

**EFFECT OF POSTERIOR PERICARDIOTOMY IN REDUCING FREQUENCY OF ATRIAL FIBRILLATION IN POST OPERATIVE CORONARY ARTERY BYPASS GRAFTING SURGERY (CABG) PATIENTS IN PUNJAB INSTITUTION OF CARDIOLOGY LAHORE**

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**Abstract:** Postoperative atrial fibrillation (POAF) is a common complication following coronary artery bypass grafting (CABG), associated with increased morbidity, prolonged hospitalization, and higher healthcare costs. Posterior pericardiotomy, a surgical technique that facilitates the drainage of pericardial fluid into the pleural cavity, has been proposed as a preventive measure against POAF. **Objective:** To evaluate the effectiveness of posterior pericardiotomy in reducing the incidence of POAF in patients undergoing CABG at the Punjab Institute of Cardiology, Lahore, Pakistan. **Methods:** This randomized controlled trial included 94 patients undergoing CABG, randomized into two groups: Group A (posterior pericardiotomy) and Group B (control). Demographic data, POAF incidence, and postoperative outcomes were collected. Statistical analysis was conducted using SPSS version 20, with a  $p$ -value  $\leq 0.05$  considered significant. **Results:** The incidence of POAF was significantly lower in Group A (6.4%) compared to Group B (25.5%) ( $p=0.014$ ). Group A also exhibited a shorter hospital stay ( $7.8 \pm 1.4$  days vs.  $8.5 \pm 1.6$  days;  $p=0.021$ ) and a lower incidence of pericardial effusion (4.3% vs. 21.3%;  $p=0.032$ ). Both groups were comparable in baseline demographics and comorbidities. **Conclusion:** Posterior pericardiotomy significantly reduces the incidence of POAF, pericardial effusion, and hospital stay duration in CABG patients. These findings support its use as a safe and effective intervention to improve postoperative outcomes in resource-limited settings like Pakistan.

**Keywords:** Posterior Pericardiotomy, Atrial Fibrillation, Coronary Artery Bypass Grafting, Postoperative Complications, Cardiac Surgery

## Introduction

Atrial fibrillation (AF) is the most common arrhythmia observed after coronary artery bypass grafting (CABG), with an incidence ranging between 20–30% worldwide. The onset typically occurs within the first five days postoperatively, with a peak on the second day. This complication is associated with increased risks of morbidity, prolonged hospital stay, higher healthcare costs, and poorer long-term outcomes. The pathophysiology of postoperative atrial fibrillation (POAF) remains multifactorial and includes mechanisms such as systemic inflammation, oxidative stress, and structural and electrical remodeling of the atria. These mechanisms are further exacerbated by the surgical trauma and cardiopulmonary bypass associated with CABG (1, 2).

In Pakistan, where cardiovascular diseases are a leading cause of mortality, CABG procedures are frequently performed to manage ischemic heart disease. However, limited local data are available regarding the burden of POAF and its management. South Asian populations, including Pakistan, have distinct demographic and clinical characteristics, such as younger patients undergoing CABG, higher rates of comorbidities like diabetes and hypertension, and a unique genetic predisposition to arrhythmias, which may influence POAF incidence and outcomes (3, 4). Despite international advancements in pharmacological and non-pharmacological interventions to prevent POAF, these approaches often come with limitations, including adverse

effects, high costs, and limited efficacy in high-risk populations (5, 6).

Posterior pericardiotomy, a surgical procedure involving a 4 cm incision in the posterior pericardium to facilitate drainage of pericardial fluids into the pleural cavity, has emerged as a promising technique to reduce POAF. By preventing pericardial effusion and its associated inflammatory response, this technique has shown efficacy in reducing the incidence of atrial fibrillation in several international studies. For instance, Ahmad et al. reported a significant reduction in POAF from 24% to 4% with posterior pericardiotomy ( $p=0.004$ ), while Fawzy et al. observed a decrease from 30% to 13% ( $p=0.01$ ) (7, 8). These findings suggest that posterior pericardiotomy may provide a safe, cost-effective alternative for POAF prevention, particularly in resource-constrained settings like Pakistan (9).

However, evidence on the effectiveness of posterior pericardiotomy in the South Asian population remains limited. Given the demographic and clinical differences, extrapolating findings from Western populations to Pakistani patients may not accurately reflect the local outcomes. Moreover, existing studies have reported conflicting results regarding the efficacy of this technique, necessitating further research to validate its benefits and safety in this population (10).

This study aims to address the knowledge gap by evaluating the effect of posterior pericardiotomy on the frequency of POAF in patients undergoing CABG at the Punjab Institute

of Cardiology, Lahore. By generating local evidence, this study seeks to provide actionable insights for cardiac surgeons and policymakers to optimize postoperative care and improve clinical outcomes in the Pakistani population. The findings will contribute to the global literature on POAF prevention and have the potential to influence practice guidelines for CABG surgeries in resource-limited settings.

**Methodology**

This study was designed as a randomized controlled trial to evaluate the effect of posterior pericardiotomy on the frequency of postoperative atrial fibrillation (AF) in patients undergoing coronary artery bypass grafting (CABG). The study was conducted in the Department of Cardiac Surgery at the Punjab Institute of Cardiology, Lahore, from July 2024 till the completion of sample size in November 2024. A total of 94 patients, meeting the inclusion and exclusion criteria, were enrolled and randomly allocated into two equal groups: Group A (posterior pericardiotomy) and Group B (control group).

Patients aged 18–70 years with no prior history of arrhythmias, thyroid disorders, or neurological conditions were included. All participants had preoperative sinus rhythm and no intraoperative or postoperative complications requiring re-exploration surgery. Patients with pre-existing atrial fibrillation, significant left ventricular dysfunction (ejection fraction  $\leq 30\%$ ), diabetes mellitus, chronic kidney disease, or severe comorbid conditions were excluded to minimize confounding factors. Randomization was performed using a computer-generated sequence, and all surgeries were conducted by the same experienced cardiac surgeon to ensure procedural consistency.

In the intervention group (Group A), posterior pericardiotomy was performed as part of the surgical procedure. A 4 cm longitudinal incision was made in the posterior pericardium parallel to the left phrenic nerve, extending from the left pulmonary vein to the diaphragm. The control group (Group B) underwent standard CABG without posterior pericardiotomy. Both groups received similar perioperative care, including anesthesia protocols,

median sternotomy, and grafting procedures. All patients were monitored postoperatively in the intensive care unit for the first 48 hours, with continuous ECG monitoring to detect atrial fibrillation episodes lasting more than 60 seconds. Electrolytes, blood pressure, pulse, and oxygen saturation were monitored daily during the hospital stay.

Data were collected on demographic variables, including age, gender, and comorbidities, as well as clinical outcomes such as the incidence of postoperative atrial fibrillation, duration of hospital stay, and complications like pericardial effusion and wound infections. Numerical variables were summarized using means and standard deviations, while categorical variables were presented as frequencies and percentages. Statistical analyses were performed using SPSS version 20, applying the Chi-square test for categorical data and independent sample t-tests for continuous variables. A p-value of  $\leq 0.05$  was considered statistically significant. Effect modifiers, including age, gender, body mass index, and comorbid conditions, were addressed through stratification, and post-stratification analyses were conducted to assess their impact on the incidence of atrial fibrillation.

Ethical approval for the study was obtained from the institutional review board, and written informed consent was secured from all participants. Data collection adhered to strict confidentiality protocols, and all laboratory investigations were performed at the same facility to ensure standardization. This rigorous methodology ensures the reliability and generalizability of the study findings to inform clinical practice and improve postoperative outcomes in CABG patients.

**Results**

The study included **94 patients**, divided equally into two groups: the posterior pericardiotomy group (Group A, n=47) and the control group (Group B, n=47).

Demographic data such as age, gender, and comorbidities were analyzed to understand the population characteristics. The incidence of atrial fibrillation (AF) was significantly lower in the posterior pericardiotomy group compared to the control group.

**Table 1: Demographic Characteristics of Study Participants**

Variable	Category	Group A (n=47)	Group B (n=47)	p-value
Age (years)	Mean $\pm$ SD	58.3 $\pm$ 8.5	59.1 $\pm$ 7.8	0.712
Gender	Male	32 (68.1%)	34 (72.3%)	0.635
	Female	15 (31.9%)	13 (27.7%)	
Hypertension	Yes	30 (63.8%)	29 (61.7%)	0.825
Diabetes Mellitus	Yes	28 (59.6%)	27 (57.4%)	0.821
Smoking	Yes	25 (53.2%)	26 (55.3%)	0.847
BMI (kg/m <sup>2</sup> )	Mean $\pm$ SD	27.1 $\pm$ 3.2	27.5 $\pm$ 3.6	0.682

Table 1 highlights the demographic distribution of patients across the two groups. Both groups were comparable in terms of age, gender, and comorbidities, with no statistically significant differences.

**Table 2: Incidence of Postoperative Atrial Fibrillation**

Outcome	Group A (n=47)	Group B (n=47)	p-value
Atrial Fibrillation	3 (6.4%)	12 (25.5%)	0.014

Table 2 demonstrates a statistically significant reduction in postoperative AF in the posterior pericardiotomy group compared to the control group.

**Table 3: Postoperative Outcomes**

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Outcome	Group A (n=47)	Group B (n=47)	p-value
Duration of Hospital Stay (days)	7.8 ± 1.4	8.5 ± 1.6	0.021
Pericardial Effusion	2 (4.3%)	10 (21.3%)	0.032
Wound Infection	1 (2.1%)	2 (4.3%)	0.563

Table 3 indicates that the posterior pericardiectomy group had a shorter hospital stay and fewer cases of pericardial effusion compared to the control group

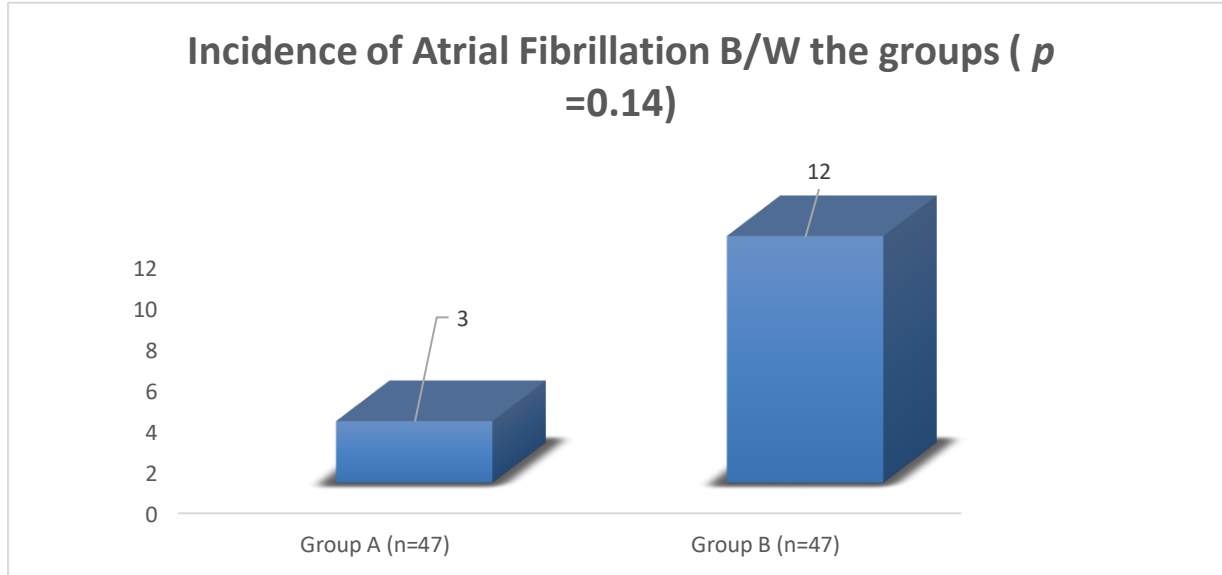


Figure 1: Additional postoperative outcomes, including hospital stay and complications, were analyzed

**Discussion**

The results of this study demonstrate the significant efficacy of posterior pericardiectomy in reducing the incidence of postoperative atrial fibrillation (POAF) in patients undergoing coronary artery bypass grafting (CABG) at the Punjab Institute of Cardiology, Lahore. In our study, the incidence of POAF in the posterior pericardiectomy group (Group A) was 6.4% compared to 25.5% in the control group (Group B), showing a statistically significant reduction (p=0.014). These findings align closely with the results of previous studies conducted internationally and regionally.

Ahmad et al. reported a similar decrease in POAF, where the incidence was 4% in the posterior pericardiectomy group versus 24% in the control group (p=0.004) (11). This suggests that the efficacy of posterior pericardiectomy in our study is comparable to findings from other settings, indicating its universal applicability as an effective surgical modification to reduce POAF. Additionally, Fawzy et al. observed a reduction from 30% in the control group to 13% in the posterior pericardiectomy group (p=0.01), further corroborating the benefits of this technique (12).

The reduction in hospital stay observed in our study (7.8 ± 1.4 days in Group A vs. 8.5 ± 1.6 days in Group B; p=0.021) is consistent with findings by Gaudino et al., who reported shorter hospitalization durations associated with reduced complications, including POAF, in patients undergoing posterior pericardiectomy (13). This reflects the additional advantage of the technique in improving recovery efficiency and reducing healthcare costs.

Our study also demonstrated a reduction in pericardial effusion in the posterior pericardiectomy group (4.3% in Group A vs. 21.3% in Group B; p=0.032). Similar trends were observed in a study by Kikuchi et al., where posterior pericardiectomy significantly minimized pericardial effusion and its associated complications (14). These findings highlight the role of posterior pericardiectomy in preventing effusion-related inflammatory responses, which are strongly linked to the development of POAF.

However, conflicting results exist in the literature. Haddadzadeh et al. found no statistically significant difference in POAF rates between groups (4.8% vs. 5.9%; p=0.719) (15). This discrepancy may be attributed to differences in study populations, surgical techniques, and definitions of atrial fibrillation duration. It emphasizes the importance of conducting localized studies, such as ours, to understand population-specific outcomes.

Overall, the findings of this study confirm the efficacy of posterior pericardiectomy in reducing POAF, hospital stays, and pericardial effusion in a Pakistani population. The reduction rates observed in our study are comparable to those reported in international literature, underscoring the global relevance of this technique. Future studies should explore the long-term impact of posterior pericardiectomy on atrial fibrillation recurrence and patient survival to further solidify its role in cardiac surgery.

**Conclusion**

Posterior pericardiectomy is an effective surgical technique for reducing the incidence of postoperative atrial fibrillation (POAF) in patients undergoing

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coronary artery bypass grafting (CABG). This study demonstrates its efficacy in a Pakistani population, showing significant reductions in POAF, hospital stay duration, and pericardial effusion rates. These findings align with international data and emphasize the potential of posterior pericardiotomy as a safe, cost-effective intervention for improving postoperative outcomes. Further research is recommended to explore its long-term benefits and integration into routine cardiac surgery protocols.

## Declarations

### Data Availability statement

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

### Ethics approval and consent to participate

Approved by the department Concerned. (IRBEC-PIC-0232/24)

### Consent for publication

Approved

### Funding

Not applicable

## Conflict of interest

The authors declared absence of conflict of interest.

## Author Contribution

### FARIAL JAVED RAO

*Study Design, Review of Literature, Data entry and Data analysis, drafting, Conception of Study,*

### ASIF HASSAN

*Development of Research Methodology Design, Study Design, Review of manuscript, final approval of manuscript, Conception of Study, Final approval of manuscript.*

### ABDUL REHMAN SARWER

*Manuscript revisions, critical input, Coordination of collaborative efforts.*

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*Data acquisition, analysis, Manuscript drafting, article.*

## References

- Gaudino M, Di Franco A, Rahouma M, et al. Postoperative atrial fibrillation: From mechanisms to treatment. *Eur Heart J.* 2023; 44(12):1020–1039. doi:10.1093/eurheartj/ehad019.
- Kikuchi Y, Maze Y, Yamaguchi S, et al. Post-cardiotomy pericardial effusion and postoperative atrial fibrillation risk. *Int J Cardiovasc Imaging.* 2022; 38(8):1873–1879. Doi: 10.1007/s10554-022-02560-9.
- Shaikh Q, Malik F, Faruqi AM, et al. Risk factor analysis for atrial fibrillation in Pakistani patients undergoing coronary artery bypass surgery. *Pak Heart J.* 2021; 54(2):90–96. doi:10.47144/phj.v54i2.229.
- Kumar A, Sulaiman A, Bano S, et al. Prevalence of postoperative atrial fibrillation following off-pump CABG in elderly patients. *Cureus.* 2023; 15(1):e34499. doi:10.7759/cureus.34499.
- Maze Y, Kikuchi Y, Shirai K, et al. The effect of posterior pericardiotomy after thoracic aortic surgery. *J Cardiothorac Surg.* 2022; 17(1):152. Doi: 10.1186/s13019-022-01967-8.
- Montrief T, Koymfan A, Long B. Coronary artery bypass graft surgery complications: A review for emergency clinicians. *Am J Emerg Med.* 2018; 36(12):2289–2297. doi:10.1016/j.ajem.2018.09.014.
- Ahmad M, Riaz A, Waseem U, et al. Role of posterior pericardiotomy in prevention of pericardial effusion and atrial fibrillation after coronary artery bypass grafting surgery. *Pak Armed Forces Med J.* 2021; 71(1):1992.
- Fawzy H, El-Said A, Aref S. Can posterior pericardiotomy reduce the incidence of postoperative atrial fibrillation after CABG? *Interact Cardiovasc Thorac Surg.* 2015; 21(4):488–491. doi:10.1093/icvts/ivv190.
- Gaudino M, Rahouma M, Di Franco A, et al. Posterior left pericardiotomy for the prevention of atrial fibrillation after cardiac surgery: A randomized controlled trial. *Lancet.* 2021; 398(10316):1611–1619. Doi: 10.1016/S0140-6736(21)02490-9.
- Haddadzadeh M, Mahmoudi M, Ebrahimi M. The effect of posterior pericardiotomy on pericardial effusion and atrial fibrillation after off-pump coronary artery bypass graft. *Acta Med Iran.* 2015; 53(1):57–61. Available from: <https://pubmed.ncbi.nlm.nih.gov/25597607/>.
- Ahmad M, Riaz A, Waseem U, et al. Role of posterior pericardiotomy in prevention of pericardial effusion and atrial fibrillation after coronary artery bypass grafting surgery. *Pak Armed Forces Med J.* 2021; 71(1):1992.
- Fawzy H, El-Said A, Aref S. Can posterior pericardiotomy reduce the incidence of postoperative atrial fibrillation after CABG? *Interact Cardiovasc Thorac Surg.* 2015; 21(4):488–491. doi:10.1093/icvts/ivv190.
- Gaudino M, Rahouma M, Di Franco A, et al. Posterior left pericardiotomy for the prevention of atrial fibrillation after cardiac surgery: A randomized controlled trial. *Lancet.* 2021; 398(10316):1611–1619. Doi: 10.1016/S0140-6736(21)02490-9.
- Kikuchi Y, Maze Y, Yamaguchi S, et al. Post-cardiotomy pericardial effusion and postoperative atrial fibrillation risk. *Int J Cardiovasc Imaging.* 2022; 38(8):1873–1879. Doi: 10.1007/s10554-022-02560-9.
- Haddadzadeh M, Mahmoudi M, Ebrahimi M. The effect of posterior pericardiotomy on pericardial effusion and atrial fibrillation after off-pump coronary artery bypass graft. *Acta Med Iran.* 2015; 53(1):57–61. Available from: <https://pubmed.ncbi.nlm.nih.gov/25597607/>.



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