VIDEO ASSISTED MINIMAL INVASIVE MITRAL VALVE REPAIR VS CONVENTIONAL IN DEGENERATIVE MITRAL VALVE DISEASE

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ABSTRACT:

Background: *The lateral thoracotomy approach for mitral valve surgery was used extensively in the early history of open-heart surgery. Postoperative sternal wound complications are the major problem with sternotomy incision, other disadvantages of median sternotomy is the bad cosmetic appearance of the scar, which is more prone to keloid formation.*

Aim of the Work: *To compare the procedure and early postoperative outcome of the standard sternotomy approach for mitral valve repair surgery versus the video assisted minimally invasive approach through right anterolateral minithoracotomy.*

Patients and Methods: *This study is a randomized, controlled and prospective study. It was conducted on 66 patients suffering from MVD selected randomly (purposive non probability sample) to compare procedure and early outcome of traditional sternotomy versus video assisted minimal invasive technique. Patients were divided into two groups of 33 cases, Group "A" underwent mitral valve surgery through video assisted minimally invasive right anterolateral video-assisted minithoracotomy, while group 'B" underwent mitral valve repair surgery through a conventional median sternotomy from 2020 to August 2021.*

Results: *There was no statistically significant difference as regards the age, sex, NYHA, preoperative echocardiographic findings. Regarding intraoperative comparison, there was highly statistically significant difference in the cross-clamp time, total bypass time and total operative time, this difference may be due to the new experiences in MIMVS. The length of the incision was highly significantly lesser in group "A" than in group "B", There was significant difference in the intensive care parameters. The mechanical ventilation time was shorter in group "A", the blood loss and the blood transfusion required was lesser in group "A". The ICU stay was shorter in group "A". There was significantly less postoperative pain in group (A) than in group (B). Total hospital stay was less in group (A) than in group (B). The complications of group "A" were less serious than those in group "B" but there was no statistical significance. MIMVS was more cost effective than sternotomy group.*

Conclusion: *In patients with mitral valve disease, minimally invasive surgery may be an alternative to conventional mitral valve surgery. Right anterolateral minithoracotomy provides excellent exposure of the mitral valve and offers a better cosmetic lateral scare comparable short-term mortality. Comparable in-hospital morbidity (renal, pulmonary, cardiac complications, and readmissions), Reduced pain perception, transfusions, postoperative blood loss,*

duration of ventilation, ICU, hospital length of stay and early return to normal life activity in minithoracotomy than conventional sternotomy.

Keywords: *Mitral Valve Disease; Mitral Valve Repair; Video Assisted Minimal Invasive*

INTRODUCTION:

Degenerative mitral valve disease is a common disorder affecting around 2% of the population. The most common finding in patients with degenerative valve disease is leaflet prolapse due to elongation or rupture of the chordal apparatus, resulting in varying degrees of mitral valve regurgitation[1].

Mitral valve prolapse due to degenerative disease is defined by a spectrum of lesions, varying from simple chordal rupture involving prolapse of an isolated segment (most commonly the middle scallop of the posterior leaflet) in an otherwise normally shaped valve, to multi-segment prolapse involving one or both leaflets in a valve with significant excess tissue and large annular size; thus, a spectrum of degenerative disease is evident in clinical practice, which has important clinical and surgical implications[2].

Surgical intervention for chronic severe mitral valve regurgitation is usually triggered by the occurrence of symptoms, declining LV function, significant LV enlargement, or the development of atrial fibrillation or severe pulmonary hypertension[3].

Full median sternotomy has been well established as a standard approach for all types of open heart surgery for many years. Although well established the full sternotomy incision has been frequently criticised for its length, postoperative pain and possible complications like wound infection and instability[4].

Other less invasive approaches, including limited sternotomy or small skin incision (8–10 cm)-full sternotomy, and right sided minithoracotomies with or without video assistance are now successfully performed in many expert centres[5].

Since the first video-assisted mitral valve repair through a minithoracotomy carried out in 1996 and the first minimally invasive mitral valve replacement in the same year, an increasing enthusiasm has accompanied the development of minimally invasive mitral valve surgery[6].

These approaches are associated with higher patient cosmetic satisfaction; lesser blood transfusion has been reported in some series, at the expense of longer cross-clamp times[5].

The right thoracotomy approach is often used in the redo setting, as it avoids the need for repeat sternotomy and requires less dissection of the heart. Completely endoscopic robotic valve repair has been reported to be feasible and reproducible in expert centers and has been embraced in selected high volume centers. Higher costs, undocumented benefit, and the extensive learning curve associated with robotic approaches likely explain slow adoption[7].

In this modern era of imaging and degenerative disease differentiation, it should be very uncommon for a patient with mitral valve prolapse to have an unexpected valve replacement based on operative findings[8].

The patient with degenerative mitral valve disease deserves the best possible chance for a repair procedure, which is associated with lower long-term morbidity and mortality compared with valve replacement in a majority of patients[9].

AIM OF THE WORK:

The aim is to evaluate early post-Operative outcome after mitral valve repair in degenerative mitral valve disease either by conventional median sternotomy or video assisted thoracoscopic surgery.

PATIENTS AND METHODS:

A randomized, controlled and prospective study will be conducted on patients diagnosed to have degenerative mitral valve disease with severe mitral regurge. Patients divided to 2 groups according to surgical approach either conventional median sternotomy or video assisted thoracoscopic surgery. The study will be conducted from 2020 to August 2021. Patients were divided in to 2 groups according to surgical technique, each group include (33) patients: Group A: using video assisted thoracoscopic surgery and Group B: using conventional median sternotomy

The inclusion criteria were: patients with severe symptomatic mitral regurge due to degenerative mitral valve disease and myocardial preservation were custodial. While the exclusion criteria were: Patients with morbid obesity, history of previous thoracic surgery, Patients with concomitant other valve lesions like calcific aortic stenosis or tricuspid regurge, Ischemic heart disease patients who need coronary artery bypass grafting surgery and redo patients.

A- Preoperative period:

History taking: a through history will taken; as regards age, sex, and functional class according to the New York Heart association (NYHA), Data were registered in a detailed report card, including diagnosis, risk factors for (systemic arterial hypertension, diabetes mellitus).

Clinical examination: a complete clinical general and local cardiological examination will performed including (Heart rate, Rhythm, Blood pressure, Chest and heart auscultation) The examination for exclusion of any comorbidity was done.

Investigations: a. Laboratory investigations: i. Liver function tests (total bilirubin, liver enzymes, serum albumin, total proteins, prothrombin time and concentration). ii. CBC. iii. Kidney function tests (serum urea and creatinin), iv. Fasting blood sugar, 2h post prandial blood glucose level, HBA1C.

Electorcardiogram: 12 leads ECG will be done for all patients to evaluate any previous myocardial infarctions.

Radiological examination: Plain chest x-ray postero –anterior view to evaluate cardiothoracic ratio and the different cardiac chambers.

Echocardiography:

1. Assessment of valve leaflets and segments.
2. Estimation of vena contracta.
3. Estimation of central regurge jet area and regurge volume.
4. Assessment sub valvular apparatus.
5. Left ventricular and left atrial dimensions.
6. Assessment of ejection fraction.
7. Estimation of pulmonary artery systemic pressure.

B- Intraoperative assessment:

- Type of surgical procedure.
- Total operative time.
- Cross clamp time.
- Pre and post-operative transesophageal echo assessment
- Need for inotropic support and need for D.C shock.
- Need and amount of blood transfusion.
- Weaning from cardiopulmonary bypass either smooth or difficult.
- Any complications necessitating conversion from minimal invasive to conventional sternotomy

C) Postoperative assessment:

- Total I.C.U stay
- Duration of mechanical ventilation
- Need for inotropes
- Total hospital stay
- Reoperations for bleeding
- Need and amount of blood transfusion.
- Predischarge echo assessment.
- Incidence of cerebrovascular stroke.
- Incidence of wound infection
- Incidence of respiratory infection
- Mortality

Statistical analysis:

The statistical analysis will be performed using PASS 11 program for sample size calculation, confidence interval 90%, margin of error ± 0.1 and by reviewing previous study results, showed the rates of freedom of reoperation (accuracy of Repair) among group of patients underwent Video assisted minimal invasive mitral valve repair versus patients underwent conventional median sternotomy in degenerative mitral valve disease were (95% vs. 92% respectively); based on that, the required sample size will be 66 patients (33 patients in each group) to be sufficient to detect the difference between groups.

RESULTS

Table (1): Descriptive data regarding Demographic data

		No. = 66
Age	Mean±SD	43.62 ± 11.14
	Range	28 – 66
Sex	Female	31 (47.0%)
	Male	35 (53.0%)
BMI	Mean±SD	24.92 ± 2.46
	Range	20 – 30
Smoking	Non-smoker	37 (56.1%)
	Smoker	29 (43.9%)
AF/Sinus	AF	26 (39.4%)
	Sinus	40 (60.6%)
HbA1c	Mean±SD	5.95 ± 1.26
	Range	4 – 9
NYHA Grade	NYHA II	34 (51.5%)
	NYHA III	32 (48.5%)

Table (2): Comparison between Group A and group B regarding Demographic data.

		Group A	Group B	Test value	P-value	Sig.
		No. = 33	No. = 33			
Age	Mean ± SD	43.79 ± 11.07	43.45 ± 11.38	0.121•	0.904	NS
	Range	28 – 66	28 – 66			
Sex	Female	14 (42.4%)	17 (51.5%)	0.547*	0.459	NS
	Male	19 (57.6%)	16 (48.5%)			
BMI	Mean ± SD	24.24 ± 2.21	25.61 ± 2.54	0.537*	0.323	NS
	Range	20 – 30	21 – 30			
Smoking	Non-smoker	20 (60.6%)	17 (51.5%)	0.554*	0.457	NS
	Smoker	13 (39.4%)	16 (48.5%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; •: Independent t-test.

The Previous table shows that there was no statistically significant difference found between two groups regarding Age, ex, BMI and smoking.

Table (3): Comparison between Group A and group B regarding preoperative assessment

		Group A No. = 33	Group B No. = 33	Test value	P-value	Sig.
AF/Sinus	AF	12 (36.4%)	14 (42.4%)	0.254*	0.614	NS
	Sinus	21 (63.6%)	19 (57.6%)			
HbA1c	Mean ± SD	5.97 ± 1.26	5.94 ± 1.27	0.097•	0.923	NS
	Range	4 – 9	4 – 9			
NYHA Grade	NYHA II	16 (48.5%)	18 (54.5%)	0.243*	0.622	NS
	NYHA III	17 (51.5%)	15 (45.5%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; •: Independent t-test

The Previous table shows that there was no statistically significant difference found between two groups regarding AF/Sinus, HbA1c and NYHA grade.

Table (4): Comparison between Group A and group B regarding preoperative echo:

		Group A No. = 33	Group B No. = 33	Test value	P-value	Sig.
Ejection Fraction (%)	Mean ± SD	50.06 ± 6.06	49.91 ± 6.13	0.101•	0.920	NS
	Range	39 – 65	39 – 65			
Mitral pathology	Moderate MR	2 (6.1%)	4 (12.1%)	0.733*	0.392	NS
	Severe MR	31 (93.9%)	29 (87.9%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; •: Independent t-test

The Previous table shows that there was no statistically significant difference found between two groups regarding Ejection fraction and the Mitral pathology.

Table (5): Comparison between Group A and group B regarding intraoperative course:

		Group A No. = 33	Group B No. = 33	Test value	P-value	Sig.
Mitral repair	Mitral repair	32 (97.0%)	32 (97.0%)	NA	NA	NA
	Mitral repacment	1 (3.0%)	1 (3.0%)			
Bypass Time	Mean ± SD	95.39 ± 15.69	62.67 ± 8.96	10.403•	<0.01	HS
	Range	65 – 130	45 – 85			
XC Time (min)	Mean ± SD	83.33 ± 14.07	52.27 ± 8.89	10.722•	<0.01	HS
	Range	55 – 110	30 – 75			
Total operative time	Mean ± SD	5.70 ± 0.98	3.24 ± 0.61	12.160•	<0.01	HS
	Range	4 – 8	2 – 5			
Conversion to open	No	32 (97.0%)	32 (97.0%)	NA	NA	NA
	Yes	1 (3.0%)	1 (3.0%)			
Inotropes	No	23 (69.7%)	22 (66.7%)	0.070*	0.792	NS
	Yes	10 (30.3%)	11 (33.3%)			
DC shock	No	17 (51.5%)	20 (60.6%)	0.554*	0.457	NS
	Yes	16 (48.5%)	13 (39.4%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; •: Independent t-test

The Previous table shows that there was highly significant difference found between two groups regarding Bypass time, Cross clamp and total operative time with ***(p-value<0.01).*** While there was no statistically significant difference found between two groups regarding Mitral repair, conversion to open, inotropes and DC shock.

Table (6): Comparison between Group A and group B regarding post operative course:

Complications		Group A		Group B		Test value*	P-value	Sig.
		No.	%	No.	%			
Arrythmia	No	31	93.9%	33	100.0%	2.063	0.151	NS
	Yes	2	6.1%	0	0.0%			
Bleeding	No	32	97.0%	25	75.8%	6.304	0.012	S
	Yes	1	3.0%	8	24.2%			
pulmonary complications	No	31	93.9%	33	100.0%	2.063	0.151	NS
	Yes	2	6.1%	0	0.0%			
Pericardial effusion	No	33	100.0%	26	78.8%	7.831	0.005	HS
	Yes	0	0.0%	7	21.2%			
Heart block	No	33	100.0%	33	100.0%	NA	NA	NA
	Yes	0	0.0%	0	0.0%			
Femoral complication	No	33	100.0%	33	100.0%	NA	NA	NA
	Yes	0	0.0%	0	0.0%			
Renal impairment (Dialysis)	No	33	100.0%	33	100.0%	NA	NA	NA
	Yes	0	0.0%	0	0.0%			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test

The Previous table shows that there was highly significant difference found between two groups regarding Pericardial effusion with ***(p-value=0.005).***

There was statistically significant difference found between two groups regarding bleeding with ***(p-value=0.012).***

While there was no statistically significant difference found between two groups regarding Arrhythmia, pulmonary complications, heart block, femoral complication and renal impairment.

Table (7): Comparison between Group A and group B regarding ICU course:

		Group A	Group B	Test value	P-value	Sig.
		No. = 33	No. = 33			
Stay in ICU (Nights)	Mean ± SD	1.36 ± 0.78	3.45 ± 0.97	-9.627	<0.01	HS
	Range	1 – 5	2 – 5			
Mechanical ventilations (MV)Hrs	Mean ± SD	3.03 ± 1.07	9.30 ± 2.56	-12.998•	<0.01	HS
	Range	2 – 6	2 – 14			
Cerebrovascular stroke	No	32 (97.0%)	30 (90.9%)	1.065*	0.302	NS
	Yes	1 (3.0%)	3 (9.1%)			
Reopening	No	32 (97.0%)	24 (72.7%)	7.543*	0.006	HS
	Yes	1 (3.0%)	9 (27.3%)			
Wound infection	No	33 (100.0%)	30 (90.9%)	3.143*	0.076	NS
	Yes	0 (0.0%)	3 (9.1%)			
Hospital stay	Mean ± SD	4.79 ± 0.65	9.06 ± 1.14	-18.655•	<0.01	HS
	Range	4 – 6	7 – 12			
blood transfusion	No	31 (93.9%)	16 (48.5%)	16.629*	<0.01	HS
	Yes	2 (6.1%)	17 (51.5%)			
Mortality	Alive	32 (97.0%)	32 (97.0%)	0.000*	1.000	NS
	Died	1 (3.0%)	1 (3.0%)			

P-value >0.05: Non significant (NS); P-value <0.05: Significant (S); P-value< 0.01: highly significant (HS) *:Chi-square test; •: Independent t-test

The Previous table shows that there was highly significant difference found between two groups regarding Stay in ICU with *(p-value<0.01),* Mechanical ventilation Hrs with

(p-value<0.01), Reopening with *(p-value= 0.006,* hospital stay *(p-value<0.01) and* blood transfusion *(p-value<0.01).* While there was no statistically significant difference found between two groups regarding Cerebro-vascular stroke, wound infection and mortality.

DISCUSSION:

Increased recognition of advantages, over the last decade, of minimizing surgical trauma by operating through smaller incisions and its direct impact on reduced postoperative pain, improved cosmoses, earlier return to work has spurred the minimally invasive cardiac surgical revolution[10].

This transition began in the early 1990s with advancements in endoscopic instruments, video & fiber optic technology and improvements in perfusion systems for establishing cardiopulmonary bypass (CPB) via peripheral cannulation. Society of Thoracic Surgeons data documents that 20% of all mitral valve surgeries are performed using minimally invasive techniques, with half being robotically assisted[11-13].

In this study, the mean age in group "A" was 39.24±11.061 years, while in group "B", it was 48.76±11 years. The age groups in this study are relatively younger than the age groups in other studies.

DePraetere et al. (2015)[24] found no statistically significant difference in demographics of patients undergoing MIMVS in his study.

In Cheng et al. regarding baseline characteristics, the patients in the mini-MVS group were younger on average by 1.6 years compared with conventional open mitral valve repair/replacement (MVR). The percentage of females was similar for both groups (42%). group. For other baseline characteristics, there were no statistically significant differences detected between mini-MVS and conventional MVS for most reported baseline characteristics; however, some characteristics were reported in only a few studies. *Hozley et al. (2011)*[35] report mini-MVS in patients over 70 years.

The younger mean age in this series may be attributed to earlier and repeated affection by rheumatic fever, which is endemic in most statistically developing countries including Egypt there was no significant difference between mean ages in our study groups.

Regarding the sex, in some studies, females were more in MIMVS[14,15] but in this study there was no statistically significant group difference between sex distributions.

Regarding BMI, there was no statistically significant difference between both groups. MIMVS has revealed lower morbidity and mortality in obese patients compared to conventional surgery[16-17] however in this study both groups were matched regarding BMI.

Moscarelli et al. (2016)[10], report that MIMVS can patients at risk, and different encouraging reports have been published about patients with specific single comorbidities such as depressed left endocarditis, renal dysfunction, ventricular function[18] redo surgery, elderly and obesity[3,13].

In this study NYHA functional class was matched for both groups as in number of similar studies[14,15]. *Thompson et al. (2000)* [19] who found that 86% of patients belonged to NYHA class II and III preoperatively.

No statistical difference between the 2 groups regarding preoperative echocardiography. Many studies showed fesibility of repair of mitral valve through minimal invasive approach[20]. However in this study, all valves were degenerative with severe mitral regurge. So, repair was done in all cases and only one case replacement was

done after turning from minimal invasive to conventional.

Patients may remain asymptomatic for many years as long as mitral regugre is mild and not accompanied by any other valvular disease.

A statistically significant difference in length of incision was found between the two groups in similar studies[19].

Thoracotomy approach utilizes a smaller incision length that improves the cosmetic result due to small scar which is less visible especially in females. *El- Fiky et al. (2000)*[20] reported an incision length of 12-15 cm in test group. Reduction in the size of the operative incision for cardiac valve surgery has been associated with reduced postoperative discomfort, shorter intensive care and hospital stay, earlier recovery and return to work, and an overall improvement in patient's satisfaction was reported by many studies[16,21-24].

One of the disadvantages of the right mini-thoracotomy approach is that it needs a learning curve for the surgeon and team to be able to perform the procedure through a smaller incision in a faster time. This was supported by comparable results of bypass time, cross-clamp time and total operating time between the two study groups[25-27].

In this study, Chitwood cross clamp and custdiol cardioplegia was used for all group A patients.

The cross clamp time and the total bypass time were longer in the group of mini-thoracotomy with statistically significant difference.

Luca et al. (2013)[29] found cross-clamp time was significantly increased with minimal invasive group versus conventional median stemotomy (95 ± 39 minutes vs 74 ± 36 minutes). *Shinfeld et al. (2003)*[28] reported that in the beginning of the learning curve, cross-clamp time was 25 minutes longer in the minimal invasive group compared with sternotomy group, however with experience, cross-clamp time improved in their center but still remained longer in the minimally invasive group.

In this study, the group (A) patients had femoral cannulation of both femoral artery and vein; the cannulation was through the small 3-4cm transverse incision in the groin between the inguinal crease and the inguinal ligament. The femoral cannulation was easy in all patients. We did not need any aortic cannulation.

Several studies reported the use of femoral artery cannulation for arterial blood inflow[31]. Femoral vessel cannulation was progressively performed through smaller incisions and minimal dissection limited to the anterior face of the vessels and also percutaneous femoral cannulation[32].

In our study, group "B", the ventilation time was significantly higher than group A with statistically significant difference; *Srivastava et al. (1998)*[16] *and El Fiky et al. (2000)*[20] studies showed that postoperative mechanical ventilation is significantly lower in patients undergoing minimally invasive mitral valve surgery.

One of the most important advantages of the less invasive technique is the lesser incidence of postoperative bleeding and lesser requirement for re-exploration. As a result of decreasing the demands for blood transfusion, the hazards of blood transfusion are lessened, and the patient's costs are decreased[3].

This difference was found in our study with high statistically significant difference between both groups. Some studies report no difference in transfusion requirements.

Other studies showed that the amount of blood drainage is significantly less in patients undergoing minimally invasive heart surgery.

Riess & associates (2001)[30] reported a mean postoperative blood loss of 361±143 ml in the minimally invasive group.

None of the patients in group "A" required re exploration, while in group "B", 3 patients required exploration for bleeding, in this study we cannot comment on the incidence of reopening in both groups due to limited number of patients, which cannot reflect the significance of re-exploration. Other studies reported that the incidence of re-exploration after minimally invasive heart surgery is nearly negligible[6,34].

Other study as *Holzhey et al. (2011)*[35] showed that blood units needed 3.6±1.2 units in MIMVS group while 4.6± 1.6 units in sternotomy group with no statistically significant difference. The higher needs of blood transfusion in this study may be due to higher mean of patients' age which was above 70 years.

The mean stay in the ICU was less in group "A" with an obvious statistically significant difference.

In a study done by *Shah et al. (2013)*[33]. Duration ICU stay was 21.9±3.7 hours in sternotomy and 17.1±4.2 hours in thoracotomy.

In other studies, ICU stay and ventilation time was shorter in MIMVS group but does not reach significant statistical difference[38].

Both groups appeared to achieve satisfactory echocardiographic outcomes as regards mitral valve repair accuracy, although in group A the view of the mitral valve during the repair was better than Group B as all the valve anatomy was seen clearly.

In a study done by Antonio Miceli, MV repair was successfully performed in 670 patients, with rate of success of 95.3%. Repair techniques included annuloplasty (89%), leaflet resection (n=54.2%) and after eight year follow up, overall survival was 90.1%, freedom from reoperation 93%, and freedom from recurrent mitral regurgitation was 90%.

After discharge from the hospital, all patients were subjected to do follow up trans-thoracic echocardiography 1 month later. There was no significant difference in ejection fraction percentage, left ventricular internal dimensions, left atrial diameter or pulmonary artery pressure between both groups 1 month post operatively. Also the comparison between pre and post-operative trans-thoracic echocardiography of both groups showed no statistically significance in all parameters, well-functioning mitral valve with no mitral regurge and mild decrease in pulmonary artery pressure.

We can deduct from previous Echocardiographic studies for both groups of patients (pre and post-operative) that the minimal invasive approach is feasible for mitral valve surgery without affecting the core of surgery or compromising the surgical target[35,39].

Pain level after cardiac operations is relatively low in most patients. Such postoperative pain is bearable; the patients receive sufficient pain medication on request of all the potential benefits of MIMVS, a reduction in pain and faster return to normal activity is the most consistent finding. All four studies that measured postoperative pain levels reported less compared to sternotomy [40-43], and both studies reporting time to return to normal activities noted a significant advantage for a minimally invasive approach[44,45].

Evaluation of pain by visual analogue pain scale was used in the study. In group "A", the mean pain score on the 5th day postoperative was less than group "B" denoting high statistically significant change with low pain sensation in MIMVS group.

Cohn's data is concordant with less pain in hospital land after discharge, less analgesic usage, greater patient satisfaction,

and a return to normal activity 4.8 weeks ahead of sternotomy patients[46]. *Walther et al. (1999)*[47] reported that 94% of his patients report mild post-operative pain, 99.3% feel they have anaesthetically pleasing scar, 93% would choose the same procedure again if they had to have redo surgery, and 46% are back at work within 3 weeks.

The complications reported in both groups were not statistically different. This may be due to limited number of studied cases.

In group (A) no patient (0%) had superficial wound infection. While in group (B) three patient (12%) had superficial wound infection involving the skin and subcutaneous layers and responded to frequent dressing and antibiotics.

In Shah study 3 (9.3%) out of 32 patients in sternotomy group and 1 out of 32 (3.1%) cases in thoracotomy group had wound infection. Thoracotomy wounds were less prone to infection while sternal wounds were more vulnerable to infection. This was in agreement with the studies by *Aybek et al. (2006)*[37].

In our study, the mean hospital stay was 6.04±1.10 days in group "A" and 1 1020±2.45 days in group "B" this difference is statistically highly significant with a P value < 0.01.

In *Iribarne et al. (2012)*[13] while MIMVS patients had a shorter length of stay than sternotomy patients, the mean lengths of stay for MIMVS and sternotomy groups were 701 and 902 days, respectively. Hospital stays vary from one center to the next, this variability may be explained by the fact that patients had numerous comorbidities.

Three studies *Chitwood et al., (1997)*[48], *Iribarne et al (2012)*[13] *and Cosgrove et al (1998)*[25] recorded reduced costs of the MIMVS group compared with the MS group. Furthermore, discharge to the home, routinely or with a health aide, and satisfactory rehabilitation were more commonly reported in ALMT compared with MS, which can greatly save healthcare costs.

MIMVS was associated with a significant reduction in costs of cardiac imaging, laboratory tests, boarding, nursing, and radiology. However, there were no differences in morbidity or long-term survival. A higher proportion of ST patients required readmission within 1 year[49].

Conclusion:

In patients with mitral valve disease, minimally invasive surgery may be an alternative to conventional mitral valve surgery. Right anterolateral mini-thoracotomy provides excellent exposure of the mitral valve and offers a better cosmetic lateral scare comparable short-term mortality. Comparable in-hospital morbidity (renal, pulmonary, cardiac complications, and readmissions), Reduced pain perception, transfusions, postoperative blood loss, duration of ventilation, ICU, hospital length of stay and early return to normal life activity in minithoracotomy than con-ventional sternotomy.

REFERENCES:

1. Schmitto JD, Mokashi SA and Cohn LH. Minimally invasive valve surgery. J am Coll cardiol. Elsevier Inc,2010;56(6):455-62.
2. Seeburger J, Borger MA, Falk V, Kuntze T,Czesla M, Walther T, et al. Minimal invasivemitral valve repair for mitral regurgitation: results of 1339 consecutive patitents. Eur J cardio-thoracic Surg, 2008;34;760-5.
3. Grossi EA, Galloway AC, Ribakove GH, Buttenheim PM, Esposito R, Baumann FG, et al. Minimally invasive port access surgery reduces operative morbidity for valve replacement in the elderly. Heart Surg Forum, 1991;2:212-5.

4. Casselman FP, Van Slycke S, Dom H, Lambrechts DL, Vermeulen Y, Vanermen H, et al. Endoscopic mitral valve repair: Feasible, reproducible, and durable. J thorac Cardiovasc Surg, 2003; 125:273-82.
5. Yamada T, Ochiai R, Takeda J, Shin H, yozu R. comparison of early postoperative quality of life in minimally invasive versus conventional valve surgery. J anesth,2003;17:171-6.
6. Felger JE, Chitwood WR, Nifong LW, Holbert D. Evolution of mitral valve surgery: toward a totally endoscopic approach. Ann thorac Surg, 2001; 72(4):1203-8-9.
7. Casselman FP, Van Slycke S, Wellens F, De Geest R, Degrieck I, Van Praet F, et al. Mitral valve surgery can now routinely be performed endoscopically. Circulation, 2003;108 Suppl: II48-I54.
8. Grossi EA, Zakow PK, Ribakove G, Kallenbach K, Ursomanno P, Gradek CE, et al. Comparison of post-opertaive pain, Stress response, and quality of life in port access vs. standard sternotomy coronary bypass patients. Eur J Cardiothorac Surg,1999;16 Suppl 2:S39-42.
9. Kronzon I, Matros TG. Intraoperative echocardiography in minimally invasive cardiac surgery and novel cardiovascular surgical techniques. Am Heart Hosp J, 2004;2(4):198-204.
10. Moscarelli M, Cerillo A, Athanasiou T, Farneti P, Bianchi G, Margaryan R, et al. Minimally invasive mitral valve surgery in high-risk patients: operating outside the boxplot. Interact Cardiovasc Thorac Surg, 2016; 22(6):756–61.
11. Sir Reginald Watson-Jones, 1902-1972. J Bone Joint Surg Br, 1972; 54(4):569–75.
12. Atluri P, Woo YJ, Goldstone AB, Fox J, Acker MA, Szeto WY, et al. Minimally invasive mitral valve surgery can be performed with optimal outcomes in the presence of left ventricular dysfunction. Ann Thorac Surg. Elsevier Inc, 2013; 96(5):1596–602.
13. Iribarne A, Easterwood R, Russo MJ, Chan EY, Smith CR, Argenziano M. Comparative effectiveness of minimally invasive versus traditional sternotomy mitral valve surgery in elderly patients. The Journal of Thoracic and Cardiovascular Surgery, 2012; S86–90.
14. Ding C, Jiang D, Tao K, Duan Q, Li J, Kong M, et al. Anterolateral minithoracotomy versus median sternotomy for mitral valve disease: a meta-analysis. J Zhejiang Univ Sci B, 2014; 15(6):522–32.
15. Wang D, Wang Q, Yang X, Wu Q, Li Q. Mitral Valve Replacement Through a Minimal Right Vertical Infra-axillary Thoracotomy Versus Standard Median Sternotomy. Ann Thorac Surg. The Society of Thoracic Surgeons, 2009; 87(3):704–8.
16. Srivastava AK, Garg SK, Ganjoo AK. Approach for primary mitral valve surgery: right anterolateral thoracotomy or median sternotomy. J Heart Valve Dis, 1998; 7(4):370–5.
17. Parvathy UT, Rajan R, Faybushevich AG. Pulmonary function derangements in isolated or predominant mitral stenosis - Preoperative evaluation with clinico-hemodynamic correlation. Interv Med Appl Sci, 2014; 6(2):75–84.
18. Falk V, Cheng DCH, Diegeler A, Nifong LW, Raanani E, Seeburger J. Minimally Invasive Versus Open Mitral Valve Surgery, 2011; 6(2):66–76.
19. Thompson CR, Buller CE, Sleeper LA, Antonelli TA, Webb JG, Jaber WA, et al. Cardiogenic shock due to acute severe mitral regurgitation complicating acute myocardial infarction: a report from the shock trial regusrty. Should we use emegently revascularize occluded coronaries in cardiogenic shock. J Am Coll Cardiol, 2000;36(3 Suppl A): 1104-9.
20. El-Fiky MM, El-Sayegh T, El-Beishry AS, Abdul Aziz M, Aboul Enein H, Waheid S, et al. Limited right anterolateral thoracotomy for mitral valve surgery. Eur J Cardiothorac Surg, 2000 ;17(6):710–3.
21. Cane RD, Buchanan N, Miller M. Pulmonary oedema associated with hydrocarbon inhalation. Intensive Care Med, 1977; 3(1):31–3.

22. Ward AF, Grossi EA, Galloway AC. Minimally invasive mitral surgery through right mini-thoracotomy under direct vision. J Thorac Dis, 2013; 5(SUPPL.6).
23. Cao C, Gupta S, Chandrakumar D, Nienaber TA, Indraratna P, Ang SC, et al. A meta-analysis of minimally invasive versus conventional mitral valve repair for patients with degenerative mitral disease. Ann Cardiothorac Surg, 2013; 2(6):693–703.
24. De Praetere H, Verbrugghe P, Rega F, Meuris B, Herijgers P. Starting minimally invasive valve surgery using endoclamp technology: Safety and results of a starting surgeon. Interact Cardiovasc Thorac Surg, 2015; 20(3):351–8.
25. Cosgrove DM, Sabik JF, Navia JL. Minimally invasive valve operations. Ann Thorac Surg, 1998; 65(6):1535-8-9.
26. Holman WL, Goldberg SP, Early LJ, McGiffin DC, Kirklin JK, Cho DH, et al. Right thoracotomy for mitral reoperation: analysis of technique and outcome. Ann Thorac Surg, 2000; 70(6):1970–3.
27. Solutions AORTIC. The instruments of minimally invasive cardiac surgery.
28. Shinfeld A, Kachel E, Paz Y, Praisman S, Smolinsky AK. Minimally invasive video-assisted mitral and aortic valve surgery--our initial clinical experience. Isr Med Assoc J, 2003; 5(7):482–4.
29. Luca F, van Garsse L, Rao CM, Parise O, La Meir M, Puntrello C, et al. Minimally invasive mitral valve surgery: a systematic review. Minim Invasive Surg, 2013; 2013:179569.
30. Riess FC, Moshar S, Bader R, Hoffmann B, Löwer C, Bleese N. Correction of congenital heart defects and mitral valve operations using limited anterolateral thoracotomy. Heart Surg Forum, 2001; 4(1):34–9.
31. Murphy DA, Miller JS, Langford DA, Snyder AB. Endoscopic robotic mitral valve surgery. J Thorac Cardiovasc Surg, 2006; 132(4):776–81.
32. Ender J, Sgouropoulou S. Value of transesophageal echocardiography (TEE) guidance in minimally invasive mitral valve surgery. Ann Cardiothorac Surg, 2013; 2(6):796–802.
33. Shah ZA, Ahangar AG, Ganie FA, Wani ML, Lone H, Wani SN, et al. Comparison of Right Anterolateral Thorocotomy with Standard Median Steronotomy for Mitral Valve Replacement, 2013; 7(1):15–20.
34. Galloway AC, Schwartz CF, Ribakove GH, Crooke GA, Gogoladze G, Ursomanno P, et al. A Decade of Minimally Invasive Mitral Repair: Long-Term Outcomes. Ann Thorac Surg, 2009; 88:1180–4.
35. Holzhey DM, Shi W, Borger MA, Seeburger J, Garbade J, Pfannmller B, et al. Minimally invasive versus sternotomy approach for mitral valve surgery in patients greater than 70 years old: A propensity-matched comparison. Ann Thorac Surg. Elsevier Inc, 2011; 91(2):401–5.
36. Yung MC, Wang JS, Lai ST. Minimally invasive mitral valve surgery via submammary hidden incision. Zhonghua Yi Xue Za Zhi (Taipei), 2000; 63(4):322–8.
37. Aybek T, Dogan S, Risteski PS, Zierer A, Wittlinger T, Wimmer-Greinecker G, et al. Two hundred forty minimally invasive mitral operations through right minithoracotomy. Ann Thorac Surg, 2006; 81(5):1618–24.
38. Chahin S, Balcer LJ, Miller DM, Zhang A, Galetta SL. Vision in a Phase 3 Trial of Natalizumab for Multiple Sclerosis: Relation to Disability and Quality of Life. J Neuro-Ophthalmology, 2015; 35(1):6–11.
39. Mohr FW, Onnasch JF, Falk V, Walther T, Diegeler A, Krakor R, et al. The evolution of minimally invasive valve surgery--2 year experience. Eur J Cardiothorac Surg, 1999; 15(3):233–9.
40. Pezzella AT, Utley JR, Salm TJ Vander. Operative approaches to the left atrium and mitral valve: An update. Oper Tech Thorac Cardiovasc Surg, 1998; 3(2):74–94.

41. Lam JH, Ranganathan N, Wigle ED, Silver MD. Morphology of the human mitral valve. I. Chordae tendineae: a new classification. Circulation, 1970; 41(3):449–58.
42. Messas E, Yosefy C, Chaput M, Guerrero JL, Sullivan S, Menasché P, et al. Chordal cutting does not adversely affect left ventricle contractile function. Circulation, 2006; 114(1 Suppl):I524-8.
43. Victor S, Nayak VM. Variations in the papillary muscles of the normal mitral valve and their surgical relevance. J Card Surg, 1995; 10(5):597–607.
44. Yamada T, Ochiai R, Takeda J, Shin H, Yozu R. Comparison of early postoperative quality of life in minimally invasive versus conventional valve surgery. J Anesth, 2003; 17(3):171–6.
45. Santana O, Reyna J, Benjo AM, Lamas GA, Lamelas J. Outcomes of minimally invasive valve surgery in patients with chronic obstructive pulmonary disease. Eur J Cardiothorac Surg, 2012; 42:648–52.
46. Cohn LH, Adams DH, Couper GS, Bichell DP, Rosborough DM, Sears SP, et al. Minimally invasive cardiac valve surgery improves patient satisfaction while reducing costs of cardiac valve replacement and repair. Ann Surg,1997;226(4):421-6-8.
47. Walther T, Falk V, Metz S, Diegeler A, Battellini R, Autschbach R, et al. Pain and quality of life after minimally invasive versus conventional cardiac surgery. Ann Thorac Surg, 1999; 67:1643–7.
48. Chitwood WR, Elbeery JR, Chapman WH, Moran JM, Lust RL, Wooden WA,et al. Video-assisted minimally invasive mitral valve surgery: the ‘’micro-mitral’’ operation. J thorac Cardiovasc Surg, 1997;113(2):413-4.
49. Ritwick B, Chaudhuri K, Crouch G, Edwards JRM, Worthington M, Stuklis RG. Minimally Invasive Mitral Valve procedures: The Current state, 2013.

جراحة اصلاح الصمام الميترالي المساعدة بمنظار الصدر مقارنة بالطريقة التقليدية لشق عظمة القص في مرضي تأكل الصمام الميترالي

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خلفية البحث: جراحات الصمام المتيرالى محدودة التداخل بإستخدام منظار تجويف الصدر تتميز بأن لها مظهر تجميلى بديل للطريقة التقليدية التى ينتج عنها ندبه سيئة، والتى هى أكثر عرضه لحدوث الألتهابات وتلوث الجرح.

الغرض من البحث: كانت هذه الدراسة للمقارنة بين النتائج المبكرة للجراحات محدودة التداخل باستخدام منظار تجويف الصدر مقارنة بالجراحات التقليدية فى أمراض الصمام الميترالى.

المرضى وطرق البحث: أجريت هذه الدراسة على ٦٦ مريضاً، الأنتهاء من جميع المرضى فى الدراسة دون وفيات تم تصنيف المرضى إلى مجموعتين: المجموعة (أ): مجموعة التداخل المحدود بإستخدام منظار تجويف الصدر وتضمنت هذه المجموعة ٣٣ مريض الذين يحتاجون إلى جراحات الصمام الميترالى. المجموعة (ب): مجموعة التدخل التقليدى عن طريق شق عظمة القص وتضمنت هذه المجموعة ٣٣ مريض الذين يحتاجون إلى جراحة الصمام الميترالى.

النتائج: لم يكن هناك فروق ذات دلالة إحصائية فيما يتعلق العمر، والجنس، وأعراض المرض ودرجة شدته، كما كشفت نتائج الموجات الصوتية على القلب قبل الجراحة ودراسة وظائف الرئة قبل الجراحة عدم وجود دلالة إحصائية. وفيما يتعلق بالمقارنة أثناء العملية، لم يكن هناك فروق ذات دلالة إحصائية فى وقت غيقاف عضلة القلب ووقت ماكينة القلب الصناعى، ولكن هناك فرق فى مجموعة وقت الجراحة الكامل داخل غرفة العلميات، قد يكون هذا الاختلاف بسبب حداثة الطريقة الجديدة بغستخدام منظار تجويف الصدر. كان طول الجرح أقل بشكل ملحوظ فى المجموعة "أ" من فى المجموعة "ب"، كان هناك اختلاف كبير فى وقت الرعاية المركزة، وكان وقت استمرار المريض على جهاز التنفس الصناعى أقصر فى مجموعة "أ"، وكان فقدان الدم ونقل الدم المطلوبة أقل فى مجموعة "أ". وكانت مدة استمرار المريض فى وحدة العناية المركزة أقصر فى مجموعة "أ"، تم أنخفاض الوظائف الرئوية بعد الجراحة بشكل ملحوظ فى المجموعة "ب" من فى المجموعة "أ"، وكان هناك ألم أقل بكثير بعد العلمية الجراحية فى المجموعة (أ) مكن فى المجموعة (ب) كماغ كانت مدة الإقامة فى المستشفى أقل فى المجموعة (أ) منها فى مجموعة (ب).

الخلاصة: جراحات التدخل المحدود بإستخدام منظار تجويف الصدر لعلاج أمراض الصمام الميترالى الصحيح ليست متميزة فقط بصغر شكل الجرح الأفضل من حيث المظهر التجميلى ولكنها تتميز أيضاً بقصر مدة الإقامة فالرعاية المركزة وقصر فترة التواجد فى المستشفى وسرعة العودة لممارسة الحياة بصورة طبيعية بعد الجراحة، كما تتيح التدخل بطريقة أسهل فى حالة الأحتياج إلى جراحة قلب مفتوح مرة أخرى.