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Original Research Article

Intraoperative Administration of Amiodarone for Prophylaxis Against Postoperative Atrial Fibrillation in Patients Undergoing Coronary Artery Bypass Grafting

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Abstract: *Postoperative atrial fibrillation is a common complication after coronary artery bypass grafting and may increase morbidity, intensive care stay, and hospital burden. Pharmacological prophylaxis with amiodarone may reduce perioperative rhythm disturbances in cardiac surgical patients.* ***Objective:*** *To evaluate the efficacy of intraoperative intravenous amiodarone in preventing postoperative atrial fibrillation and other perioperative arrhythmias in patients undergoing coronary artery bypass grafting.* ***Methods:*** *This prospective randomized controlled study was conducted at the Department of Cardiac Surgery, Chaudhry Pervaiz Elahi Institute of Cardiology, Wazirabad, over one year from November 2024 to November 2025. A total of 150 patients undergoing elective on-pump coronary artery bypass grafting were randomly allocated into two equal groups of 75 patients each. Patients in the amiodarone group received intraoperative intravenous amiodarone before aortic cross-clamp release, while patients in the control group received placebo. The primary outcome was the development of postoperative atrial fibrillation within the first five postoperative days. Secondary outcomes included ventricular arrhythmias, need for defibrillation or cardioversion, duration of mechanical ventilation, intensive care unit stay, total hospital stay, postoperative complications, and in-hospital mortality. Data were analyzed using SPSS. Categorical variables were compared using the chi-square or Fisher's exact test, while continuous variables were compared using the independent sample t-test or Mann–Whitney U test, as appropriate. A p-value ≤0.05 was considered statistically significant.* ***Results:*** *Postoperative atrial fibrillation occurred significantly less frequently in the amiodarone group than in the control group (14.7% vs. 34.7%, p=0.004). The amiodarone group also showed significantly lower rates of ventricular fibrillation (9.3% vs. 24.0%, p=0.015), ventricular tachycardia (6.7% vs. 17.3%, p=0.041), premature ventricular contractions (13.3% vs. 28.0%, p=0.027), and requirement for electrical cardioversion (6.7% vs. 18.7%, p=0.026). Patients receiving amiodarone had significantly shorter duration of mechanical ventilation, intensive care unit stay, and total hospital stay. No statistically significant differences were observed between the groups regarding postoperative myocardial infarction, in-hospital mortality, or major adverse hemodynamic effects.* ***Conclusion:*** *Intraoperative intravenous amiodarone significantly reduced postoperative atrial fibrillation and other perioperative ventricular arrhythmias in patients undergoing elective on-pump coronary artery bypass grafting. Its use was associated with shorter postoperative recovery time and hospital stay without a significant increase in adverse effects, supporting its role as an effective prophylactic strategy in selected cardiac surgical patients.*

Keywords: Amiodarone; Arrhythmias, Cardiac; Atrial Fibrillation; Coronary Artery Bypass; Postoperative Complications; Ventricular Fibrillation

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Introduction

Postoperative atrial fibrillation (POAF) is one of the most frequent rhythm disturbances after coronary artery bypass grafting (CABG) and remains an important cause of early postoperative morbidity. Although POAF may terminate spontaneously in many patients, it is not a harmless event because it can lead to hemodynamic instability, increased use of antiarrhythmic therapy, need for cardioversion, prolonged intensive care monitoring, longer hospitalization, thromboembolic complications, and higher healthcare cost. The 2023 ACC/AHA/ACCP/HRS guideline recognizes atrial fibrillation as a clinically important arrhythmia requiring structured risk assessment and management across acute and postoperative settings (1). The 2024 European Society of Cardiology guideline also emphasizes prevention, early recognition, and individualized management of atrial fibrillation in patients exposed to surgical and cardiovascular stress (2).

The reported incidence of POAF after cardiac surgery varies widely because of differences in patient age, type of surgery, monitoring duration, definition of atrial fibrillation, and perioperative prophylaxis. Contemporary reviews describe POAF as a multifactorial complication involving atrial ischemia, systemic inflammation, oxidative stress, autonomic imbalance, myocardial reperfusion injury, electrolyte shifts, postoperative pain, and catecholamine exposure (3). McIntyre et al. highlighted that POAF creates challenges throughout the patient journey, beginning with in-hospital rhythm instability and extending to recurrence, anticoagulation decisions, and long-term cardiovascular risk (4).

Several clinical variables have been linked with increased POAF risk after CABG. Turkkolu et al. reported POAF in 330 of 1191 patients undergoing open cardiac surgery, giving an incidence of 27.7%, and identified reduced ejection fraction, diabetes, low hematocrit, impaired renal function, and elevated inflammatory markers as predictors (5). Seo et al. reported that advanced age, hypertension, diabetes mellitus, left atrial enlargement, reduced left ventricular function, cardiopulmonary bypass exposure, and longer aortic cross-clamp time were relevant perioperative factors for new-onset POAF after CABG (6). Bowdish et al. further supported the role of patient-related and operative variables in predicting atrial fibrillation after cardiac surgery (7). Zhou et al. analyzed 6229 patients undergoing isolated CABG and found that age, hypertension, smoking, cardiopulmonary bypass time, and reduced ejection fraction were associated with postoperative atrial fibrillation (8).

The clinical effect of POAF extends beyond rhythm disturbance. Son et al. evaluated CABG patients and found that POAF was independently associated with prolonged hospital stay, with multivariable analysis showing a regression coefficient of 4.36 days for length of stay (9). These findings suggest that preventing POAF may improve early postoperative recovery and reduce resource utilization. This is particularly relevant for cardiac surgical units where ICU beds, telemetry monitoring, and postoperative nursing resources are limited.

Amiodarone is frequently used for prevention and treatment of perioperative arrhythmias because it has class III antiarrhythmic activity along with sodium-channel, calcium-channel, beta-blocking, and alpha-blocking effects. These properties allow it to suppress atrial and ventricular arrhythmias while having a comparatively lower proarrhythmic risk than many other antiarrhythmic agents. A Pakistani study also highlighted that POAF remains a relevant postoperative problem after CABG in local practice and showed age-related increase in its occurrence (10). However, local data on intraoperative amiodarone administration during CABG are still limited.

The rationale of the present study is based on the need to evaluate an easily applicable prophylactic strategy in Pakistani CABG patients, who often present with diabetes, hypertension, smoking history, reduced ejection fraction, and previous myocardial infarction. In a resource-constrained setting, reducing POAF, ventricular arrhythmias, defibrillation requirement, cardioversion, ICU stay, and total hospital stay may have direct clinical and economic benefits. Therefore, this study was conducted to assess the efficacy of intraoperative intravenous amiodarone for prophylaxis against POAF and other perioperative arrhythmias in patients undergoing CABG.

Methodology

A prospective randomized controlled study was carried out in the Cardiac Surgery Department at Chaudhry Pervaiz Elahi Institute of Cardiology Wazirabad for 1 year from November 2024 to November 2025. In total, 150 patients undergoing elective CABG were included in the trial. Individuals aged between 40 and 80 years who were considered at increased risk for POAF, including elderly patients and those with left ventricular ejection fraction below 40%, were enrolled. Patients with baseline pulse rate under 60 beats/minute, systolic blood pressure below 100 mmHg, prolonged QTc interval exceeding 500 ms, atrioventricular heart block, history of thyroid disease or interstitial lung disease, known allergy to amiodarone, previous use of class I or class III antiarrhythmic drugs, use of more than two inotropic agents, or amiodarone therapy within two months prior to surgery were excluded from the trial. Patients undergoing emergency surgery or having a record of prior atrial fibrillation were also excluded. Written informed consent was obtained from all study participants prior to the pharmaceutical intervention and data collection. The study design was submitted to theInstitutional Ethical Review Board of the hospital for ethical approval.

The patients were randomly divided into two groups comprising 75 patients each. The amiodarone group received intraoperative intravenous amiodarone administered at a dose of 300 mg diluted in 100 mL normal saline before aortic cross-clamp release during surgery, while the control group were given an equivalent amount of normal saline as a placebo. All patients underwent standard on-pump CABG surgery under general anesthesia using conventional cardiopulmonary bypass techniques without modification of routine surgical protocols. Intraoperative variables including cardiopulmonary bypass time, aortic cross-clamp time, number of grafts, and hemodynamic parameters were recorded.

The primary outcome of the study was the occurrence of POAF requiring pharmacological or electrical treatment within the first five postoperative days. Secondary outcomes included incidence of ventricular arrhythmias after aortic cross-clamp release, need for defibrillation, length of intensive care unit stay, total hospital stay, postoperative myocardial infarction, rhythm status at discharge, adverse effects related to amiodarone administration, anticoagulation-related complications, and in-hospital mortality. Continuous electrocardiographic monitoring was performed during the postoperative intensive care stay, and standard 12-lead electrocardiograms were obtained daily until discharge. Serum electrolyte levels were also monitored on postoperative days 0, 1, 2, and 4.

The entire data wasanalyzed using Statistical Package for Social Sciences (SPSS) (version 23). Continuous variables were recorded as mean ± standard deviation, whereas categorical variables were documented as frequencies and percentages. Student's t-testwas used to compare continuous variables between two study groups while categorical variables were analyzed using Chi-square test or Fisher's exact test, according to property of data. A p-value of less than 0.05 was considered statistically significant.

Results

The two study groups were evaluated for all primary and secondary variables. The baseline characteristics, both clinical and demographic, of both study groups were comparable, with no scientifically meaningful differences observed regarding age, gender distribution, body mass index (BMI), comorbidities, smoking status, ejection fraction, previous myocardial infarction, or preoperative beta-blocker use (Table 1).

The intraoperative characteristics of the study population are presented in Table 2. Mean cardiopulmonary bypass time and aortic cross-clamp duration were similar between the two groups. However, the requirement for intraoperative defibrillation following aortic cross-clamp release was significantly lower in the amiodarone group vs their counterparts (18.7% vs. 38.7%, p=0.008). Although fewer participants in the amiodarone group required inotropic support postoperatively, the difference was not statistically significant (25.3% vs. 37.3%, p=0.11).

Postoperative arrhythmias and clinical outcomes are summarized in Table 3. The occurrence rate of POAF was significantly lower in patients receiving intraoperative amiodarone against the control group (14.7% vs. 34.7%, p=0.004). Similarly, ventricular fibrillation occurred less frequently in the amiodarone group (9.3% vs. 24.0%, p=0.015). A statistically significant reduction was also observed in the incidence of ventricular tachycardia (6.7% vs. 17.3%, p=0.041) and premature ventricular contractions (13.3% vs. 28.0%, p=0.027) among patients treated with amiodarone. The requirement for electrical cardioversion was significantly lower in the amiodarone group (6.7% vs. 18.7%, p=0.026). No significant difference was observed regarding postoperative bradycardia between the two groups (p=0.51).

Postoperative recovery outcomes are shown in Table 4. Patients in the amiodarone group had significantly shorter duration of mechanical ventilation compared to controls (9.6 ± 2.8 hours vs. 11.4 ± 3.6 hours, p=0.001). Additionally, participants in amiodarone group remained admitted in the hospital for significantly lesser time than the one in control group (7.4 ± 1.8 days vs. 9.1 ± 2.3 days, p<0.001, respectively). Although postoperative myocardial infarction and mortality rates were reduced in the amiodarone group, the reduction rate was, however, not statistically significant. A significantly higher number of amiodarone group patients were discharged with normal sinus rhythm in contrast to the control group (92.0% vs. 76.0%, p=0.009).

Postoperative electrolyte and hemodynamic parameters are presented in Table 5. No statistically significant differences were observed in postoperative potassium, magnesium, or mean arterial pressure between the two groups. However, patients receiving amiodarone demonstrated a significantly lower mean postoperative heart rate compared to controls (78.6 ± 9.4 beats/min vs. 86.1 ± 10.2 beats/min, p<0.001). The postoperative pH level was also significantly better maintained in the amiodarone group (7.38 ± 0.04 vs. 7.36 ± 0.05, p=0.018).

Table 1: Baseline Demographic and Clinical Characteristics of Patients (N=150)

Variables	Amiodarone Group (n=75)	Control Group (n=75)	P-value
Age (years)	61.4 ± 8.2	60.8 ± 7.9	0.64
Male Gender, n (%)	52 (69.3%)	49 (65.3%)	0.60
BMI (kg/m²)	27.1 ± 3.5	26.8 ± 3.2	0.58

Hypertension, n (%)	48 (64.0%)	45 (60.0%)	0.61
Diabetes Mellitus, n (%)	36 (48.0%)	33 (44.0%)	0.62
Smoking History, n (%)	31 (41.3%)	29 (38.7%)	0.74
Ejection Fraction (%)	38.6 ± 5.1	39.1 ± 4.8	0.53
Previous Myocardial Infarction, n (%)	27 (36.0%)	25 (33.3%)	0.73
Beta-blocker Use, n (%)	57 (76.0%)	54 (72.0%)	0.57

Table 2: Intraoperative Characteristics

Variables	Amiodarone Group (n=75)	Control Group (n=75)	P-value
Cardiopulmonary Bypass Time (min)	96.5 ± 18.4	99.2 ± 19.1	0.38
Aortic Cross-clamp Time (min)	58.7 ± 11.6	60.4 ± 12.1	0.39
Number of Grafts	3.1 ± 0.8	3.0 ± 0.7	0.47
Intraoperative Defibrillation Required, n (%)	14 (18.7%)	29 (38.7%)	0.008
Inotropic Support Required, n (%)	19 (25.3%)	28 (37.3%)	0.11

Table 3: Postoperative Arrhythmias and Clinical Outcomes

Variables	Amiodarone Group (n=75)	Control Group (n=75)	P-value
Postoperative Atrial Fibrillation, n (%)	11 (14.7%)	26 (34.7%)	0.004
Ventricular Fibrillation, n (%)	7 (9.3%)	18 (24.0%)	0.015
Ventricular Tachycardia, n (%)	5 (6.7%)	13 (17.3%)	0.041
Premature Ventricular Contractions, n (%)	10 (13.3%)	21 (28.0%)	0.027
Bradycardia, n (%)	6 (8.0%)	4 (5.3%)	0.51
Need for Electrical Cardioversion, n (%)	5 (6.7%)	14 (18.7%)	0.026

Table 4: Postoperative Recovery and Hospital Outcomes

Variables	Amiodarone Group (n=75)	Control Group (n=75)	P-value
Mechanical Ventilation Duration (hours)	9.6 ± 2.8	11.4 ± 3.6	0.001
ICU Stay (days)	2.8 ± 0.9	3.7 ± 1.2	<0.001
Hospital Stay (days)	7.4 ± 1.8	9.1 ± 2.3	<0.001
Postoperative Myocardial Infarction, n (%)	2 (2.7%)	5 (6.7%)	0.24
Mortality, n (%)	1 (1.3%)	3 (4.0%)	0.31
Rhythm Normal at Discharge, n (%)	69 (92.0%)	57 (76.0%)	0.009

Table 5: Postoperative Electrolyte and Hemodynamic Parameters

Variables	Amiodarone Group (n=75)	Control Group (n=75)	P-value
Postoperative Potassium (mmol/L)	4.2 ± 0.5	4.1 ± 0.6	0.29
Postoperative Magnesium (mg/dL)	2.0 ± 0.3	1.9 ± 0.4	0.17
Mean Heart Rate (beats/min)	78.6 ± 9.4	86.1 ± 10.2	<0.001
Mean Arterial Pressure (mmHg)	74.8 ± 8.1	73.2 ± 7.9	0.22
pH Level	7.38 ± 0.04	7.36 ± 0.05	0.018

Discussion

In the present study, intraoperative amiodarone significantly reduced POAF after CABG, with POAF occurring in 11 patients in the amiodarone group compared with 26 patients in the control group. The absolute rates were 14.7% versus 34.7%, giving an absolute risk reduction of 20.0% and a relative reduction of approximately 57.6% (p=0.004). This finding is strongly comparable with Ahmed et al., who conducted a randomized controlled trial in 150 CABG patients and reported POAF in 16.0% of patients receiving prophylactic amiodarone compared with 33.3% in controls, with a relative risk of 0.48 and p=0.013 (11). The magnitude of benefit in our study was slightly greater, which may be related to intraoperative administration before the high-risk reperfusion period.

Our findings are also close to the Pakistani study by Rai et al., who evaluated prophylactic amiodarone in CABG patients with low ejection fraction and reported POAF in 17.3% of the amiodarone group compared with 33.3% of the control group (p=0.024) (12). The POAF rate in our amiodarone group was 14.7%, which is slightly lower than Rai et al., while the control-group rate was similar. Deng et al. reported in a 2024 meta-analysis that intraoperative intravenous amiodarone significantly reduced POAF after on-pump CABG, with pooled risk ratio 0.39, 95% confidence interval 0.20 to 0.77, and p=0.007 (13). This pooled estimate supports the direction of our result and indicates that intraoperative

administration may be an effective timing strategy. Azemati et al. also evaluated a small single intravenous dose of amiodarone in CABG patients, adding further contemporary randomized evidence on intraoperative dosing strategies (14).

The present study additionally showed significant reductions in ventricular fibrillation, ventricular tachycardia, premature ventricular contractions, and electrical cardioversion. Ventricular fibrillation occurred in 9.3% versus 24.0% (p=0.015), ventricular tachycardia in 6.7% versus 17.3% (p=0.041), premature ventricular contractions in 13.3% versus 28.0% (p=0.027), and electrical cardioversion in 6.7% versus 18.7% (p=0.026). Deng et al. found that intraoperative amiodarone did not significantly reduce intraoperative defibrillation overall, with risk ratio 0.82 and p=0.31, whereas our study showed a significant reduction in defibrillation requirement from 38.7% to 18.7% (p=0.008) (13). This difference may reflect variation in operative protocols, timing of drug administration, myocardial protection, electrolyte correction, or baseline ventricular function.

The safety profile in our study was acceptable. Bradycardia was not significantly increased in the amiodarone group, occurring in 8.0% versus 5.3% (p=0.51), although mean heart rate was significantly lower with amiodarone at 78.6±9.4 beats/min compared with 86.1±10.2 beats/min (p<0.001). Polintan et al. reported that combined prophylaxis with amiodarone and beta-blockers reduced POAF more effectively than beta-blockers alone, with pooled risk ratio 0.63 and p<0.001, while mortality was not increased (15). Chen et al. also reported benefit from intraoperative topical amiodarone for prevention of new-onset atrial fibrillation after cardiac surgery (16). Kamali et al. evaluated amiodarone with and without vitamin C after CABG and supported the role of antiarrhythmic prophylaxis in reducing postoperative rhythm disturbance (17).

Recovery outcomes were better in the amiodarone group. Mechanical ventilation duration was shorter at 9.6±2.8 hours versus 11.4±3.6 hours (p=0.001), ICU stay was 2.8±0.9 days versus 3.7±1.2 days (p<0.001), and hospital stay was 7.4±1.8 days versus 9.1±2.3 days (p<0.001). Ahmed et al. similarly reported shorter ICU stay in the amiodarone group, 2.51±1.11 days versus 3.31±1.83 days, and shorter hospital stay, 10.0±1.99 days versus 12.72±2.23 days (11). Son et al. found that POAF was independently associated with longer hospital stay, with a coefficient of 4.36 days in multivariable analysis (9). Yang et al. also demonstrated that prevention of POAF after CABG can be clinically meaningful, reporting POAF in 18.1% of the intervention group compared with 31.6% of controls in a randomized trial of partial cardiac denervation (18).

The higher discharge rate with normal sinus rhythm in our amiodarone group, 92.0% versus 76.0% (p=0.009), is clinically relevant. Rezk et al. reported POAF in 2172 of 6435 cardiac surgery patients, giving an incidence of 33.8%, and found that 94.9% converted before discharge (19). Herrmann et al. studied 10,609 CABG patients with POAF and found that early AF recurrence was associated with heart failure hospitalization, with hazard ratio 1.80, and major bleeding, with hazard ratio 1.92 (20). Taha et al. reported that among 6903 POAF patients not receiving oral anticoagulation after coronary surgery, 3.1% experienced ischemic stroke within one year (21). Benedetto et al. further showed that POAF after isolated CABG was associated with long-term stroke risk (22). Matos et al. reported variation in amiodarone and anticoagulation prescribing after new-onset AF following CABG, highlighting the need for structured postoperative rhythm management (23).

Overall, our results show that intraoperative amiodarone significantly reduces POAF and ventricular arrhythmias after CABG, lowers defibrillation and cardioversion requirements, improves sinus rhythm at discharge, and shortens mechanical ventilation, ICU stay, and hospital stay. In Pakistani cardiac surgical practice, these benefits may be especially valuable because reduced arrhythmia burden can improve patient flow and decrease postoperative resource utilization.

Conclusion

Intraoperative intravenous amiodarone significantly reduces postoperative atrial fibrillation and other perioperative arrhythmias in patients undergoing CABG. It also improves postoperative recovery by reducing ICU and hospital stay without significant adverse effects. Therefore, intraoperative amiodarone may be considered an effective and safe prophylactic strategy in high-risk CABG patients.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-CPEIC-22/4-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

SQA (Assistant Professor)

Review of Literature, Data entry, Data analysis, and drafting articles.

FHR (Assistant Professor)

Conception of Study, Development of Research Methodology Design,

MA (SR)

Manuscript drafting, Study Design

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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