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Efficacy of Limited Right Anterior Thoracotomy versus Median Sternotomy for Mitral Valve Replacement

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ABSTRACT
Background: With low rates of reoperation, perioperative morbidity, and short-term mortality, minimally restricted right anterior thoracotomy mitral valve surgery has proven to be a viable alternative to the traditional complete sternotomy procedure. Minimally invasive procedures are still being promoted as a way to reduce surgical trauma.
Objective: Comparing between right anterior thoracotomy versus median sternotomy for mitral valve replacement.
Patients and Methods: Prospective randomized clinical trial performed at Cardiothoracic Surgery Department, Zagazig University Hospitals for one year from May 2022 to May 2023. The study included 41 patients requiring mitral valve replacement divided into group (A) 20 patients underwent mitral valve replacement by right anterior thoracotomy and the other group (B) 21 patients underwent mitral valve replacement by standard sternotomy.
Results: There was clinical and statistically significant difference between the two groups, regarding length of skin incision, 5th day postoperative pain and modified Likert scale for wound satisfaction from 1 to 5.
Conclusion: Our study found that thoracotomy group demonstrated a quicker return to their normal lifestyle with accepted surgical scar compared to sternotomy group. The findings suggest that minimally invasive approaches like thoracotomy offer significant advantages for patients seeking a faster, more comfortable recovery process
Keywords: Mitral Valve Replacement, Right Anterior Thoracotomy, Median Sternotomy.

INTRODUCTION
Sternotomy has been used in most cardiac procedures, and other cardiac surgeries [(1)]. Due to its ease of use and superior exposure, this is the most popular surgical technique in our clinic for adult cardiac surgeries [(2)].

In rare cases, major sternotomy complications following heart surgery include dehiscence, sternal wound infection (SWI), osteomyelitis, mediastinitis, and/or non-union/displacement. Deep surgical wound infections are a bad sequalae due to high treatment costs. However, these issues if occurred lead to significant morbidity, mortality, and resources utilization [(1)]. With rates ranging from 14% to 47%, it has a significant rate of morbidity and mortality [(3)].

Minimally invasive mitral valve (MMVS) surgery is procedure that is safe and effective for most people [(4)]. Neptune and Bailey described the right thoracotomy technique for mitral valve surgery in 1954, and it has been frequently utilized ever since. It provides excellent mitral valve exposure, especially in small left atriums. For young female patients, this incision offers good cosmetic effects and is a good substitute [(5)].

Due to its less invasive nature, this surgery is more aesthetically pleasing to patients and carries a decreased risk of serious wound consequences. Numerous advantages of minimally invasive cardiac surgery, including reduced blood loss and a shorter intensive care unit stay [(6)]. The idea behind this type of procedure is to lower costs and morbidity, accelerate hospital discharge, and shorten the recovery period [(7)].

This study aimd to comparing between right anterior thoracotomy versus median sternotomy for mitral valve replacement.

PATIENTS AND METHOD
This is a randomized clinical trial. Randomization was performed by systematic random sampling. The study was registered (ZU-IRB # 9413-13-4-2022, ClinicalTrials.govID:NCT06869980) and it was conducted at Cardiothoracic Surgery Department, Zagazig University Hospitals, Egypt during the period from May 2022 to May 2023, on 41 patients with isolated mitral valve disease who needed to replace the mitral valves. Group A included twenty of these patients who underwent right anterior thoracotomies, while the remaining 21 patients were included in Group B and they underwent midline sternotomies.

Inclusion criteria: Patients with acquired isolated mitral valve disease requiring mitral valve replacement with age > 18 years.

Exclusion criteria: Previous cardiac surgery, patients less than 18 years, patients with other valvular lesions (aortic valve or tricuspid valve), patients suffering from IHD, obese patients (BMI>35) and COPD patients.

Intraoperative procedures:
Anaesthetic technique:
All patients received the same surgical anaesthetic procedure.

Surgical technique:
Group "A" (Limited right anterior thoracotomy):
Patients were positioned supine with their right arm elevated over their right shoulder to reveal the mid-axillary line on the right side.

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Incision: The incision was made across the fourth intercostal gap, which is just lateral to the nipple (in the inframammary crease for most women and above the nipple for men). For the fourth intercostal space thoracic entrance, the pectoralis muscles, which are 6–10 cm long, were activated. The soft tissues were deflected by a soft tissue thoracotomy retractor, which also minimized rib spreading.

The pericardium was opened 2 cm ventral to the phrenic nerve and was carried cephalad to the aortic reflection when viewed directly. The posterior margin of the pericardium was diverted posterolaterally, and the anterior edge was sewn to the edges of the incision using silk sutures. By turning the heart counterclockwise, this technique successfully moved the left atrium ventrally and laterally. The aortic origin, atriocaval junction, and right superior pulmonary vein were all accessible and exposed to direct vision because to this configuration.

Cannulation and Initiation of cardiopulmonary bypass (CPB): Cardiopulmonary bypass should be initiated by cannulating the femoral artery and vein prior to mediastinal dissection.

The left atrium was opened next to the interatrial groove when the heart was stopped on cardiopulmonary bypass. Generally speaking, the left atrium and mitral valve view is good enough to perform mitral valve replacement, particularly when utilizing a minimally invasive atrial retractor.

After the mitral procedure was finished, a left ventricular vent was introduced through the left atrial incision, past the mitral valve, and into the left ventricle, and the left atrium was closed as usual. The aorta was still clamped, the left atrium was closed around the vent, and the heart was deairing while suction was applied to the left ventricular vent.

Following the removal of the aortic clamp, the cardiopulmonary circuit was permitted to receive the full venous return. The paediatric paddles were used to administer a DC shock of 10–30 Joules if the heart continued to fibrillate. When cardiac contraction returns, the aortic root was kept under suction as the heart fills. Any air that remains on echo could be aspirated using the aortic root vent. The left atriotomy cardiopulmonary bypass was terminated.

After the pacing wires were inserted, interrupted sutures were used to seal the pericardium over a drain. Another pleural drain was placed in the paravertebral gutter to reach the top of the lung. The subcutaneous tissue was sealed using absorbable suture. The incision was closed as normal after the venous and arterial purse strings were tied in the groin area. The skin incision and any other port locations were closed using absorbable sutures.

Group "B" (Sternotomy):

The patient was positioned with their arms by their sides in a supine position. By palpating the sternal notch and the tip of the xiphoid process, the incision was made. It started about 2 cm below the sternal notch and extended about 2 cm below the distal tip of the xiphoid process. After then, the retractor was gradually opened.

The pericardium was reached after the left innominate vein was located and the thymus gland was dissected. Sufficient exposure was usually achieved by employing strong silk stay sutures and suturing the pericardium to the edges of the incision. A cannula was positioned on the aortic root to provide cardioplegia and de-air following aortobicaval cannulation.

The left atrium was opened next to the interatrial groove once cardiopulmonary bypass had been started. It was often possible to execute mitral valve replacement with a good view of the left atrium and mitral valve.

Following the completion of the mitral procedure, the left atrium was closed normally and a left ventricular vent was inserted through the left atrial incision, across the mitral valve, and into the left ventricle. Weaning off the cardiopulmonary bypass, decannulation, and hemostasias were accomplished when the aortic clamp was removed. A retrocardiac tube was inserted, along with retrosternal and, if necessary, pleural tubes. Following the insertion of pacing wires, continuous sutures were used to approximate the pericardium over the aortic root. Six to nine heavy stainless-steel wires were then put through the sternum to be closed as usual fashion.

Ethical approval:

The Ethics Committee of the Zagazig Faculty of Medicine authorized this investigation. After receiving all of the information, all the participant signed their permission. The Helsinki Declaration was followed throughout the course of the investigation.

Statical analysis:

SPSS Version 20.0 and EPICalc software were used to analyse the data after they had been gathered, checked, and entered on a personal computer. The following tests were employed: t test (student test) was used to compare quantitative data, which were presented as mean ± SD and range and X^2-test was used to compare qualitative data, which were presented as frequency and percentage. For all statistical comparisons, a P value of less than 0.05 was considered significant, and a P value of less than 0.01 was considered very significant.

RESULTS

Table 1: Baseline demographic data and preoperative characteristics showed no statistically significant difference between both groups.

Table (1): Baseline demographic data and preoperative characteristics

Number	Group (A), N=20	Group (B), N=21	p-value	Sig.
Age				
Range	18-64	32-64	0.365	NS
Mean±SD	43.05±10.531	45.81±8.693		
Sex				
Male %	50%	47.6%	0.879	NS
Female %	50%	52.4%		
BMI				
Mean±SD	26.98±5.05	28.4±2.95	0.255	NS
NYHA class				
I	0(0%)	0(0%)		
II	0(0%)	0(0%)		
III	12 (60%)	11(52.4%)	0.633	NS
IV	8 (40%)	10(47.6%)		
Mean ± SD	3.4 ± 0.503	3.48 ± 0.512		
Echo assessment				
LVEDD	4.96 ± 0.306	5.01 ± 0.203	0.327	NS
LVESD	4.23 ± 0.152	4.28 ± 0.166	0.546	NS
E.F. (%)	56.05 ± 2.87	56.04 ± 2.80	0.998	NS
L.A. dimension	5.04 ± 0.334	5.08 ± 0.364	0.746	NS
P.A pressure	40.71 ± 6.57	38.58 ± 9.36	0.407	NS
Mitral stenosis	10 (50%)	7 (33.3%)		
Mitral regurge	2 (10%)	8 (38.1%)	0.111	NS
Double mitral	8 (40%)	6 (28.6%)		
ECG				
A.F.	9 (45%)	11 (52.4%)	0.636	NS
Sinus rhythm	11 (55%)	10 (47.6%)		
P.F.T.				
FVC (Liters)	4.04 ± 0.230	4.10 ± 0.321	0.465	NS
FVC %	71.98 ± 2.646	71.38 ± 2.56	0.464	NS
FEV1 (Liters)	3.03 ± 0.181	3.04 ± 0.232	0.883	NS
FEV1 %	71.54 ± 2.207	71.19 ± 2.184	0.616	NS

Table 2 intraoperative and I.C.U. data showed no statistically significant difference between both groups.

Table (2): Intraoperative and I.C.U. data.

Number	Group (A), N=20	Group (B), N=21	p- value	Sig.
Cross clamp	48.85 ± 4.8	43.19 ± 3.76	0.125	NS
Total bypass time	61.67 ± 6.41	54.5 ± 5.91	0.153	NS
Total operative time	146.8 ± 2.93	135.9± 2.58	0.218	NS
Ventilation (hours)				
Range	2-4	2-5	0.159	NS
Mean	2.9	3.33		
SD	0.788	1.11		
Blood loss (ml)				
Range	150 - 400	200 – 700	0.089	NS
Mean	295	354.7		
SD	77.62	133.13		
Blood transfusion (units)				
Range	0 – 1	0 – 3	0.153	NS
Mean	0.85	1.19		
SD	0.366	0.981		
I.C.U. stay (days)				
Range	1-3	1-3	0.384	NS
Mean	1.9	2.09		
SD	0.718	0.700		
Need of inotropic support	3 (15%)	5 (23.8%)	0.477	NS

Table 3: postoperative data showed no statistically significant difference between both groups as regard A.F, re exploration, pericardial effusion, superficial wound infection, Deep SWI, NYHA class, and PFT, but showed statistically significant difference between both groups as regard length of skin incision (Figures 1, 2, and 3), 5th day postoperative pain, and wound satisfaction.

Table (3): Postoperative data.

Number	Group A	Group B	p- value	Sig.
A.F.	4(20%)	4(19%)	0.939	NS
Re exploration	0 (0%)	2(9.5%)	0.157	NS
Pericardial effusion	0 (0%)	1 (4.8%)	0.157	NS
Superficial wound infection	1 (5%)	2(9.5%)	0.578	NS
Deep sternal wound infection	0 (0%)	1 (4.8%)	0.323	NS
NYHA class				
I	14(70%)	15 (71.4%)		
II	6 (30%)	6 (28.5%)		
III	0(0%)	0(0%)		NS
IV	0(0%)	0(0%)		
Mean ± SD	1.33 ± 0.47	1.28 ± 0.46	0.920	
Total hospital stay				
Range	5-7	5-7	0.656	
Mean	5.92	6.02		NS
S.D.	0.73	0.67		
P.F.T (2weeks)				
FVC (litres)	2.78 ± 0.17	3.06 ± 0.17	0.196	NS
FVC%	59.5 ± 3.53	63.0 ± 2.16	0.104	NS
FEV1 (litres)	2.33 ± 0.187	2.87 ± 0.116	0.127	NS
FEV1%	59.1 ± 3.52	62.57 ± 1.96	0.093	NS
P.F.T (1 month)				
FVC (litres)	5.08 ± 0.230	5.10 ± 0.22	0.678	NS
FVC%	89.4 ± 4.05	90.38 ± 3.26	0.398	NS
FEV1 (litres)	3.97 ± 0.265	3.79 ± 0.456	0.148	NS
FEV1%	89.4 ± 4.03	90.66 ± 3.52	0.290	NS
Length of skin incision				
Range (cm)	5.9 – 10 cm	12.3 – 16 cm		
Mean ± SD (cm)	7.6 ± 1.05	14.97 ± 0.93	0.0094	S
5the day postoperative pain	5.5 ± 1.39	3.5 ± 0.74	0.002	S
Wound satisfaction	4.6 ± 0.502	2.4 ± 0.67	0.0007	S

Figure (1): Length of thoracotomy incision of one patient.

Figure (2): Length of thoracotomy incision of one patient.

Figure (3): Length of thoracotomy incision of one patient.

DISCUSSION

Our study's primary goal was to evaluate the practicability, safety, and effectiveness of limited right anterior thoracotomy in comparison to normal sternotomy [8]. For many years, the standard procedure for doing any kind of open cardiac surgery was thorough median sternotomy. Despite being well-established, the full sternotomy incision has frequently been complained for its length after surgery as well as possible issues such instability and wound infection [9].

With low rates of reoperation and perioperative morbidity and short-term mortality, minimally limited right anterior thoracotomy mitral valve surgery has been shown to be a good alternative to the conventional full sternotomy method. Efforts to lessen surgical trauma continue to support minimally invasive techniques [10].

The mean age in group A of our study was 43.05 ± 10.53 years, while the mean age in group B was 45.81 ± 8.693 years. Compared to the age groups in other studies, the age groups in ours are comparatively younger. We found no statistically significant difference in the mean ages of our study groups. **Zhou *et al.*** [11] reported a mean age of 64.7 years, which was similarly reported in other studies as [12,13]. The fact that 51.2% of patients were female and 48.8% of patients were males suggests that female affection is higher than male affection with rheumatic fever that considered to be endemic in most developing countries including Egypt [14]. In our series, the average age was above forty. The younger mean age in our sample may be explained by earlier and recurring affection [14]. The sex distributions in our research groups did not differ in a way that was statistically significant.

The mean BMI for groups A and B was 26.98 ± 5.05 and 28.4 ± 2.95, respectively, with no statistical significance. **Zapata *et al.*** [15] indicates that obesity does not increase the risk of death or the majority of complications after heart surgery, except for the unexplainedly elevated risk of reoperation within the same hospital.

In group A, 0 patients (0.0%) were in class I, 1 patient (0%) was in class II, 12 patients (60%) were in class III, and 8 patients (40%) were in class IV based on the preoperative clinical evaluation of the patients and their classification into four classes using the NYHA classification. Ten patients (47.6%) were in class IV, eleven patients (52.4%) were in class III, one patient (5.55%) was in class II, while group B's class I consisted of 0 patients (0.0%). There was no statistically significant difference between the two groups. The same results were found by **Sá *et al.*** [16]**.**

According to our study's preoperative echocardiographic evaluation, the left atrial dimensions in groups A and B were 5.04 ± 0.334 and 5.08 ± 0.364, respectively. The pulmonary artery pressure in groups A and B was 40.71 ± 6.57 and 38.58 ± 9.36, respectively, P value >0.05. The two groups were not statistically different from one another. However, because the posterior position of the mitral valve provides for good vision and access with the least amount of separator retraction, many studies have shown that patients with tiny left atriums are simpler to reach utilizing the left lateral prone position. Additionally, because the valve is directly in front of, the surgeon so, can operate more comfortably even on patients with small left atria [17-19].

All patients in our study underwent preoperative pulmonary function testing in the morning while seated, 24 hours before surgery. The mean percentage of projected FVC in group A was 71.98 ± 2.646, whereas the preoperative mean FVC was 4.04 ± 0.230 (Liters).

In the preoperative spirometry investigation, there was no statistically significant difference between the two groups; however, both groups had subnormal lung congestion as a result of mitral valve affection. In group B, the average FVC was 4.10 ± 0.321 litres, and the average percentage of expected FVC (FVC%) was 71.38± 2.56%. In research by **Elshihy *et al.*** [18] the mean FEV1 was 3.02 ± 0.287 litres, and the mean FVC before surgery was 3.96 ± 0.305. The lower score of the spirometry study can be the result of more patients falling into NYHA class III. The greater mean NYHA among study participants may affect the preoperative pulmonary functions because pulmonary congestion is more common in patients with class III and IV, and this is reflected in the preoperative pulmonary function. Both groups' incision lengths were examined; group A's mean was 7.6 ± 1.05 cm, with a range of 5.9–10 cm. With a range of 12.3-16 cm and a mean length of 14.97 ± 0.93 cm, group B showed a statistically significant difference with a P value < 0.05. **Wang and associates** found that the thoracotomy group's mean incision length was considerably less than the sternotomy group's (8.7 2.2 cm vs. 23.5 2.5 cm) [19]. The two studies are nearly identical with regard to the thoracotomy incision.

Cross-clamping and valve replacement, are similar for both sternotomy and thoracotomy, the group getting limited right thoracotomy had longer cross clamp and total bypass times. However, these differences were not statistically significant [20].

Similar to our study, **Eltonsy *et al.*** [21] found that the thoracotomy group experienced longer cross clamp and total bypass times. This can be attributed to the technical difficulties of this less invasive procedure, since a limited right anterior thoracotomy offers a more constrained and smaller operating space than a median sternotomy, which opens the chest completely. As a result, it may take longer to set up cardiopulmonary bypass and secure the aortic cross-clamp.

Group A took 146.8 ± 2.93 minutes to complete the operation, while group B took 135.9 ± 2.58 minutes. There was no significant difference in the two groups' total operation times, which can be explained by the fact that group A's femoral cannulation time was roughly equivalent to the time needed to complete the procedure following weaning from the bypass and homeostasis, as well as by the findings of other study by **Paparella *et al.*** [20].

In contrast to our study, the two groups' total operating times differed in a way that was statistically significant. A disadvantage of the limited right thoracotomy approach is that it necessitates a learning curve in order for the surgeon to finish the procedure faster and with a smaller incision [22].

In our study, the patients in group (A) underwent femoral cannulation of the femoral vein and artery. To do this, a small transverse incision was made in the groin between the inguinal crease and the inguinal ligament, which was 3 to 5 cm long. For every patient, the femoral cannulation was simple. No aortic cannulation was required.

Femoral artery cannulation for arterial blood input has been documented in a number of papers [23]. Furthermore, we think that the restricted field and relative inaccessibility for aortic cannulation are the main drawbacks of right thoracotomy [24].

Postoperative evaluation:

ICU evaluation:

The mean duration of postoperative mechanical breathing in group A in our study was 2.9 ± 0.788 hours, with a range of 2-5 hours. The ventilation duration in group B ranged from 2 to 5 hours, with an average of 3.3 ± 1.11 hours. The similar finding in studies by **Iyengar *et al.*** [13] indicated that postoperative mechanical ventilation is not significant between both groups, indicating a non-statistically significant difference between the two groups.

On the other hand, **Eqbal *et al.*** [25] demonstrated that the thoracotomy group had a shorter ventilation duration. This can be explained by the fact that a sternotomy involves a central chest opening, which can impact diaphragmatic function and core stability, resulting in a lengthier reliance on the ventilator. On the other hand, even with some degree of lung function impairment, thoracotomy usually leaves diaphragmatic function more intact, allowing patients to breathe on their own sooner. Decreased chest structure trauma as well because the sternum is not cut during a thoracotomy, the chest wall and surrounding tissues sustain less damage. Because there would be less inflammation, weaning off the ventilator will be simpler and quicker.

Explanation of why there is no statistically significant difference in postoperative bleeding between the two groups. The same findings were also demonstrated by **Liu *et al.*** [26]**.** However, in contrast to our study **Cuartas *et al.*** [27] revealed less bleeding with the thoracotomy group because of a smaller incision and more bleeding with the sternotomy technique, it is explained by the fact that during a traditional sternotomy, sternal bleeding persists throughout the surgical process. It is believed that bleeding into the mediastinum can persist even after a sternotomy has been re-approximated.

Re-exploration indicated that there was no significant difference between the two groups because no patients in group A needed re-exploration, whereas two patients in group B (9.5%) needed it because of a large drain (700 ml in the first two hours). Re-examination is necessary, and this can be explained by effective surgical hemostasis, that the same demonstrated by **Papadopoulos *et al.*** [28] the same outcomes. However, because of the increased sternal bleeding, against our study, **Cuartas *et al.*** [27] revealed more bleeding at the sternotomy group.

The amount of blood transfusion needed in both groups was likewise not statistically different since the incidence of bleeding and the amount of blood loss following surgery were not statistically significantly different. The same outcomes were displayed by **Papadopoulos *et al.*** [28]**.**

Eqbal *et al.* [25] show that because thoracotomy involves a smaller incision and less disruption to the chest wall and surrounding tissues than median sternotomy, patients undergoing this procedure needed fewer units of packed red blood cells transfused per patient with a statistically significant difference, which contrasts with our study.

Because there was less trauma, there was less bleeding throughout the procedure, which means fewer blood transfusions were required.

Surgical considerations such cardiac bypass time, cross-clamp time, and the difficulty of mitral valve replacement frequently have a greater impact on the length of stay in the intensive care unit than the kind of incision, which is about the same for thoracotomy and sternotomy. As a result, the mean ICU stay does not significantly differ between the two groups. The same outcomes were displayed by **Cetinkaya *et al.*** [29]**.**

In contrast, the study of **Hage *et al.*** [30] revealed that the minimal invasive group had a lower mean ICU stay. This is because the minimally invasive procedure often has fewer complications, like severe bleeding or re-exploration. Patients can spend less time in critical care and recover faster.

Postoperative studies:

All patients underwent postoperative spirometry two weeks and one month following surgery. Following two weeks, in group A spirometric study revealed that all mechanical pulmonary function tests had reduction than preoperative pulmonary function. The postoperative FVC % was 59.5 ± 3.53 % and the FEV1% was 59.1 ± 3.52 %. In group B the FVC% was 63.0 ± 2.16 % and FEV1% was 62.57 ± 1.96 % without statistically significant difference and this can be explained by postoperative pain in both groups. Same results were shown by **Mubarak** [31]**.** The surgeon usually operates through an intercostal space during MMVS surgery via a right anterior thoracotomy. In contrast to our study **Mohamed *et al.*** **[32]** revealed a significant difference in both groups (more reduction in pulmonary function in the thoracotomy group) due to restricted lung expansion. This may impede lung expansion on the operated side, resulting in decreased pulmonary function, or it may induce transient compression or damage to the ribs, lungs, or intercostal muscles **[32]**.

All mechanical pulmonary function tests showed improvement over preoperative pulmonary function after one month, according to a group spirometry study. The FEV1% was 89.4 ± 4.03 percent, and the FVC% was 89.4 ± 4.05. The FEV1% and FVC% in group B were 90.66 ± 3.52% and 90.38 ± 3.26%, respectively, with no statistically significant difference. This can be explained by the reduction of postoperative pain and the improvement of lung congestion following mitral valve replacement. The same outcomes were displayed by **Mubarak [31].**

For a number of reasons related to the nature of the thoracotomy approach, including rib spreading, intercostal nerve and muscle trauma, localized incision, and sensory nerves, as the incision in thoracotomy is frequently made in a region that is densely innervated by sensory nerves, making the area particularly sensitive, there was a significant difference between the two groups in terms of postoperative pain.

The study employed a visual analogue pain scale to measure pain. On the fifth postoperative day, the mean pain score for group A was 5.5±1.39. For group B, the mean pain score was 3.5±0.74, indicating a large statistically significant change with minimal pain perception. According to the sternotomy group, **Jahanian *et al.*** **[33]** on a visual analogue scale of 0 to 10, the thoracotomy group had a higher mean pain score in the first 24 hours than the sternotomy group (4.7 [4.5-4.8] vs. 4.4 [4.3-4.5], respectively).

Evaluation of postoperative complications:

There was no statistically significant difference between the reported problems in the two cases. Nine patients (45%) in group A had preoperative atrial fibrillation, and four patients (20%) had newly discovered atrial fibrillation after surgery. Eleven cases (52.4%) in group B also had preoperative atrial fibrillation, and four patients (19%) developed postoperative atrial fibrillation. The two groups did not differ in any noticeable way. Furthermore, 20% of the patients in **Iyengar *et al.*** **[13]** experienced postoperative arrhythmias as well. Regular dressing changes and medication helped one patient (5%) in group (A) with a superficial wound infection that only affected the skin. Because both surgical treatments minimize the risk of contamination at the incision site by adhering to standardized sterile techniques during the surgery, the non-significant difference between the two groups can be explained. Group B included three patients (14.3%) who had wound infections, two of which involved only the skin and responded to frequent dressings and antibiotics, and the third patient had mediastinitis, which required debridement with re-wiring. Additionally, similar infection prevention was ensured in all groups with the use of prophylactic antibiotics, appropriate skin preparation, and postoperative wound care. The same outcome was displayed by **Sá *et al.*** **[16]**.

Unlike our investigation, a study by **Eltonsy *et al.*** **[21]** found that the sternotomy group experienced more superficial wound infections. This can be explained by the larger incision made during a median sternotomy, which entails cutting through the sternum and necessitates a big incision down the middle of the chest. The risk of superficial wound infections is increased by the size and depth of this incision, which increases the surface area exposed to possible infection. Because median sternotomy entails more thorough dissection and damage to the surrounding tissues, there is a higher chance of infection. A significant portion of skin, subcutaneous tissue, and bone may experience a disturbance in blood flow, which could postpone healing and make them more vulnerable to superficial infections.

One patient (4.8%) in group B experienced pericardial effusion during follow-up in the outpatient clinic, necessitating the insertion of a subxiphoid tube under general anaesthesia (because of the elevated INR).

Wound Satisfaction:

The study employed a modified Likert scale to assess wound satisfaction. Patients were more satisfied with the thoracotomy group than the sternotomy wound, with a mean pain score of 4.6 ± 0.502 in group A and 2.4 ± 0.67 in group B. This shows a high statistically significant difference of satisfaction. This can be explained by the fact that a thoracotomy requires a smaller incision on the side of the chest, making it less noticeable than a sternotomy's midline scar. For patients who are concerned about their appearance, the side placement could be more aesthetically acceptable. In contrast to sternotomy patients, who must follow stringent movement limitations (such as wearing a chest band, avoiding lifting, and sleeping exclusively on their back), thoracotomy patients can frequently return to their regular activities sooner. A higher sense of pleasure might result from less restrictions on lifestyle. Additionally, the scar from a midline sternotomy is frequently linked to severe psychological bad sense or a feeling of "major surgery." A smaller, lateral incision, on the other hand, would not have as significant of a psychological effect. The same outcomes were displayed by **Eqbal *et al.*** **[25].**

Total hospital stay:

In our study, the mean hospital stay for groups A and B was 5.92 ± 0.73 days and 6.02 ± 0.67 days, respectively. A P value > 0.05 indicates that this difference was not statistically significant. This is explained by the fact that if the incidence of complications like bleeding, wound infections, or arrhythmias is similar in both groups, the length of hospital stay will logically meet because these are frequently the main causes of prolonged stays. As the same results of **Hage *et al.* [30].**

Eqbal *et al.* [25] found that the mean hospital stay for the thoracotomy group was about two days shorter than that of the sternotomy group. Less invasive procedure can explain this: Since a thoracotomy does not involve cutting through the entire sternum, it is typically less invasive than a median sternotomy.

CONCLUSION

Mitral valve replacement is a critical surgical intervention, and the choice of surgical approach plays a significant role in determining patient outcomes. This study compared the efficacy and outcomes of two surgical techniques limited right thoracotomy (Group A) and median sternotomy (Group B) to identify advantages and limitations of each approach. The results demonstrated that both techniques were effective in achieving the primary goal of mitral valve replacement, with no statistically significant differences observed in ventilation time, cardiopulmonary bypass time, cross-clamp time, postoperative bleeding, wound infections, or other complications. Both groups also exhibited comparable outcomes in terms of wound length and cosmetic satisfaction, reflecting the efficacy of standardized surgical and postoperative care protocols. Although Group A (thoracotomy) offers a smaller incision and avoids the need for chest stabilization devices, such as chest belts, required in sternotomy, this study found no significant difference in recovery times or hospital stay duration between the two groups. The psychological and aesthetic benefits of the thoracotomy incision may make it particularly appealing to younger and female patients, who often prioritize cosmetic outcomes. These findings highlight that both approaches are safe and effective, with their respective strengths offering flexibility in tailoring surgical strategies to individual patient needs.

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