

Atrial Fibrillation Following Off-pump Coronary Artery Bypass Graft Surgery: Influence Of Single, Low Dose Amiodarone

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ABSTRACT:

Background: Atrial fibrillation occurs in 20%-50% of patients who undergo coronary artery bypass grafting and major cause of increased intensive care unit and hospital costs. This study, therefore assessed the safety, efficacy and benefits of low dose amiodarone in the prevention of post-operative atrial fibrillation after coronary artery bypass grafting.

Materials and Methods: One hundred and twenty eight patients who underwent off pump coronary artery bypass grafting during November 2011 to January 2013 received low dose intravenous amiodarone at induction and compared to controls (N=130). A reduction in the incidence of post-operative atrial fibrillation, its duration and the need for other drug combinations for its control were examined. **Results: Incidence of post-operative** atrial fibrillation in amiodarone treated patients was significantly lesser 13/121 (10.7%) patients as compared to 26/122 (21.3%) controls. The duration of atrial fibrillation, however was similar in both the groups (3.3±1.4 days in patients, 3.5±1.7 days in controls; Mean ±SD). Amiodarone infusion at a dose of 700 mg for the next 24 h in all the patients controlled the heart rate. In the average duration of reversal of atrial fibrillation to sinus rhythm was 4 to 6 h in all these patients. **Conclusion:** The current study is a demonstration of significant reduction in the number of patients experiencing post-operative atrial fibrillation following peri-operative single intravenous, low dose amiodarone. Further, low dose amiodarone is well tolerated and does not increase risk of intra- and post-operative complications in patients undergoing off pump coronary arterial bypass grafting.

Key words: Off pump coronary artery bypass graft surgery, postoperative atrial fibrillation (POAF), Low dose Amiodarone.

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INTRODUCTION:

Atrial Fibrillation (AF) is the most common arrhythmia type occurring after cardiac surgery; its incidence peaks during second and third post-operative day and depends on the type of surgery. Coronary artery bypass grafting (CABG) result into AF in the range of 20-50%; the highest on the second post-operative day.^{1,2} The precise

mechanism of patho-physiology of AF following heart surgery is not known, but is thought to be multifactorial. Advanced age, previous AF, valvular heart surgery and hypertension have the most consistently identified risk factors for the arrhythmias.³ Postoperative AF result in significant morbidity (thrombo-embolic risk and stroke, hemodynamic compromise, ventricular

dysarrhythmia), increased hospital stay and increased mortality particularly in elderly patients and patients with left ventricular dysfunction.^{4,5}

A number of strategies have been attempted so far to decrease the incidence of post-operative AF including physiological and pharmacological intervention with varying results. This study assessed the safety and efficacy of preoperative low, single dose intravenous amiodarone at induction in the prevention of AF after off pump CABG.

MATERIALS AND METHODS:

Patients: All patients undergoing off pump CABG under a single team (same team of surgeons and anesthetists) were enrolled in the study during November 2011 to January 2013 with the approval of the institutional ethics committee. A total of 128 patients (Test group) and 130 patients (Controls) could be enrolled using the following exclusion criteria: history of previous AF, history of previous cardiac surgery, concomitant surgery (e.g. valvular replacement, aneurysmectomy), pre-operative use of anti-arrhythmia therapy (other than digitalis calcium-channel blockers, B-blockers), history of amiodarone toxicity, use of amiodarone within 6 months, concomitant thyroid disease, abnormal liver function tests, pre-existing bradycardia (defined as heart rate <55/min at rest), uncontrolled severe heart failure and atrioventricular block, patients who required emergency conversion to on pump CABG. The control group did not receive low dose peri-operative amiodarone infusion. Clinical history, physical examination, laboratory investigations, chest X ray, two dimensional echocardiography and color doppler were recorded for all the patients.

Study Design: The test group in this study consisted of patients operated for off pump CABG who were offered 300 mg amiodarone (IV) over 30 minutes through an infusion pump at the time of induction. The control group consisted of patients enrolled with similar criteria and did not receive peri-operative amiodarone infusion. None of the patients received any antiarrhythmic drug (including beta blocker, verapamil, sotalol,

Mg+2 and IV procainamide or amiodarone) unless indicated for AF or ventricular arrhythmia. The statistical analysis was performed with SPSS v20.

Surgical technique: The anesthetic and surgical techniques were identical in all patients and carried out by a single team of surgeons and anesthetists. The heart was stabilized with octopus 3 and 4 (Medtronic, USA) stabilizer. In addition, the vessels were exposed by retracting sutures in the pericardium with gauze pack. All patients received Left Internal Mammary Artery (LIMA) to Left Anterior Descending (LAD) and venous graft to other vessels except a few cases who received all venous grafts. The distal venous anastomosis was performed, followed by LIMA to LAD and finally all proximal anastomosis was in single clamp. Lastly epicardial pacing wire was introduced. All vital signs along with specific symptoms (e.g. Chest pain, palpitation, and dyspnea; if any) were recorded every 4 hours along with invasive and non-invasive monitoring of all parameters.

Criteria for Postoperative Atrial Fibrillation (POAF): POAF was defined by Atrial Fibrillation of any duration during the post-operative period as documented with rhythm strip or 12 lead electrocardiogram recording with an assessment by the physician.²

RESULTS:

Demographic variables like age, sex were noted. Other preoperative characteristics connected to heart functionality and medications are described in Table-1. It could be seen that almost all the patients and controls had either systolic or diastolic dysfunction (as evidenced by 2D Echocardiography) and was largely in the form of reduced Left Ventricular Ejection Fraction (LVEF). Moreover, all the patients received the medication either in the form of beta blockers or Ca⁺ channel blockers or both. Seven patients from the test group and 8 patients from control group needed additional antiarrhythmic drug during the surgery and therefore omitted from the study. Endarterectomy was done in three patients in

the control group and five patients in the study group, but we did not find any co-relation between the impact of Endarterectomy and incidence of AF.

Thirteen (10.7%) patients from the remaining 121 patients from the test group developed AF in the post-operative period. The duration of AF was 3.3 ± 1.4 (Mean \pm SD) days. On the other hand, twenty six (21.3%) patients from the control group developed AF during the post-operative period with a duration of 3.5 ± 1.7 (Mean \pm SD) days. Thus, the number of patients experiencing post-operative AF was significantly higher in the control group as compared to the test group ($p=0.035$). Serum Potassium was corrected if low and then amiodarone was started for AF, if AF persisted after electrolyte correction. However, the duration for the development of AF was similar in both the groups (P value is not significant). These entire patients who developed AF were prescribed amiodarone infusion at a dose of 700 mg for the next 24 h for the control of heart rate. In the average duration of reversal of AF to sinus rhythm was 4 to 6 h in all these patients. AF reverted to sinus rhythm in all cases with amiodarone. These patients subsequently were maintained on their pre-operative antiarrhythmic drugs. All these patients were discharged with sinus rhythm.

DISCUSSION:

Morbidity of post-operative AF after CABG is well documented in large randomized studies.^{1, 6} Mathew⁵ et al studied more than 2400 patients undergoing CABG and observed the development of post-operative AF. They found that the patients who developed post-operative AF had a 13 hours longer ICU stay and two days longer stay in the ward as compared to patients without AF.

However, despite a large number of studies, no prophylactic or optimally effective therapeutic intervention has yet been universally accepted.¹ Administration of beta blocker/s before and after surgery can decrease the prevalence of POAF as well as other prophylactics like calcium channel blockers, digoxin, Magnesium (Mg^{+2}), Amiodarone, amide procaine and cortico-

steroids and combination of glucose insulin and potassium have been reported.⁷⁻¹¹

Amiodarone is a unique class III antiarrhythmic drug which also has alpha- and beta- adrenergic blocking properties that may regulate sympathetic over stimulation during and after surgery in addition to inhibiting multiple ion channels (i.e. Potassium and calcium). In large randomized studies prophylactic amiodarone is associated with significantly reduced POAF, ventricular tachyarrhythmia and duration of hospitalization.¹²⁻¹⁴

We evaluated a prevention method of a single intravenous dose of amiodarone administered perioperatively at the time of induction that rapidly results into maximal effect. The current study is a demonstration of significant reduction in the number of patients experiencing POAF with the use of perioperative single, low dose IV amiodarone. Further, low dose amiodarone was well tolerated and does not increase the risk of intra-operative and post-operative complications in patients undergoing off pump CABG.

The primary advantage of single, low dose, pre-operative IV prophylactic amiodarone is a significant reduction in the number of patients experiencing POAF following off pump CABG and a marginal decrease in the duration of POAF in such patients. The secondary advantage is a reduction in ICU stay and hospital stay. This observation is consistent with other investigators.¹⁵⁻¹⁶

CONCLUSION:

The impact of various therapies aimed at reducing post-operative AF and its complications need further investigations. A better knowledge of the mechanisms implicated in POAF would undoubtedly translate into better prevention of this common post-operative complication.

Conflict of Interest: None.

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