.3 ± 6.2 minutes in the second group ($P = 0.1$). The cardiopulmonary bypass (CPB) time was significantly longer in patients with

conventional MVR than in chordal preservation group (120.5 ± 16.8 versus 95.1 ± 12.4 with $P = 0.01$). There was no significant difference between the two groups regarding the valve type or size. Postoperative low cardiac output (LCOP) syndrome is defined as the requirement of infusion of inotropic drugs for more than 30 minutes to maintain a systolic blood pressure greater than 90 mm Hg or a cardiac index above 2 L/min/m² (20). There was a statistically significant difference in the incidence of LCOP syndrome in the two groups which was more in group I ($P = 0.001$). Postoperative ventilation hours and intensive care unit (ICU) stay were significantly longer in the group I than in group II ($p = 0.003$ and 0.02 respectively), while the total hospital stay was not statistically different ($P = 0.07$) although it was apparently longer in group I (17 versus 13 days).

Early postoperative and recent follow-up echocardiographically measured EF, FS, LVESD, LVEDD, LAD, and peak gradient across the left ventricular outflow tract values are shown in Table 2. One-way repeated measures ANOVA demonstrated a statistically significant better improvement in all these parameters in group II than

in group I. However, there was no significant difference between the two groups regarding the peak gradient across the left ventricular outflow tract.

Hospital mortality included 6 patients (4.5%), 4 of them were from the conventional MVR group. The follow-up ranged between 10 and 81 months with a mean of 40.3 ± 16.5 months. Through the follow-up period 8 patients died, 6 of them were from the conventional MVR group. Figure 1 shows actuarial survival curve for the two groups of patients. At 5 years, the cumulative proportion survival for group I was 83.5% and for group II was 91.5%. Kaplan-Meier estimate of survival showed that patients with chordal preservation had a statistically significant better survival rate than in patients with conventional MVR ($P = 0.03$ & Log Rank = 4.31).

II- ASSESSMENT OF POSTERIOR VERSUS POSTERIOR AND ANTERIOR CHORDAL PRESERVATION: We compared the results between group III with posterior chordal preservation (partial preservation) and group IV with preservation of both posterior and anterior chordae tendineae (total preservation).

Preoperative data showed that there is no statistically significant difference between the two groups regarding age, NYHA functional class, EF, FS, LVESD, LVEDD, and LAD (Table 3).

Postoperatively both groups of patients improved clinically and hemodynamically. Patients with both anterior and posterior chordal preservation (group IV) had statistically significant better improvement in mid-term follow-up EF and both early postoperative and follow-up FS. Although there is a better improvement in all other parameters in group IV than in group III but it did not reach a statistically

significant values. There is no change in the peak gradient across the left ventricular outflow tract between the two groups throughout the follow-up period (Table 4).

In comparison of the two groups regarding the hospital and follow-up mortality, there was one hospital death and two deaths group III. In group IV was also one hospital mortality and only one late death. Kaplan-meier estimate of survival in these two groups (Fig. 2) shows no statistically significant difference ($P = 0.6$ & Log Rank 0.22). At 5 years, the cumulative proportion survival for group I was 84% and for group II was 91.5%.

Table 1. Preoperative comparison between the two main groups of patients (conventional versus chordal preservation).

Factor	Group I (N = 71)	Group II (N = 62)	P-value
Age (years)	29.2 ± 4.9	28.0 ± 5.7	0.2
NYHA functional class	3.0 ± 0.3	3.1 ± 0.5	0.7
Ejection fraction (%)	63.4 ± 3.7	62.5 ± 3.6	0.1
Fractional shortening (%)	33.0 ± 2.3	33.2 ± 2.7	0.7
LVESD (mm)	40 ± 2	41 ± 3	0.8
LVEDD (mm)	61 ± 3	63 ± 5	0.07
LAD (mm)	60 ± 11	61 ± 9	0.5

N: Number of patients. NYHA: New York Heart Association functional class. LVESD: Left ventricular end systolic diameter. LVEDD: Left ventricular end diastolic diameter. LAD: Left atrial diameter. $P < 0.05$ considered significant.

Table 2. Comparison of postoperative results in two groups of patients (conventional versus chordal preservation).

Factor	Group I (N=71)	Group II (N=62)	P-value
Early postoperative results:	(N = 67)	(N = 60)	
NYHA functional class	1.9 ± 0.3	1.5 ± 0.2	0.01
Ejection fraction (%)	59 ± 3	65 ± 3	0.00001
Fractional shortening (%)	31 ± 2	35 ± 3	0.001
LVESD (mm)	38 ± 2	36 ± 3	0.003
LVEDD (mm)	57 ± 4	53 ± 5	0.003
Left atrial diameter (mm)	56 ± 7	52 ± 5	0.01
LVOT peak gradient (mm Hg)	4.3 ± 0.2	5.1 ± 0.1	0.07
Mid-term follow-up results:	(N = 61)	(N = 57)	
NYHA functional class	1.9 ± 0.8	1.2 ± 0.5	0.0009
Ejection fraction (%)	57 ± 2	68 ± 4	0.0002
Fractional shortening (%)	29 ± 2	39 ± 3	0.0001
LVESD (mm)	41 ± 2	34 ± 2	0.002
LVEDD (mm)	62 ± 4	49 ± 4	0.001
Left atrial diameter (mm)	52 ± 6	49 ± 7	0.003
LVOT peak gradient (mm Hg)	4.6 ± 0.3	5.2 ± 0.2	0.08

N: Number of patients. NYHA: New York Heart Association functional class. LVESD: Left ventricular end systolic diameter. LVEDD: Left ventricular end diastolic diameter. LVOT: Left ventricular outflow tract. $P < 0.05$ considered significant.

Table 3. Preoperative comparison of two groups of patients (partial versus total chordal preservation).

Factor	Group III (N = 43)	Group IV (N=19)	P-value
Age (years)	28.2 ± 5.9	27.7 ± 5.3	0.3
NYHA functional class	3.0 ± 0.4	3.1 ± 0.6	0.3
Ejection fraction (%)	62.5 ± 3.8	62.3 ± 2.9	0.8
Fractional shortening (%)	33.5 ± 2.6	32.2 ± 0.8	0.8
LVESD (mm)	40.2 ± 2.5	41.7 ± 3.8	0.07
LVEDD (mm)	64.1 ± 4.8	62.5 ± 5.3	0.2
Left atrial diameter (mm)	62.3 ± 5.4	60.8 ± 4.7	0.07

N: Number of patients. NYHA: New York Heart Association functional class. LVESD: Left ventricular end systolic diameter. LVEDD: Left ventricular end diastolic diameter. $P < 0.05$ considered significant.

Table 4. Postoperative results in two groups of patients (partial versus total chordal preservation).

Factor	Group III (N=43)	Group IV (N=19)	P-value
Early postoperative results:	(N = 42)	(N = 18)	
NYHA functional class	1.33 ± 0.34	1.26 ± 0.34	0.5
Ejection fraction	64.9 ± 3.7	65.5 ± 2.2	0.1
Fractional shortening	35.4 ± 2.7	37.5 ± 2.6	0.007
LVESD	35.5 ± 2.4	36.8 ± 3.0	0.07
LVEDD	54.0 ± 4.9	52.1 ± 4.3	0.1
Left atrial diameter	52.4 ± 4.3	51.7 ± 5.1	0.3
LVOT peak gradient	5.0 ± 0.3	5.3 ± 0.2	0.1
Mid-term follow-up results:	(N = 40)	(N = 17)	
NYHA functional class	1.30 ± 0.56	1.23 ± 0.43	0.6
Ejection fraction	67.1 ± 4.0	70.1 ± 3.1	0.006
Fractional shortening	38.3 ± 2.3	40.4 ± 2.9	0.006
LVESD	33.8 ± 2.0	33.5 ± 2.7	0.5
LVEDD	50.2 ± 4.0	48.9 ± 4.1	0.2
Left atrial diameter	51.1 ± 3.8	49.2 ± 4.8	0.6
LVOT peak gradient	5.1 ± 0.3	5.4 ± 0.4	0.09

N: Number of patients. NYHA: New York Heart Association functional class. LVESD: Left ventricular end systolic diameter. LVEDD: Left ventricular end diastolic diameter. LVOT: Left ventricular outflow tract. $P < 0.05$ considered significant.

Fig 1. Kaplan-Meier estimate of survival by type of management.

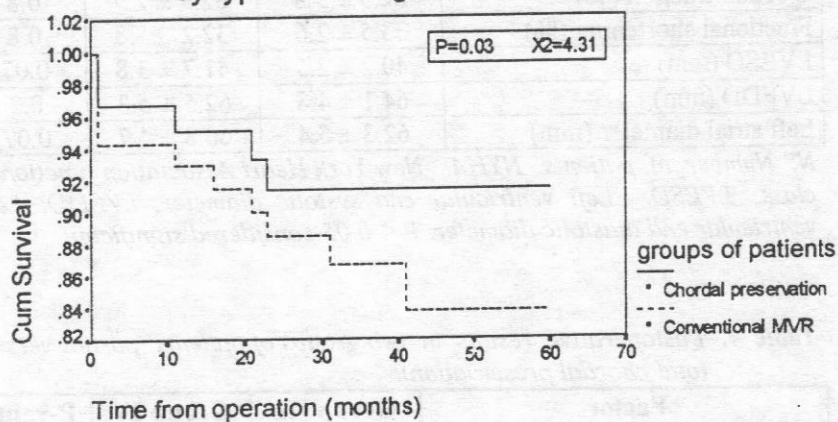
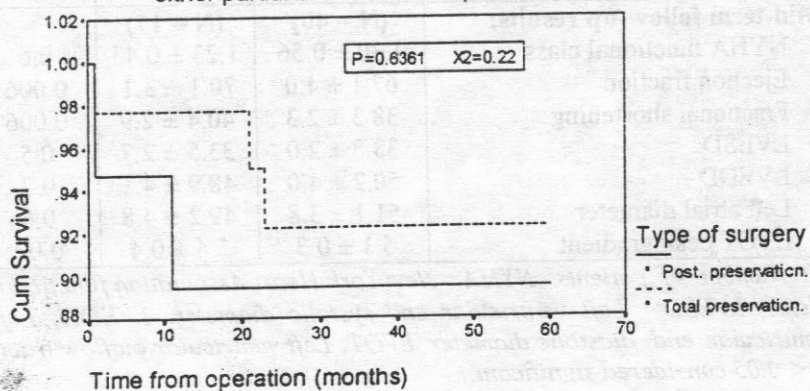


Fig 2. Kaplan-Meier estimate of survival according to either partial or total chordal preservation.



DISCUSSION

Left ventricular dysfunction has been prevalent after mitral valve replacement for mitral regurgitation, resulting in poor postoperative results (21,22). Many perioperative strategies, such as myocardial protection, prosthetic valve insertion, and mitral reconstructive technique, to decrease the postoperative low cardiac output, have been elaborated (23).

The clinical problem with chronic mitral regurgitation undergoing MVR is due to the fact that sudden interruption of the regurgitant flow into the low resistance left atrium will increase left ventricular afterload, which may further depress an already compromised left ventricle (21). Patients who had mitral regurgitation repaired by means of valve repair do better than those who had mitral valve replacement (24,25). Thus the presence of the mitral apparatus was suggested to be important for postoperative left ventricular function in patients with chronic mitral regurgitation (23,26).

In 1956 Rushmer (27) showed in dog experiments that the integrity of the mitral valve apparatus and its attachment to the ventricular wall plays an important role in left ventricular

function. The importance of preservation of the native valve and the attached chordae in MVR was initially introduced by Lillehei and associates in 1964 (10). In 1980s Hetzer and associates (13) and David and associates (25) have been responsible for the reemergence of the chordal preservation technique as an important method of maintaining left ventricular function after MVR.

In our previous work (28) we got the preliminary results in a smaller number of patients in the early postoperative period only. In this study we extend the results to the mid-term follow-up on a bigger number of patients. The previous study compared between three groups (conventional MVR, MVR with posterior chordal preservation, and MVR with posterior and anterior chordal preservation). In the current study we compared first between patients underwent conventional MVR with patients underwent MVR with any chordal preservation, then we compared between patients with partial (posterior) chordal preservation and patients with total (anterior and posterior) chordal preservation.

The current study demonstrates that MVR with partial or total chordal

preservation is associated with a better long-term survival than conventional MVR. The operative mortality of our group of patients undergoing conventional MVR was 5.6% and the follow-up mortality was 10.2%. The 5-year cumulative proportion survival rate was 83.5%, results analogous to those of recently reported series (18). Conversely, two operative (3.2%) and 3 late deaths (5%) occurred in patients undergoing chordal preserving MVR at a mean follow-up of 40.3 ± 16.5 months. The 5-year cumulative proportion survival rate for patients with chordal preservation (Fig 1) was 91.5% which is statistically significant better than in patients with conventional MVR ($P = 0.03$). Hence chordal preservation appears to be better in the mid-term results than conventional MVR, yet analogous to results previously reported for MVR with or without chordal preservation as well as results associated with mitral valve reconstruction (23-26).

In addition to an improved survival, patients undergoing chordal preservation MVR derived greater functional benefit than patients undergoing conventional operation. Whereas all patients in the preservation group had an improvement in functional class at

mid-term follow-up, 26% of patients who had conventional MVR remained either in the same functional class or were more incapacitated. As a group, patients undergoing chordal preservation MVR had a significantly greater improvement ($P = 0.002$) in functional class than patients in the conventional replacement group (Table 2).

Left ventricular ejection fraction and fractional shortening measured by echo-Doppler study has been reported to decrease (30-32) or remain the same (32,33) after MVR for mitral regurgitation. The decline in the EF and FS after MVR has been typically explained by the increased afterload produced by a competent mitral valve (21). Controlled studies determined that EF and FS are preserved when chordal preservation techniques are used as compared with techniques that remove the native valve and attached chordae (25). The present study demonstrates that postoperative and mid-term follow-up results revealed improvement of EF and FS in the chordal preservation group than in conventional MVR group with statistically significant difference (Table 1&2). This dependency of the postoperative EF and FS on the method of MVR supports the theory that preser-

vation of annular-ventricular continuity through the chordae tendineae is an important determinant of postoperative left ventricular function and that the increased afterload produced by a competent valve is of less importance (18).

Left ventricular volumes assessed by echo-Doppler study have also been reported to decrease (30,31), or not change significantly (25) after conventional MVR. The present study demonstrates that LVESD and LVEDD decreased in both groups in the early postoperative examination, however, this decrease was statistically significant only in chordal preservation group (Table 1&2). In the mid-term postoperative examination left ventricular dimensions continue to improve in the chordal preservation group while deteriorated and returned back almost to the preoperative values in the conventional MVR group (Table 1&2). These changes in the LVESD primarily accounted for the preservation of the FS in patients with preserved chordae compared with those with removal of the chordae.

Some previous studies (15,16) have compared MVR with total versus partial chordal preservation in relation

to outcome and functional results. All of these studies proved better early postoperative results in patients with total than in patients with partial chordal preservation. Our study demonstrates that patients in both groups had similar early and mid-term postoperative results regarding cumulative survival at 5-years (Fig 2), NYHA functional class, left ventricular dimensions and early postoperative EF. However mid-term follow-up EF as well as both early and follow-up FS showed better results with total versus partial chordal preservation (P values are 0.006, 0.007, 0.006 respectively) as demonstrated in Table 4. However, the two preservation groups experienced continuous improvement throughout the follow-up period in comparison to the preoperative results. These findings emphasize the importance of total chordal preservation in preserving the left ventricular ejection fraction and fractional shortening throughout the mid-term follow-up.

In conclusion, the current study demonstrates that chordal preservation techniques during MVR for severe isolated rheumatic mitral regurgitation improves survival, enhances functional capacity, preserves left

ventricular ejection fraction and fractional shortening, and results in reduction in both LVESD and LVEDD compared with conventional MVR.

Compared with posterior chordal preservation only, complete retention of the subvalvular apparatus results in improved postoperative NYHA functional class and left ventricular systolic function.

We recommend that during MVR attempts should be made to preserve all chordal structures to both the anterior and posterior leaflet to optimize postoperative left ventricular systolic function. These hemodynamic advantages proved to continue throughout the mid-term follow-up results in this study.

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نتائج المتابعة متوسطة المدى لحالات الارتجاع الروماتيزمي المزمن التي أجري لها إستبدال الصمام الميترالي أما بقطع الأحيال الوترية أو الإبقاء عليها

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خلال الفترة مابين يناير ١٩٩٤ وديسمبر ١٩٩٩ أجريت عملية إستبدال الصمام الميترالي لسلسلة متتابعة من ١٣٣ مريضاً مصابون بارتجاع روماتيزمي مزمن لصمام الميترال وذلك بقسم جراحة الصدر والقلب بكلية الطب - جامعة المنصورة.

سته وخمسون مريضاً (٤٢٪) كانوا ذكوراً و ٧٧ (٥٧٪) كانوا من الاناث. وكانت الأعمار تتراوح بين ١٦ و ٤١ سنة بمتوسط عمر ٢٨.٦ سنة. وقد تمت دراسة الحالات قبل إجراء الجراحة وفي الفترة المبكرة بعد الجراحة (خلال ٣ شهور) وبعد فتره متوسطه المدى تتراوح بين ١٠ و ٨١ شهراً بمتوسط ٤٠.٣ شهراً بعد الجراحة .

كان الهدف فى الجزء الأول من الدراسة هو إيجاد الفرق بين نتائج العملية مع الإبقاء على الأحيال الوترية وبين نتائج العملية مع قطع الأحيال الوترية. وتم تقسيم المرضى إلى مجموعتين. المجموعة الأولى وتشمل ٧١ مريضاً (٥٣٪) أجريت لهم عملية إستبدال الصمام الميترالي التقليدي والتي يتم فيها قطع الأحيال الوترية وشملت المجموعة الثانية ٦٢ مريضاً (٤٦٪) وتم لهم إستبدال الصمام الميترالي مع الحفاظ على إتصال الأحيال الوترية بين شرفات الصمام والعضلات الحليمية. وقد وجد من النتائج أن عدد الوفيات بالمجموعة الأولى فى المرحلة المبكرة بعد الجراحة ٤ حالات وستة حالات خلال فترة المتابعة بينما كان هناك حالتين وفاه مبكره وثلاثة حالات وفاه خلال المتابعة بالمجموعة الثانية مما يبين فرق ذات دلالة إحصائية عن تحسن البقاء على قيد الحياه فى المجموعة الثانية. وكذلك عن اختبارات وظائف القلب وتصنيف المرضى حسب التصنيف الوظيفى لجمعية القلب الأمريكية بعد الجراحة فكلها أظهرت تحسن ذات دلالات إحصائية فى المجموعة الثانية والتي تم فيها الحفاظ على إتصال

الأحبال الوترية بالمقارنة بالمجموعة الأولى وذلك فى الفترة المبكرة بعد الجراحة واستمرار هذا التحسن حتى آخر متابعه

وامتدت الدراسة فى الجزء الثانى للبحث فى الفرق فى النتائج بين الحفاظ الكلى وبين الحفاظ الجزئى للأحبال الوترية. حيث تم تقسيم المجموعة الثانية (وهى مجموعة المرضى الذين تم لهم الحفاظ على الأحبال الوترية) الى مجموعتين ثالثة ورابعة حسب الحفاظ الجزئى أو الكلى للأحبال الوترية ففى المجموعة الثالثة تم الحفاظ على الجزء الخلفى فقط من الأحبال الوترية وشملت ٤٣ مريضاً وفى المجموعة الرابعة تم الحفاظ على الجزء الخلفى والأمامى للأحبال الوترية وشملت ١٩ مريضاً. وبمقارنة المجموعتين الثالثة والرابعة كما تم فى المقارنة بين المجموعة الأولى والثانية تبين أن الحفاظ الكلى على الأحبال الوترية يعطى نتائج أفضل وذات دلالة إحصائية فى الوظائف الانقباضية للبطين الأيسر أما فى باقى المقارنات والتي شملت التصنيف الوظيفى ونسبة البقاء على قيد الحياة والمقاسات الأخرى للبطين الأيسر والأذين الأيسر فكانت النتائج أفضل فى المجموعة الرابعة وإن لم تصل الى دلالة إحصائية ذو إعتبار ويستخلص من البحث أن الحفاظ على الأحبال الوترية عموماً يعطى نتائج أفضل فى جميع النقاط التى تم بحثها فى حالة قطع الأحبال الوترية مع شرفات الصمام فى حالات إستبدال الصمام الميترالى للإرتجاع الروماتيزمى. وأن الحفاظ الكلى للأحبال الوترية يتميز عن الحفاظ الجزئى لها فى إعطاء نتائج أفضل فى الوظائف الانقباضية للبطين الأيسر وعلى هذا فإننا نوصى بالحفاظ الكلى للأحبال الوترية كلما أمكن ذلك للحصول على نتائج أفضل على المدى القريب والمتوسط بعد الجراحة .