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Original Research Article

COMPARATIVE ASSESSMENT OF RIGHT ANTEROLATERAL THORACOTOMY WITH STANDARD MEDIAN STERNOTOMY FOR MITRAL VALVE REPLACEMENT- A PROSPECTIVE SINGLE CENTER STUDY

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ABSTRACT

Background: In current decade rapid advancement of surgical techniques and the assistance of developed instrumentation has been improved the outcome of cardiac surgeries. Minimally invasive cardiac valve surgeries are reported to conduct with improved outcome. Mitral valve surgeries have been conducted through Median Sternotomy as reported as the early era of cardiopulmonary bypass. **Material & Methods:** The present Hospital based prospective study was conducted at department of Cardiothoracic Vascular Surgery of S.M.S. Medical college Hospital from December 2017 to December 2020. Total 200 patients were included in our study with moderate to severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to the ACC/AHA guidelines to undergo either right anterolateral thoracotomy (Group I, n:100) or through standard Median Sternotomy for mitral valve replacement (Group II, n:100). **Results:** Mean operation duration (min) was 178.1 ± 24.7 among group I and 138.3 ± 31.5 among group II (p value > 0.05). Cardiopulmonary bypass time was 81.5 ± 13.1 among group I and 71.7 ± 15.2 among group II (p value < 0.05). Aortic clamp time (min) was 32.1 ± 7.2 among group I and 30.1 ± 8.4 among group II (p value > 0.05). Chest tube drainage (ml) was 167 ± 22 among group I and 319 ± 46 among group II (p value < 0.05). Score of visual analogue scale was 42.0 ± 14.2 among group I and 45.4 ± 12.8 among group II (p value > 0.05). Mechanical ventilation time was 4.3 ± 1.1 among group I and 6.1 ± 2.4 among group II (p value > 0.05). Blood transfusion (unit) was 1.4 ± 1.1 among group I and 2.2 ± 3.2 among group II (p value > 0.05). Wound infection in no. of cases (%) was 4% among group I and 9% among group II (p value > 0.05). Hospital stay (days) was 8.2 ± 0.9 among group I and 10.5 ± 2.8 among group II (p value < 0.05). ICU stay (days) was 1.9 ± 0.7 among group I and 1.6 ± 1.4 among group II (p value < 0.05). Time to normal activity (weeks) was 8.2 ± 4.8 among group I and 11.8 ± 3.6 among group II (p value < 0.05). **Conclusion:** We concluded that minimal invasive right anterolateral thoracotomy has less bleeding, shorter hospital and ICU stay, less pain score and faster recovery than standard Median Sternotomy for mitral valve replacement.

Keywords: Right anterolateral thoracotomy, standard Median Sternotomy, mitral valve disease.

INTRODUCTION

The primary function of Heart valves is to take care of pressure gradients among the cardiac chambers and maintain the unidirectional flow of blood without any reflux from and through the heart.**(1)** Out of the all Heart valves, the aortic valve and mitral valve, are the two most vulnerable to affect.**(2)** In reference to public health, medical diagnostic techniques and surgical techniques, mitral valve diseases have been reported as the most important human disease to be treated in current century.**(3)**

In current decade rapid advancement of surgical techniques and the assistance of developed

instrumentation has been improved the outcome of cardiac surgeries. Minimally invasive cardiac valve surgeries are reported to conducted with improved outcome.**(4)** Mitral valve surgeries have been conducted through Median Sternotomy as reported as the early era of cardiopulmonary bypass. However, these surgeries have been associated with postoperative instability and cases of osteomyelitis of the sternum, although Median Sternotomy is generally used as a standard procedure for mitral valve surgeries. **(5)** Some other postoperative consequences such as Large scar especially among young women because of adverse cosmetic and psychological outcome. The burden of postoperative morbidity and mortality among patients of cardiac surgeries has increases when patients had associated with other associated comorbid conditions like diabetes **(6)**

Heart failure reported from mitral valve stenosis was well documented by 19th century and surgical correction of mitral valve stenosis was began even before the heart lung machine was assessable. **(7)** Rheumatic heart disease and rheumatic fever affects the mitral valve by resulting in stenosis of both posterior and anteromedial commissures of the valve along with subsequent mitral regurgitation. However, the compensatory mechanisms of ventricles enable the heart to compensate these lesions for a long variable periods of time. **(8)**

Right anterolateral thoracotomy surgical approach to mitral valve disease is a routine surgical approach. Some studies have been recommended that Right anterolateral thoracotomy has been an alternative approach to standard Median Sternotomy for patients who were undergoing for mitralvalve replacement **(9)** Hence the present study was conducted to assess the comparative evaluation of right anterolateral thoracotomy and standard Median Sternotomy for mitral valve replacement.

MATERIALS & METHODS

The present Hospital based prospective study was conducted at department of Cardiothoracic Vascular Surgery of S.M.S. Medical college Hospital from December 2017 to December 2020. Total 200 patients were included into study .A prior Ethical clearance from hospital Ethics committee was taken before the start of study. Written informed consent was taken from each study participant. All patients with moderate to severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to the ACC/AHA guidelines to undergo either right anterolateral thoracotomy (Group I, n:100) or through standard Median Sternotomy for mitral valve replacement (Group II, n:100).

All the study participants were subjected to general physical and clinical examination with special references to cardiovascular system and detailed history was recorded from all of them. All the study participants were subjected to routine blood investigation. Matching of both groups was done with respect to age, gender, NYHA Class and ejection fraction. Length of incision, surgical exposure, mean cross clamp time, mean bypass time, hospital stay, ICU stay,Blood loss, pain score, overall comorbidity with Sternotomy, dehiscence, cosmetic quality, healing and Sepsis were studied for comparison. Both the right anterolateral thoracotomy and standard Median Sternotomy for mitral valve replacement were performed using standard operating procedure.

All the recorded data was entered in an Excel spread sheet on Microsoft Excel 2016. The statistical analysis like chi square test, t test was done using the Statistical software SPSS v22. A p-value <0.05 with 95% confidence intervals were considered statistically significant.

RESULTS

In present study we enrolled a total of 200 patients with moderate to severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to the ACC/AHA guidelines to undergo either right anterolateral thoracotomy (Group I, n:100) or through standard Median Sternotomy for mitral valve replacement (Group II, n:100). All the study participants were above the age of 18 years of age and mean age of Group Istudy participants was 60.3 ± 11.9years and mean age of Group II study participants was 60.9 ± 12.4years. Out of the total study participants 54% were male and females 46% among Group I study participants and 55% were male and females 45% among Group II study participants. On the basis of etiology Rheumatic valve disease present among 88% Group I study participants and 90% among Group II study participants and Degenerative disease present among 12% Group I study participants and 10% among Group II study participants.Out of the total study participants Mitral stenosis found among 24% Group I study participants and 26% among Group II study participants, Mitral insufficiency found among 35% Group I study participants and 37% among Group II

study participants and mixed lesions found among 41% Group I study participants and 37% among Group II study participants. Out of the total study participants, ejection fraction was 55.2 ± 9.9among Group I study participants and 55.9 ± 9.4 among Group II study participants. All of these differences among both the study groups were statistically non-significant (p value > 0.05).(Table 1)

Table 1: Distribution of study subjects according to the study parameters.

Parameters		Right Anterolateral thoracotomy group (n=100)	Standard Median Sternotomy group (n=100)	P value
Age (years)	Mean ± SD	60.3 ± 11.9	60.9 ± 12.4	>0.05
Gender	Male	56%	55%	>0.05
	Female	44%	55%	
Etiology	Rheumatic valve disease	88%	90%	>0.05
	Degenerative disease	12%	10%	
Diagnosis	Mitral stenosis	24%	26%	>0.05
	Mitral insufficiency	35%	37%	
	Mixed lesions	41%	37%	
Ejection fraction	Mean ± SD	55.2 ± 9.9	55.9 ± 9.4	>0.05

In present study, out of total study participants, based on the New York Heart Association class, Fourteen percent patients were belonging from study group I while 13% patients from study group II were classified under class I. 68% patients of study group I and 69% patients of study group II were classified under class II.15% patients of study group I and 14% patients of study group II were classified under class III.3% patients of study group I and 3% patients of study group II were classified under class IV.All of these differences among both the study groups were statistically non-significant (p value > 0.05).(Table 2)

Table 2: Distribution of study subjects according to the New York Heart Association class.

Parameters		Right Anterolateral thoracotomy group (n=100)	Standard Median Sternotomy group (n=100)	P value
New York Heart Association class	Class I	14%	13%	>0.05
	Class II	68%	69%	
	Class III	15%	14%	
	Class IV	3%	3%	

In present study, out of total study participants, based on the Intraoperative and Postoperative study variables, mean operation duration (min) was 178.1 ± 24.7 among group I and 138.3 ± 31.5 among group II (p value > 0.05). Cardiopulmonary bypass time was 81.5 ± 13.1 among group I and 71.7 ± 15.2 among group II (p value < 0.05). Aortic clamp time (min) was 32.1 ± 7.2 among group I and 30.1 ± 8.4 among group II (p value > 0.05). Chest tube drainage (mL) was 167 ± 22 among group I and 319 ± 46 among group II (p value < 0.05). Score of visual analogue scale was 42.0 ± 14.2 among group I and 45.4 ± 12.8 among group II (p value > 0.05). Mechanical ventilation time was 4.3 ± 1.1 among group I and 6.1 ± 2.4 among group II (p value > 0.05). Blood transfusion (unit) was 1.4 ± 1.1 among group I and 2.2 ± 3.2 among group II (p value > 0.05).Wound infection in no. of cases (%) was 4% among group I and 9%among group II (p value > 0.05).Hospital stay (days) was 8.2 ± 0.9among group I and 10.5 ± 2.8 among group II (p value < 0.05).ICU stay (days) was 1.9 ± 0.7 among group I and 1.6 ± 1.4 among group II (p value < 0.05).Time to normal activity (weeks) was 8.2 ± 4.8 among group I and 11.8 ± 3.6 among group II (p value < 0.05). (Table 2)

Table 3: Distribution of study subjects according to the Intraoperative and Postoperative Variables

Parameters	Right Anterolateral thoracotomy group (n=100)	Standard Median Sternotomy group (n=100)	P value
Operation duration (min)	178.1 ± 24.7	138.3 ± 31.5	>0.05
Cardiopulmonary bypass time	81.5 ± 13.1	71.7 ± 15.2	**<0.05***
Aortic clamp time (min)	32.1 ± 7.2	30.1 ± 8.4	>0.05
Chest tube drainage (mL)	167 ± 22	319 ± 46	**<0.05***
Score of visual analogue scale	42.0 ± 14.2	45.4 ± 12.8	>0.05
Mechanical ventilation time (min)	4.3 ± 1.1	6.1 ± 2.4	>0.05
Blood transfusion (unit)	1.4 ± 1.1	2.2 ± 3.2	>0.05
Wound infection in no. of cases (%)	4%	9%	> 0.05
Hospital stay (days)	8.2 ± 0.9	10.5 ± 2.8	**<0.05***
ICU stay (days)	1.9 ± 0.7	1.6 ± 1.4	**<0.05***
Time to normal activity (weeks)	8.2 ± 4.8	11.8 ± 3.6	**<0.05***

Note- *Significant at 5%

DISCUSSION

In present study All the study participants were above the age of 18 years of age and mean age of Group I study participants was 60.3 ± 11.9 years and mean age of Group II study participants was60.9 ± 12.4 years. Out of 200 patients 54% were male and 46% were females among Group I while 55% were male and 45% females among Group II study participants. Similar results were obtained in a study conducted by Badkhalet al. et al among 60 patients with severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to the ACC/AHA guidelines to undergo either right anterolateral thoracotomy (Group I, n:30) or through standard Median Sternotomy for mitral valve replacement (Group II, n:30)(10).

On the basis of etiology Rheumatic valve disease present among 88% Group I and 90% among Group II study participants respectively. Degenerative

disease present among 12% Group I study participants and 10% among Group II study participants.Out of the total study participants Mitral stenosis found among 24% Group I study participants and 26% among Group II study participants, Mitral insufficiency found among 35% Group I study participants and 37% among Group II study participants and mixed lesions found among 41% Group I study participants and 37% among Group II study participants. Out of the total study participants, ejection fraction was 55.2 ± 9.9 among Group I study participants and 55.9 ± 9.4 among Group II study participants. All of these differences among both the study groups were statistically insignificant (p value > 0.05).Similar results were obtained in a study conducted by Lange et al. among 194 patients with severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to undergo either right anterolateral thoracotomy (Group I, n:97) or through standard Median Sternotomy for mitral valve replacement (Group II, n:97)(11).

In our study, according to classification based on the New York Heart Association class, 14% patients of study group I and 13% patients of study group II were classified under class I. 68% patients of study group I and 69% patients of study group II were classified under class II. 15% patients of study group I and 14% patients of study group II were classified under class III. 3% patients of study group I and 3% patients of study group II were classified under class IV. All of these differences among both the study groups were statistically insignificant (p value > 0.05).Similar results were obtained in a study conducted by Badkhal et al. et al among 60 patients with severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to the ACC/AHA guidelines to undergo either right anterolateral thoracotomy (Group I, n:30) or through standard Median Sternotomy for mitral valve replacement (Group II, n:30)(10).

In our study, based on the Intraoperative and Postoperative study variables, mean operation duration (min) was 178.1 ± 24.7 among group I and 138.3 ± 31.5 among group II (p value > 0.05). Cardiopulmonary bypass time was 81.5 ± 13.1 among group I and 71.7 ± 15.2 among group II (p value < 0.05). Aortic clamp time (min) was 32.1 ± 7.2 among group I and 30.1 ± 8.4 among group II (p value > 0.05). Chest tube drainage (mL) was 167 ± 22 among group I and 319 ± 46 among group II (p value < 0.05). Score of visual analogue scale was 42.0 ± 14.2 among group I and 45.4 ± 12.8 among group II (p value > 0.05). Mechanical ventilation time was 4.3 ± 1.1 among group I and 6.1 ± 2.4 among group II (p value > 0.05). Blood transfusion (unit) was 1.4 ± 1.1 among group I and 2.2 ± 3.2 among group II (p value > 0.05).Wound infection in no. of cases (%) was 4% among group I and 9% among group II (p value > 0.05).Hospital stay (days) was 8.2 ± 0.9 among group I and 10.5 ± 2.8 among group II (p value < 0.05). ICU stay (days) was 1.9 ± 0.7 among group I and 1.6 ± 1.4 among group II (p value < 0.05). Time to normal activity (weeks) was 8.2 ± 4.8 among group I and 11.8 ± 3.6 among group II (p value < 0.05). Similar results were obtained in a systematic review and meta-analysis conducted by Sundermann et al among 20,000 patients from 45 studies with severe mitral valve disease who were scheduled for elective mitral valve surgery were prospectively randomized according to undergo either right anterolateral thoracotomy or through standard Median Sternotomy for mitral valve replacement (12).

CONCLUSION

We concluded from the present study that after matching of both the right anterolateral thoracotomy and standard Median Sternotomy for mitral valve replacementwith respect to age, gender, NYHA Class and ejection fraction. Length of incision, surgical exposure, mean cross clamp time, mean bypass time, hospital stay, ICU stay,Blood loss, pain score,were performed using standard operating procedure we found that minimal invasive right anterolateral thoracotomy has less bleeding, shorter hospital and ICU stay, less pain score and faster recovery than standard Median Sternotomy for mitral valve replacement.

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