Indian Journal of Basic and Applied Medical Research; March 2020: Vol.-9, Issue- 2. P. 379-383
DOI: 10.36848/IJBAMR/2020/12215.51440

Original article

Effect of LA appendage ligation for controlling atrial fibrillation in patients with left atrial enlargement

Singh Pawan[1], Prerit Agarwal[1], Debmalya Saha[1], S. Naqvi[2], Muhammed Abid Geelani[3]

[1]Senior resident, department of CTVS, G B Pant Institute of Postgraduate Medical Education and Research, New Delhi
[2]Assitant Professor, Department of CTVS, G B Pant Institute of Postgraduate Medical Education and Research, New Delhi
[3]Director Professor and Head, Department of CTVS, G B Pant Institute of Postgraduate Medical Education and Research, New Delhi
Corresponding author : Dr Singh Pawan , Senior resident, department of CTVS, G B Pant Institute of Postgraduate Medical Education and Research, New Delhi – 11000; Email: dr.pawanpsingh@gmail.com

Abstract:
Left atrial enlargement has significant clinical effects over cardiovascular outcomes of patients undergoing cardiovascular surgeries. Massive enlargement of the left atrium can develop in patients with long-standing severe mitral regurgitation. Surgical reduction has been recommended since the early days of cardiac surgery but has not been generally adopted. Our study showed that the preoperative rhythm in patients with mitral valve disease strongly determines the postoperative rhythm. The results in perioperative and follow up period showed that, chronic AF is associated with persisting AF after mitral valve surgery. The aetiology and type of mitral valve disease were not found to be risk factors for postoperative AF. Though, mitral valvular surgery with AF surgery primarily aims to improve morbidity after mitral valve surgery the ligation of LAA dose not show to revert AF or maintain the sinus rhythm in patients with chronic Atrial Fibrillation. As such other methods of atrial electrical remodelling needs to be applied and studied in greater details in patients with chronic atrial fibrillation.
Keywords: Left atrial enlargement, LVF

Introduction:

Left atrial enlargement has significant clinical effects over cardiovascular outcomes of patients undergoing cardiovascular surgeries. Massive enlargement of the left atrium can develop in patients with long-standing severe mitral regurgitation. Surgical reduction has been recommended since the early days of cardiac surgery but has not been generally adopted [(1)]. Other conditions which may also lead to left atrial enlargement although rare are left ventricular failure, chronic atrial fibrillation, and left-to-right shunts such as patent ductus arteriosus and ventricular septal defects [(1)].

Patients with giant LA and LA appendage with long standing mitral valve disease are usually associated atrial fibrillation. These patient present with respiratory and cardiovascular complications. Atrial fibrillations may also lead to atrial thrombus formation [(2)]. The Framingham study suggested that atrial fibrillation along with an increase in diameter of left atrial chamber was associated with an increased risk of stroke and sudden death [(4)].

Currently, there is no consensus regarding the management of Giant LA during mitral valve surgery. Most surgeons fix the mitral valve, and do little to an oversized left atrium or the left atrial appendage. Others occlude the left atrial appendage [4,5].

LA Appendage has always been defined as a trivial portion of LA but recent advanced imaging modalities demonstrated that LA Appendage is a separate structure from LA with distinctive structural, hormonal, and electrophysiological properties. Atrial fibrillation is characterized by a progressive remodelling process of atrial myocardium. Other suggested mechanisms can be atrial fibrosis, tachycardia induced cardiomyopathy, cytosolic calcium alterations and atrial hibernation [7]. In 1995 Ernst and et al. studied the morphological characteristics of LA Appendages of 198 cases post-mortem and compared the LA appendage morphology and the ECG of those cases. They found that those patients with AF had significantly larger volumes of LA Appendage as compared to patients with sinus rhythm [6]. In another study Syagi G and et al. found similar findings when they observed 51 cases with mitral stenosis (29 with sinus rhythm versus 22 with AF) were evaluated. They found that LA Appendage maximal and minimal area were significantly larger in patients with AF compared to patients with sinus rhythm [7].

Material and Methods:

Between January 2019 to December 2019 53 patients with mitral valve disease and giant LA and atrial fibrillation, who underwent the Mitral Valve surgery, were retrospectively reviewed. A giant LA was defined as having a left atrium antero-posterior dimension, larger than 65 mm on trans thoracic echocardiography. Among these, 23 patients received mitral valve surgery had LA appendage ligation while the other 23 patients received no additional procedure for LA appendage. The decision to perform LA appendage ligation was influenced by the presence of LA clot in preoperative evaluation or as an intraoperative technique. However, patients who had other co morbidities like elderly over 70 years older, patients with LV dysfunction or severe co-morbidity and other associated cardiovascular disease like CAD or multiple valve involvement were not included in this study. The final decision was made by the attending surgeon's discretion.

Operative techniques

After a median sternotomy, patients were placed on a standard cardiopulmonary bypass (CPB) with bicaval cannulation and cooled to 32 °C. standard Aorto-Cavoatrial cannulation Cardiac arrest was induced with blood cardioplegic solution through aortic root cardioplegia cannula. A standard left atriotomy was made parallel to the Sondergaard's groove. Left atrium and appendage are examined for clot formation. Any clot, if present, was removed and internal ligation of appendage was done using circumferential continuous prolene suture. Thereafter, MV surgery was performed. The LA was then closed with 4-0 prolene continuous sutures. Electrical cardioversion of a non-sinus rhythm while coming off bypass was attempted. The remaining surgery were performed as per the usual standards.

Postoperative protocol

Anticoagulation therapy was started on the day after the surgery, upon confirmation of cessation of bleeding. Patients were put on continuous ECG monitoring in post op period for monitoring rhythm. Follow-up electrocardiograms (ECGs) after discharge were performed at 1^{st,} 3rd and 6th month follow up visit in the outpatient clinic.

Results:

Preoperative profile:

Preoperative baseline profiles of the patients are listed on Table 1. [8] All patients included in this study had rheumatic aetiology. All patients included presented with either persistent AF or longstanding persistent AF. Most of the preoperative characteristics in the two groups did not significantly differ except for the presence of LA clot which was the prerequisite for LA appendage ligation.

Table 1: Preoperative profile

Characteristics	Total cohort (n=53)	LA ligation (n=25)	Non ligated (n=28)	P-value
Age (years)	37.86 ± 2.36	38.52 ± 3.45	37.28 ± 3.22	0.35
Rheumatic origin	52	25	27	1
Mitral valve disease(n=53)				0.46
MR	18	7	11	
MS	15	9	6	
MSR	20	9	11	
AF duration (years)	7.05 ± 0.71	8.28 ± 0.89	5.96 ± 0.92	0.03
LA dimension	77±7	78 ± 9	77 ± 6	0.42
Severe PHT	14	3	11	>0.99

Operative characteristics:

Mitral valve replacement was done in all 53 patients. There was no difference in intraoperative protocol among ligation and non-ligation group except for LA clot removal and thorough wash of la and lv cavity done for ligation group. Aortic cross clamp (ACC) and CPB times were similar in ligation group than non-ligation groups.

Postoperative results:

Table 2 shows the summary of postoperative results. In-hospital mortality occurred in 3 (5.7%) patients. The causes of deaths were right heart failure in 2 patients, biventricular failure in 1 patient. With respect to rates of mortality and morbidity, there were no significant differences found between the two study groups.

Table 2: Postoperative results

Characteristics	Total cohort(n=53)	LA Ligation(n=25)	Non-LA Ligation(n=28)	P – value
In hospital mortality	3	1	2	>0.99
Postoperative bleeding	5	3	2	0.65
Low cardiac output	3	2	1	0.596
Prolonged ventilation	12	7	5	0.378
Wound complication	1	1	0	>0.99
Sinus rhythm (preserved)	23	13	10	0.341
Persistent AF	30	13	17	0.522

Follow up results:

The follow-up results are listed on Table 3. During the follow-up period, late death occurred in 7 (13.4%) patients without a significant inter-group difference. Patients with a mechanical valve and AF-recurred patients needed anticoagulation. In terms of warfarin-related complications and thrombo-embolism, there was no difference between the two groups. In patients with persistent AF during follow up 24 patients still had AF with controlled ventricular rhythm with no significant difference between two groups.

Table 3: Follow up results

Characteristics	Total cohort(n=53)	LA Ligation(n=25)	Non-LA Ligation(n=28)	P – value
Late mortality	7	3	4	>0.99
Warfarin complications	12	5	7	0.74
Thromboembolism	1	0	1	>0.99
Persistent AF	24	13	11	0.353

Discussion:

LA enlargement and associated development of Atrial fibrillation remains a major source of morbidity in patients of mitral valve replacements. Although a variety of methods have been described for the same most surgeons avoid any procedures directed specifically towards LA volume and Atrial Fibrillation [(1)]. In our study we attempted to measure effect of one such method in alleviating Atrial Fibrillation (AF) and subsequently reducing associated morbidity.

An increased left atrial size and rheumatic heart disease causing mitral valve pathology are frequently associated with preoperative chronic AF [(1,3)]. It has also been observed in several studies that chronic AF more frequently occurs in patients with rheumatic heart disease than in other aetiologies [(3)]. We in our study included patient with pre-operative AF with and without LA clot in an attempt to understand effect of LAA ligation on AF

Sinus rhythm after successful electric cardioversion intraoperatively helps for both atrioventricular synchrony and active diastolic ventricular filling. When preserved, a sinus rhythm after mitral valve surgery promotes survival by of prevention from tachycardia-related cardiomyopathy due to uncontrolled AF [(9)]. In our observation post mitral valve surgery there was preserved sinus rhythm in 23 patients while in 30 patient rhythms reverted back to AF. However, ligation of LAA did not provided any additional advantage in preserving the sinus rhythm statistically (p – value = 0.34).

In our experience the preservation of sinus rhythm or reverting to AF in post-operative patients remain unpredictable at best. All patients in post-operative period were given rate controlling drugs either to preserve the sinus rhythm or to mitigated the effect of chronic AF causing tachycardia induced cardiomyopathy. The follow up results show a statistically non-significant effect of LAA ligation on the preservation of sinus rhythm and controlling of AF.

Conclusion:

Our study showed that the preoperative rhythm in patients with mitral valve disease strongly determines the postoperative rhythm. The results in perioperative and follow up period showed that, chronic AF is associated with persisting AF after mitral valve surgery. The aetiology and type of mitral valve disease were not found to be risk factors for postoperative AF. Though, mitral valvular surgery with AF surgery primarily aims to improve

morbidity after mitral valve surgery the ligation of LAA dose not show to revert AF or maintain the sinus rhythm in patients with chronic Atrial Fibrillation. As such other methods of atrial electrical remodelling needs to be applied and studied in greater details in patients with chronic atrial fibrillation.

Bibliography:

1. Kouchoukos, N. T., & Kirklin, J. W. (2013). Kirklin/Barratt-Boyes cardiac surgery: Morphology, diagnostic criteria, natural history, techniques, results, and indications. Philadelphia: Elsevier/Saunders.
2. Piccoli GP, Massini C, Di Eusanio G, et al. Giant left atrium and mitral valve disease: early and late results of surgical treatment in 40 cases. The Journal of Cardiovascular Surgery. 1984 Jul-Aug;25(4):328-336.
3. Emile R. Jessurun, Norbert M. van Hemel, Johannes C. Kelder, Suzanne Elbers, Aart Brutel de la Rivière, Jo J.A.M. Defauw, Jef M.P.G. Ernst, Mitral valve surgery and atrial fibrillation: is atrial fibrillation surgery also needed?, European Journal of Cardio-Thoracic Surgery, Volume 17, Issue 5, May 2000, Pages 530–537, https://doi.org/10.1016/S1010-7940(00)00399-7
4. Benjamin E., D'Agostino R., Belanger A., Wolf P.A., Levy D.. LA size and the risk of stroke and death: the Framingham Heart Study, Circulation, 1995, vol. 92 (pg. 835-841)
5. Melo J.Q., Neves J., Adrago P., Ribeiras R., Ferreira M.M., Bruges L., Canada M., Ramos G.. When and how to report results of surgery on atrial fibrillation, Eur J Cardio-thorac Surg, 1997, vol. 12 (pg. 739-745)
6. Ernst G, Stöllberger C, Abzieher F, Veit-Dirscherl W, Bonner E, Bibus B, Schneider B, Slany J. Morphology of the left atrial appendage. Anat. Rec. 1995 Aug;242 (4):553–61.
7. Saygi S. Atrial Fibrillation and the Role of LAA in Pathophysiology and Clinical Outcomes?. J Atr Fibrillation. 2012;5(3):480. Published 2012 Oct 6. doi:10.4022/jafib.480
8. Weisstein, Eric W. "Fisher's Exact Test." From MathWorld--A Wolfram Web Resource. http://mathworld.wolfram.com/FishersExactTest.html
9. Gosselink A.T.M., Crijns H.J.G.M., Hamer H.P.M., Hillege H., Lie K.I.. Changes in left and right atrial size after cardioversion of atrial fibrillation: role of mitral valve disease, J Am Coll Cardiol, 1993, vol. 22 (pg. 1666-1672)

Date of Submission: 24 January 2020 Date of Peer Review: 22 February 2020
Date of Acceptance: 18 March 2020 Date of Publishing: 30 March 2020
Author Declaration: Source of support: Nil, Conflict of interest: Nil
Ethics Committee Approval obtained for this study? YES
Was informed consent obtained from the subjects involved in the study? YES
For any images presented appropriate consent has been obtained from the subjects: NA
Plagiarism Checked: Urkund Software

DOI: 10.36848/IJBAMR/2020/12215.51440