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KEY WORDS: LAAOS (Left Atrial Appendage Occlusion Study), LAA (Left Atrial Appendage), CABG (coronary artery bypass grafting), CPB (cardiopulmonary bypass), TEE (Transesophageal Echocardiography).

EXCLUSION OF LEFT ATRIAL APPENDAGE DURING MITRAL VALVE SURGERY : A PROSPECTIVE STUDY

Dr Rakesh Kumar* Assistant Professor, Department of CTVS, Rajendra Institute of Medical Sciences, Bariatu, Ranchi-834009, Jharkhand India. *Corresponding Author

Hemant Narayan Roy Prof(Dr.) HOD, Department of Cardiology, Rajendra Institute of Medical Sciences, Bariatu, Ranchi-834009, Jharkhand India.

ABSTRACT

Atrial fibrillation (AF) is a dismal arrhythmia. Thirty to forty percent of patients with mitral valve diseases have chronic AF at the time of surgery with increased incidence of morbidity and mortality postoperatively. Thrombo-embolism is well known among patients with AF despite adequate anticoagulation therapy and the left atrial appendage (LAA) has been proposed to be its main source. In 2014 LAA has been considered for surgical closure in the AF treatment guidelines. Several surgical techniques have been adopted to exclude LAA during surgery and none of them proved to be completely effective. The main goal of our described new technique is to completely separate the LAA from general circulation avoiding failures of other techniques.

BACKGROUND:

During the mitral valve surgery {repair /replacement} operation, there is need of ligation of left atrial appendage. The LAA may be ligated internally or externally. This study is intended to study complications related to both as well as advantage and disadvantage of both procedures.

It has been confirmed that; the main source of the intracardiac thromboembolism is the let atrium and more specifically the LAA [1]. Current guidelines suggest obliteration of the LAA during mitral valve surgery [2]. The surgical Maze procedure for AF originally adopted by Cox also incorporates excision of the LAA [3]. Recently, the LAAOS (Left Atrial Appendage Occlusion Study) stated that LAA occlusion by any one of described techniques during coronary artery bypass grafting is safe and can be done without affection of operative time or increasing postoperative bleeding incidence [4].

Excision and exclusion have been described as popular surgical techniques to occlude or isolate LAA during open heart surgery. Although simple to perform; many authors have questioned their effectiveness [5].

MATERIAL AND METHODS:

Between July 2017 to September 2018, 50 consecutive patients having atrial fibrillation and mitral valve disease, undergoing the mitral valve surgery were included in this prospective cohort study. All the preoperative and postoperative parameters were noted in the described format including age of patient, duration of disease, NYHA status, rhythm, mitral valve morphology, LAA clot, cardio-thoracic ratio etc.

Simultaneously a note was made of all the patients pre-operative characteristics, aetiology, associated cardiac anomalies, echocardiogram findings, cardiac catheterization data(if performed), intra operative details, Histo-pathological examination of native mitral valve, comparison with internal ligation versus external ligation of LAA, post operative course, follow up and follow-up echocardiographic data.

Under complete general anaesthesia and through midline sternotomy the full cardiopulmonary bypass (CPB) instituted by routine cannulation of the ascending aorta for infusion and bi-venous cannulation for venous return. Myocardial protection achieved through intermittent, ante grade, warm blood hyperkalemic arrest and mild systemic hypothermia (32–34 °C).Routine Transesophageal Echocardiography (TEE) was done prior to commencing CPB to confirm the diagnosis of the primary pathology, evaluate the LV function, evaluate other cardiac structures and exclude the presence of LAA or left atrial (LA) thrombi. The LA cavity was approached through the trans-septal bi-atrial incision as that approach facilitates surgical manipulations of LAA, especially with small LA. The LAA was carefully inspected for the presence of minute thrombi not detected during the TEE examination.The LAA was gently inverted inside the LA cavity with the aid of gentle external digital pressure and carefully inspected for the presence of minute thrombi hidden in the trabeculae of the muscle. A 4/0 polypropylene suture was used to make purse string exactly at the junction of the LAA with the LA (LAA base) and ensure not to take deep bites to avoid injury of circumflex coronary artery then the LAA was reverted to its normal position and the purse string was tied down to close the LAA mouth and reduce its base circumference (Fig. 1). External ligation of LAA was done by double loop of no 2 silk sutures after grasping the LAA through becks clamp.

Alternate 25 patients underwent internal ligation of LAA and 25 underwent external ligation of LAA.

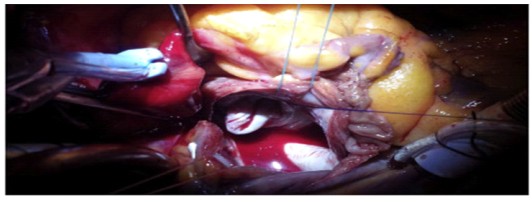

Fig. 1. Operative view shows trans-septal biatrial approach and inverted LAA inside LV cavity with purse string suture at its base.

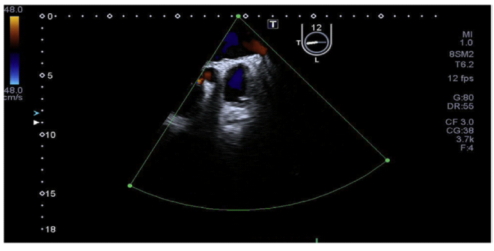

Fig. 2. Trans-oesophageal echocardiography with 2D and color Doppler shows a complete absence of residual flow across LAA and no residual pouch after pericardial patching.

TEE was used after cessation of CPB to ensure complete isolation of LAA from LA cavity by the absence of any remaining stump with 2D scanning and color flow Doppler to detect any residual flow between LAA and LA (Fig. 2).

DISCUSSION

In 2008 Kanderian et al. 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 colour 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 [7].

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 [7].

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 [7].

The notion of using fresh pericardium as patch closure of LAA mouth enabled us to avoid the common drawbacks of other Techniques namely; persistent LAA pouch and flow.

Our novel technique has achieved all above-mentioned criteria to obtain completely isolated LAA; moreover, it is simple, Easy to perform, not costly and did not affect operative time.

Author, Yr	N	Technique	Failure Rate (%)
Kanderian et al[6], 2008	52 73 12	Excision Suture Staple	27 77 100
Katz et al[7], 2000	50	Internal Suture	36
Healey et al[4], 2009	11 33	Suture Staple	55 78
Current Series 2017-18	50	LAA ligation	4

RESULTS-

Fifty patients had mitral valve repair/ replacement between July 2017- September 2018. We did internal versus external ligation of LAA, compared it with each other in the finding described in the literature. It was found that internal ligation is easier to perform, less time consuming as well as having low risk, though it requires good exposure as well as it is technically demanding and has a learning curve. Hence it is better to do internal LAA ligation during mitral valve surgeries. No complication occurred in internal LAA appendage ligation patients.

50 patients were identified (mean age 25 ±10, 59% male, NYHA 2.4 ±0.7). Preop AF type was new-onset in 7 (14%), paroxysmal in 5 (10%), persistent in 7 (14%), and permanent in 31 (62%). Five patients had LAA thrombus (10%). Concomitant procedures were CABG (n=4, 8%), mitral repair (n=18, 36%), mitral replacement (n=32, 64%), and concomitant tricuspid repair (n=7, 14%). The modified Maze procedure was biatrial in 16 (31%) and left-sided in the remainder. 30-day and in-hospital mortality were 0%. Follow-up transoesophaeal echocardiography was performed in 26 patients (52%) at a mean of 3.3 months. Previous External LAA appendage ligation failure rate was 4%, one was having tear in LAA which was repaired under CPB with multiple plegeted 3-0 prolene sutures and anther have with residual flow that was mild into the LAA.

Of these failures, one patient had residual LAA thrombus. At mean follow-up period of 5.6 months (n=17, 34%), no patients had a thrombo- embolic episode and 32 (64%) are on anticoagulants. Effect on atrial fibrillation was not significant, most patient developed atrial fibrillation in postoperative period.

Conflict of interest: - We do not have any conflict of interest. Limitation of study- short study of 50 patients only, no significant effect on atrial fibrillation in post op period.

CONCLUSIONS-

There were no gross differences between outcomes following surgery but internal ligation of LAA requires less time and there is complete obliteration of LAA. Entire procedure is under vision; therefore it is wiser to go for internal LAA obliteration.

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