

Electrocautery Maze for Chronic Atrial Fibrillation in Patients Undergoing Mitral Valve Replacement

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Abstract:

Aims: *The present research aimed at to study of the compartmentalization of the posterior wall of the left atrium by using conventional electrocautery in order to reverting atrial fibrillation in patients undergoing mitral valve replacement*

Methods: *This Quasi experimental study carried out in department of cardiac surgery, National Institute of Cardiovascular Disease (NICVD) and Hospital, Dhaka, Bangladesh. Total 64 patients are taken and then grouped into group A and group B. Each group contains 32 patients. Group A patients who underwent MVR with electrocautery maze Group B Patients who underwent for MVR only. All patients were evaluated continuous and with 12 lead ECG in immediate post-operative period, during discharge. Statistical analysis of the results was obtained by windows based computer software with statistical package for the social sciences program (SPSS version 21).*

Results: *Freedom from atrial fibrillation in group A and group B was 28 (88.6%) and 6 (16.5%) patients at 1month follow up respectively and 11.5% and 75.0% patients AF persist in group A and group B respectively. 1 (3.1%) patient in group B was AF with slow ventricular rate.*

Conclusion: *The finding of this study permit to conclude that the present study showed that the surgical treatment of atrial fibrillation with electrocautery, in mitral valve surgery, was capable of determining the reversion of this arrhythmia in a significant number of patients during a shortterm clinical follow-up, with low mortality and with low morbidity*

Key wards: *Maze, Atrial Fibrillation.*

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Introduction:

Atrial fibrillation (AF) is the most common supraventricular arrhythmia related to morbid events (thromboembolic accidents and heart failure), besides increasing mortality in several heart diseases.¹ AF is associated with significant morbidity and mortality because of its three detrimental sequelae: (1) palpitation, (2) loss of synchronous atrioventricular contraction (3) stasis of blood flow in left atrium, which can result in thromboembolism and stroke.^{2,3} The Framingham study has shown that the incidence of stroke is five times higher in patients with AF when compared to patients in sinus rhythm.¹

Results with medical therapy alone for AF have been disappointing. Antiarrhythmic drugs have had limited long-term efficacy in converting AF to normal sinus

rhythm and have significant and sometimes fatal side effects.⁴

Because of the inadequacy of medical therapy for AF and with the advances in the understanding of the AF electrophysiology surgical treatment became evident from 1991. By means of experimental studies and their knowledge of AF electrophysiology Cox, et al.,⁵ published a new technique, the "Maze procedure" (Labyrinth Operation), described for isolated treatment of AF. This technique consists of multiple incisions and sutures in the atria, forming block lines for the macro-entrant circuits, which are considered to be one of the AF pathophysiological mechanisms.

The Cox-maze procedure is the most effective surgical treatment for patients with chronic atrial fibrillation.^{5,6} The method can be combined with an operation for

organic heart disease or can be performed as an isolated surgical procedure for patients with lone atrial fibrillation refractory to medical therapy.⁵

However, from a surgical point of view, it is a demanding procedure that prolongs significantly the aortic cross clamp and operating time. Therefore, this procedure is not widely accepted.

The high complexity of this technique and postoperative complications has stimulated the development of new surgical approaches which were capable of reproducing the results from the Cox's technique less aggressively and with fewer complications.

Studies in which the electrocautery was used to perform the ablation lines in the endocardium were successful in reverting to sinus rhythm, presenting similar results to the Cox's technique, besides reestablishing the left atrial function and significantly reducing its size around 40 to 60%.⁴ Jatene, et al.,⁷ confirmed the benefits of the labyrinth operation in patients undergoing mitral valve disease repair. Only 5.3% of the patients undergoing Cox's technique developed atrial fibrillation after 37 months vs. 76.5% of those who underwent valve repair alone.

Some techniques used for AF treatment require long surgical procedure times, increasing the risk and the degree of complications; others require high-complexity and high cost equipment.

The present research aimed at to study of the compartmentalization of the posterior wall of the left atrium by using conventional electrocautery in order to reverting atrial fibrillation in patients undergoing mitral valve replacement.

Methods:

This Quasi experimental study carried out in department of cardiac surgery, National Institute of Cardiovascular

Disease (NICVD) and Hospital, Dhaka, Bangladesh during the period of July, 2016 to June, 2017 with the permission of academic council of this institute. Total 64 patients are taken and then grouped into group A and group B. Each group contains 32 patients. Group A patients who underwent MVR with electrocautery maze Group B Patients who underwent for MVR only. All patients were evaluated continuous and with 12 lead ECG in immediate post-operative period, during discharge. Statistical analysis of the results was obtained by windows based computer software with statistical package for the social sciences program (SPSS version 21).

Results:

The age ranged from 21-55 years, 36(56%) patients were male and 28(43%) patients were females. 34 patients were in NYHA class IV and 30 patients were in class III, who had left atrium (LA) size ranging from 43-63 mms.

The hospital mortality rate was one in group A of patients. There was no other perioperative death and no reoperations for bleeding. One patient needed prolonged ventilation; 48 hours.

Mean CPB time in group A was 78 minutes and in group B was 63 minutes. X –time was 52 minutes and 46 minutes respectively. The extra time of aortic cross-clamp needed for intraoperative electrocautery maze ranged from 5 to 7 minutes with a mean of 6 minutes which is not statistically significant.

Table shows conversion rate from AF to normal sinus rhythm between groups differ significantly (p<0.05)

Freedom from atrial fibrillation in group A and group B was 28 (88.6%) and 6 (16.5%) patients at 1month follow up respectively and 11.5% and 75.0% patients AF persist in group A and group B respectively. 1 (3.1%) patient in group B was AF with slow ventricular rate.

Table-I

Comparison of conversion rate of AF between two groups during follow up after one month

Procedure performed	ECG in immediate post-operative	Frequency	P value
MVR with maze(Group-A)	normal sinus rhythm	28(88.6%)	.001
	AF with fast ventricular rate	4(11.4%)	
MVR(group-B)	normal sinus rhythm	6(16.5%)	
	AF with fast ventricular rate	24 (75.0%)	
	others	4 (12.5%)	

Discussion:

The present study was performed in NICVD, DHAKA, included a total number of 64 patients. All of these patients had permanent AF and mitral valve disease. Among these patients 32 patients underwent mitral valve replacement surgery only and 32 patients underwent mitral valve replacement surgery with electrocautery maze.

The age ranged from 21-55 years, 36(56%) patients were male and 28(43%) patients were females. 34 patients were in NYHA class IV and 30 patients were in class III, who had left atrium (LA) size ranging from 43-63 mms.

The hospital mortality rate was one in group A of patients. There was no other perioperative death and no reoperations for bleeding. One patient needed prolonged ventilation; 48 hours.

Mean CPB time in group A was 78 minutes and in group B was 63 minutes. X –time was 52 minutes and 46 minutes respectively. The extra time of aortic cross-clamp needed for intraoperative electrocautery maze ranged from 5 to 7 minutes with a mean of 6 minutes which is not statistically significant.

Freedom from atrial fibrillation in group A and group B was 28 (88.6%) and 6 (16.5%) patients at 1month follow up respectively and 11.5% and 75.0% patients AF persist in group A and group B respectively. 1 (3.1%) patient in group B was AF with slow ventricular rate.

The AF reversion success rates in this study were compared to those of other authors in a number of variations from the initial technique proposed by Cox, et al.,³ and Schuetz, et al.⁴ undertook a study comparing two groups of patients undergoing mitral valve repair: the first group underwent AF treatment by microwave ablation and the second was the control group. In the treatment group, at 12 months, approximately 80% of the patients were free from AF, while in the other group only 33% of the patients were free from AF. Sie et al.,⁸ published a study with the use of radiofrequency for AF ablation, in which they followed the lines proposed by Cox's procedure in a biatrial approach, reaching 79% of the regular rhythm at 6 months of clinical follow-up. Abreu Filho et al.,⁹ published a study with similar characteristics to the abovementioned study, with a success rate of 72.7% patients free of AF at a 12-month follow-up. Sueda, et al.,¹⁰ addressed only the left atrium for AF treatment and successfully reached 100% of regular rhythm after surgery and 78% at six months. Kong et al.,(2010) published a study in which they performed

only the isolation of pulmonary vein ostia, reaching 86% of sinus rhythm after a 1-month follow-up. These results were similar to those achieved in the present study, in which only the left atrium was addressed, 91.1% of AF reversion after one month of surgery. This may show the importance of the left atrium approach, because it appears to be the most responsible by AF deflagration and maintenance. Simha, et al.,² showed that using electrocautery to perform biatrialendocardial ablation, 36% of the patients required a definitive pacemaker implantation, probably through biatrial approach. In the current study, in which the approach was restricted only to the left atrium, No patient required artificial cardiac stimulation. Inamdar et al.,¹⁰ in an approach only to the left using electrocautery, observed a high rate of AF recurrence in the first months postoperatively, possibly due to inadequate ablation of atrial tissue, producing incomplete lines. Additionally, it was hypothesized that it would be necessary 3 to 6 months to complete cicatrization of the ablation lines to achieve an efficient electrical stimulus block. In the current study, only 6.5% of patients were in AF at the hospital discharge. Surgical treatment failure appears to be more associated to predisposing factors, such as patient's age, prolonged AF time, left atrium size, ventricular dysfunction that the employed technique itself. There is no consensus about the use of postoperative antiarrhythmics and anticoagulants regarding the time and previous conditions to be withdrawal. Concerning operative times, the present study showed satisfactory rates in comparison to other techniques for surgical treatment of AF. In the current study, mean CPB time was 88 minutes and mean aortic crossclamping time was 58 minutes in group A. which is a little more as study described in study of Inamdar et al.,^{10,11} Maybe the greatest benefit determined using energy sources is in the reduction or is not significantly prolonging CPB time during mitral valve replacement. Atrial endocardial ablation time did not surpass 6 minutes; this fact was probably fundamental to achieve good outcomes, with a low rate of morbidity and postoperative mortality. Surgeries for AF treatment can pose inherent complications to the surgical procedure, such as lesion of coronary arteries (circumflex branch), rupture of the atrial wall, and esophageal perfusion (developing atri-esophageal fistula). They are considered severe but very rare complications. In the current study there no evidences of such complications. There were no reoperations due to surgical bleeding. The extensive pathogenesis variation, symptomatology, and patients' profile are factors hampering the development of global

recommendations for a standard treatment of AF, but surgical ablation seems to play an increasing role for several reasons: high success rate, surgeons' direct view making the ablation safer and faster, the removal of left atrial appendage reduces the risks for thromboembolism, and the simplicity of the technique, which does not prolong surgery times, make it possible to be performed by every surgeon.

Conclusion:

In conclusion, the finding of this study permit to conclude that the present study showed that the surgical treatment of atrial fibrillation with electrocautery, in mitral valve surgery, was capable of determining the reversion of this arrhythmia in a significant number of patients during a shortterm clinical follow-up, with low mortality and with low morbidity. Moreover, it is a fast-reproducing surgical approach, reducing CPB time, and accessible, with no need of special and expensive equipments.

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