



EFFECT OF LEFT ATRIAL APPENDAGE PPLICATION ON CEREBROVASCULAR ACCIDENTS SECONDARY TO ATRIAL FIBRILLATION IN PATIENTS WHO UNDERWENT MITRAL VALVE SURGERY

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Jl:Conducted the study and wrote the article. HK:Helped in review the article. QAQ:Re-arranged data and corrected article. ARA:Tables and figures and made corrections.

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ABSTRACT:

BACKGROUND: LA plication is a simple easy and cost effective surgical procedure. It is intended to alter the geometry and anatomy of LA supporting fibrillation.

Objective: To compare the effect of left atrial appendage exclusion in mitral valve surgery on future events of cerebrovascular accidents in comparison with non exclusion of left atrial appendage at five years of followup.

MATERIAL AND METHODS: A retrospective study was conducted in three health facilities i.e. Pakistan Institute of Medical Sciences Islamabad, Quaid-e-Azam Hospital, Rawalpindi and Bilal Hospital from September, 2010 to April, 2017. Patients undergoing mitral valve surgery with plication/occlusion of Left Atrial appendage were enrolled in two groups: group A underwent MVR with LAA plication Technique (n=60) and group B had MVR without LAA plication (n=60). Adult patients between 16 years to 60 years of age and both genders were included.

RESULTS: Females were predominant in this study. The duration of surgery was found out to be 68.0 minutes in group A as compared to 64.4 minutes in group B but not statistically different. Similarly, the stay in the ICU and overall hospital stay was also found similar in both groups (p-value, 0.68). There was no statistically significant difference in postoperative atrial fibrillation thromboembolic events and functional capacity of the patients.

CONCLUSION: There was no statistically significant benefit of LAA plication during Mitral valve surgery compared with non plication in terms of postoperative Atrial fibrillation reduction and future thromboembolic events resulting in stroke.

KEYWORDS: Mitral Valve surgery, Atrial Fibrillation, Left Atrial Appendage, Thromboembolic events.

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INTRODUCTION:

Over the age of 65 years approximately 3-5% of population suffer from atrial fibrillation (AF) that leads to thromboembolism in 15-20%.¹ In non-rheumatic AF there is cough stroke is about 5% per year.² In United States, approximately 2.5 million people have AF³ and in every one hour about 15 out of these patients suffer from ischemic stroke.⁴

Stroke and its debilitating consequences has been shown to be the most-feared complication, even higher than death, of patients undergoing surgery for AF.⁵ These strokes are mostly embolic in nature, with the left atrial appendage (LAA) and left atrium as the sources. For years and even still today, the gold standard strategy to reduce stroke risk is anticoagulation (AC) with warfarin. However, due to numerous concerns with warfarin anticoagulation, alternatives have been explored.⁶

LAA is a most common place in the heart where thrombosis occurs that leads to ischemic stroke. In previous review of 23 studies analyzing LAA during autopsy, transesophageal echocardiography (TEE), or direct intraoperative inspection, the presence of thrombus was noticed in 13% of patients with valvular or non-valvular AF.⁷ In LAA, patients with valvular AF showed presence of atrial thrombus in 57% of patients while in non-valvular AF nearly 90% thrombi were present in LAA.⁸

In guidelines about plication of the LAA in patients undergoing mitral valve surgery, it has been recommended to obliterate LAA.⁹ The surgical Maze procedure for AF originally adopted by Cox also incorporates excision of the LAA.¹⁰

In many cardiac surgery centers it is a routine practice to obliterate LAA during mitral valve surgery.¹¹ The reason is that LAA is the most common substrate for the formation of thrombus in AF. The obliteration of LAA leads to decreased accumulation of blood in LAA, thereby, reducing the risk of thrombus formation and embolization.¹²

The patients who undergo mitral valve surgery, AF is present in nearly 50% of patients.¹³ It is not necessary that valvular surgery converts AF into sinus rhythm and is not considered a curative procedure.¹⁴ The study was carried out to compare the designed to compare the effect of left atrial appendage exclusion in mitral valve surgery on future events of Cerebrovascular accidents in comparison with non exclusion of Left Atrial Appendage

MATERIAL AND METHODS:

This was a comparative retrospective study. The medical data available in hospitals of all adult pa-

tients above 16 and below 60 years of age years of age who underwent MVR with or without Tricuspid valve repair at Pakistan Institute of Medical Sciences, Islamabad, Quaid-e-Azam International Hospital and Bilal Hospital were evaluated. The pre-operative preparations were same in all the included patients for different cardiac procedures using standard median sternotomy. Both groups comprised of similar sample of cases (n=60 each). Between September 2010 to April 2017, 120 patients who underwent Mitral valve surgery with or without Tricuspid repair were included in this study and two groups were made: group A underwent MVR with Left atrial appendage exclusion by plication (n=60) and group B had MVR with Left Atrial Appendage non plication (n=60).

In the LAA Plication technique, 3/0 prolene sutures was used to internally occlude the Appendage after removal of the clot if present. The suture was fastened, making sure that there is no residual space left . to avoid the chances of any future cerebrovascular events.

In MVR without LA appendage plication, the main reason of not plicating the Appendage was to avoid the unnecessary stretch on Left Atrium wall and Pulmonary veins, as stretch on atrial chamber can cause post-operative persistent atrial fibrillation or new onset atrial fibrillation.

The study was conducted by a single surgeon in different institutions with analyzing data of valvular Heart surgery cases retrospectively. Only the first five year postoperative outcome was evaluated.

Pre-operatively Euro Score was calculated for standardization of the risk and expected outcome. Patients of both genders of age 16-60 years undergoing elective mitral valve surgery were included. Patients with history of cerebrovascular accident, patient with cardiogenic shock and high PA Pressure, patient with thick pericardial adhesions, redo valvular surgery, endocarditis with vegetations on mitral valve or mitral valve surgery with concomitant coronary artery bypass surgery were excluded. Daily progress parameters were evaluated to assess the recovery of patients. Chest x-ray was obtained before the procedure and from day 2 to day 7 postoperatively. Echocardiogram was done as a routine in all valvular patients before discharge.

The follow-up after discharge was carried out at the end of one week, then after two weeks and hereafter on monthly basis. Initial half year post operative PT/INR and overall check up was carried out. Patients were followed up till five years post operation to record recurrence of Atrial Fibrillation

and Thromboembolic events/stroke.

Data was entered in a computer using SPSS (statistical package for social sciences) version 21.0 for windows. The continuous or numerical variables like age, operative time, hospital stay and pulmonary artery pressure (PAP) were measured as mean and standard deviation whereas categorical variables like gender, hypertension, diabetes mellitus, COPD and side effects were expressed as frequencies and percentages. Chi square test was applied to compare categorical variables whereas student's t-test was applied to compare continuous or numerical variables.

RESULTS:

Female gender was predominant in this study. Out of the total 60 cases in group A, 21 (30.0%) were male and 39 (70.0%) were female whereas in group B, there were 23 (36.0%) males and 37(64.0%) were female patients. The patients had a mean age of 27.5 ± 11.2 years in group A compared to 32.4 ± 10.3 years in group B. The clinical parameters like hypertension, diabetes mellitus, COPD were found equal between the two study groups. (Table 1)

The duration of surgery was found out to be 66.4 minutes in group A compared to 71.0 minutes in group B. Though MVR without Appendage Plication group had slightly shorter operative time, this difference was not statistically significant (p-value, 0.27). Similarly, the stay in the ICU and overall hospital stay was also found similar in both groups (p-value, 0.68). (Table 2)

Table 1: Demographic and Clinical Characteristics of Patients in the Two Groups

| | LA appendage Plication group (n=60) | LA appendage non Plication group (n=60) | p-value |
|--------------|-------------------------------------|---|---------|
| Age (years) | | | |
| <30 | 28 (46.7%) | 34 (56.7%) | 0.84 |
| >30 | 32 (53.3%) | 26 (43.3%) | |
| Sex | | | |
| Male | 24(40%) | 27 (45%) | 0.63 |
| Female | 36 (60%) | 33 (55%) | |
| Hypertension | 6 (10%) | 3(5%) | 1.0 |
| DM | 4(6.7%) | 7 (11.7%) | 0.49 |
| LA dimension | 47.5±3.2 | 43.4±3.6 | 0.27 |
| NYHA class | | | |
| III | 42 (70%) | 38 (63.3%) | 0.27 |
| IV | 18 (30%) | 22 (36.7%) | |
| COPD | 8 (13.3%) | 6 (10%) | 0.77 |
| PAP mmHg | 45.6±11.2 | 43.8±10.0 | 0.76 |
| Creatinine | | | |
| <1.7 | 44 (73.3%) | 38 (63.3%) | 0.19 |
| >1.7 | 16 (26.7%) | 22(36.7%) | |
| AFR | | | |
| AFR | 46 (76.7%) | 43(71.7%) | 0.83 |
| SR | 14 (23.3%) | 17 (28.3%) | |
| LVEF | | | |
| <35 | 11(18.3%) | 13 (21.7%) | 0.46 |
| >35 | 49(81.7%) | 47 (78.3%) | |

Table 2: Comparison of operative and perioperative findings between the two groups

| | LA appendage Plication group (n=60) | LA appendage non Plication group (n=60) | p-value |
|--------------------------|-------------------------------------|---|---------|
| Operative time | | | |
| Cross X clamp time (min) | 66.4 ± 23.4 | 71.0 ± 18.3 | 0.27 |
| TPT time (min) | 91.2 ± 26.3 | 98.3 ± 29.4 | 0.18 |
| ICU stay (days) | 2.4 ± 1.2 | 2.6 ± 1.2 | 0.39 |
| Hospital stay (days) | 7.2 ± 1.2 | 7.4 ± 1.4 | 0.68 |
| Concomitant procedure | | | |
| MVR | 32 (53.3%) | 34 (56.7%) | 0.83 |
| DVR | 18 (30%) | 16 (26.7%) | |
| Hemorrhage | 3 (5%) | 2 (3.3%) | 1.0 |
| Renal failure | 2 (3.3%) | 3 (5%) | 1.0 |
| Infection | 1 (1.7%) | 2 (3.3%) | 1.0 |
| In hospital mortality | 3 (5%) | 2 (3.3%) | 1.0 |
| Heart block | 4 (6.7%) | 6 (10%) | 0.74 |
| Reverted | 3 (5%) | 4 (6.7%) | 1.0 |
| PPM | 1 (1.7%) | 2 (3.3%) | 1.0 |
| Persistent AF | 6 (10%) | 9 (15%) | 1.0 |
| Recurrent AF | 11 (18.3%) | 14 (23.3%) | 1.0 |

Table 3: Comparison of Postoperative Morbid Events/complications in Between the Two Study Groups within First Five Years.

| | Group A (60) | Group B (60) | P value |
|--|--------------|--------------|---------|
| Atrial Fibrillation persistent | 12(20%) | 9(15%) | |
| Atrial fibrillation reverted to sinus rhythm | 6(10%) | 8(13.3%) | |
| Atrial fibrillation recurrent | 13(21.7%) | 16(26.7%) | |
| Stroke Ischemic | 3(5%) | 2(3.3%) | |
| Stroke Haemorrhagic | 2(3.3%) | 4(6.7%) | |
| Death | 2(3.3%) | 1(1.7%) | |
| Thrombosed/ stuck Valve | 4(6.7%) | 5(8.3%) | |

Medium-term (25.4 ± 10.3 mo) freedom from the development of thromboembolic events in the LAA plication groups and non LAA Plicaton group was 76.9%, and 83.9% respectively (P-value, 0.30). In echocardiographic results at the medium-term follow-up, it was revealed that the ratio of freedom from recurrent thromboembolic events 4 were similar with both the groups A and B (p-value .001), Symptom-free survival was 79.3% in the LAA plication group, 88.4% in the LAA non Plication group (P-value, 0.28).

There was no statistically significant difference in postoperative functional capacity distribution (PAP) according to the surgical technique (P-value, 0.19), however, in both groups, immediate postoperative improvement was highly significant when compared with preoperative New York Heart



Association (NYHA) classifications (P-value, 0.02). (Table 3)

DISCUSSION:

The major site of thrombus formation in patients with rheumatic heart disease is left atrium and LAA. It has been suggested previously that plication of LAA may lead to decrease thrombo embolism. 15-17 Hellerstein and his associates, 15 demonstrated suitability of LAA ligation in canines. Maden 16 in 1949 carried out LAA ligation in two patients of mitral valve disease with AF. Beal et al 17 in year 1950 also reported ligation of LAA for the prevention of thromboembolism in two cases.

Johnson et al 18 performed LAA ligation in 437 patients and showed no late strokes. During follow up period TEE was carried out and no patient demonstrated atrial thrombi. So it was concluded by the authors that excision of LAA is effective and safe. During follow-up there were no clots in LAA as investigated by TEE. The authors concluded that routine LAA excision is safe and should be considered whenever the chest is opened. So it may be inferred that ligation of LAA and thrombus formation may be independent predictor for thromboembolic episodes after mitral valve surgery. 19

Bando et al 20 studied 812 patient where MVR was performed, 493 patient had LAA closed 320 patients undergoing MVR had the concomitant ligation of LAA, whereas 173 patients underwent MVR and the MAZE procedure along with LAA closure. 72 patient had the late stroke, 47 patient of which had LAA closed. Closure of LAA was not significant contributing factor towards stroke. Plication of LAA could not prevent stroke in long term. Our sample size was small but our data almost showed the similar results.

Almahameed et al 21 included 136 patients undergoing LAA ligation during mitral valve surgery. Thromboembolic events were reported in 14 patients and was concluded that LAA occlusion may be associated with increased risk of stroke. In our study although stroke rate was not much increased but there was no added benefit of LAA surgical closure while comparing it with the group with no closure of LAA.

Orszulak et al 22 included 285 patients who underwent mitral valve replacement. LAA ligation was carried out in 92 patients. The data also concluded that LAA ligation was associated with increased risk of late stroke. Ninety-two patients

received operative ligation of the LAA. This study found an increased rate of late stroke in patients who had the LAA ligated.

Johnson et al 23 in year 2000 included 437 patients who underwent LAA ligation during valvular surgery. It was reported that 21 patients had stroke in the absence of clot in LA. Currently radiofrequency (RF) ablation for patients with AF is considered treatment of choice but no guidelines are available about the management of LAA. Dawson et al 24 also reported that it is not essential to exclude LAA. This has been the eternal dilemma in the course of events while in our study 3 patients had Haemorrhagic stroke at postoperative interval of 2, 4 and five years. Two patients had Ischemic stroke at interval of one month and 14 months after surgery. While in group B two patient had Haemorrhagic stroke at interval of 18 months and 22 months after surgery. In group B 4 patient had Ischemic stroke at interval of 3, 5 and 6 years.

In 2008 Kanderian et al 25 described the outcome of surgical isolation of left atrial appendage to be either successful or unsuccessful. Successful isolation of the LAA; is the complete separation of the LAA cavity from the LA and hence the circulation. While the unsuccessful closure is characterized by either; patent LAA, isolated with a persistent flow or remaining pouch more than 1 cm in depth. TEE with 2D mode and color flow Doppler can easily detect the outcome of surgically closed LAA. The successful closure was defined as the absence of all the fore mentioned findings. 25

Several techniques have been used to exclude LAA; these include suture exclusion, excision and stapler exclusion. Among these techniques excision was nearly the most successful. 25 In the same study, Kanderian reported that excision achieved 73% success versus 23% for stapler exclusion meanwhile suture exclusion had 61% success with a persistent flow by TEE Doppler. Kanderian also stated that stapler exclusion was completely unsuccessful, while the excision was the most successful yet it remains with some failure as 27% of cases had a remnant stump more than 1 cm. 25

CONCLUSION:

There was no statistically significant benefit of LAA plication during Mitral valve surgery compared with non plication in terms of postoperative Atrial fibrillation reduction and future thromboembolic events resulting in stroke.



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