ORIGINAL ARTICLE

COMPARISON OF POSTOPERATIVE ATRIAL FIBRILLATION IN PATIENTS UNDERGOING CORONARY ARTERY BYPASS GRAFT WITH AND WITHOUT LONG CPB TIME

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Background: Postoperative atrial fibrillation (POAF) is frequently observed after cardiac surgery, and duration of Bypass Time (CPB) is an independent risk factor for postoperative atrial fibrillation (POAF). The main objective of the current study was to compare new onset Postoperative Atrial Fibrillation (POAF) in patients undergoing coronary artery bypass graft with and without long CPB time. **Methods:** A prospective comparative study design was used and conducted at the Cardiac Surgery Department in Bahawalpur- Pakistan which is a tertiary care health centre for the period of April 2020 to February 2021, a total of 110 patients were enrolled after getting institutional approval and informed consent from patients. The ethical protocol was followed throughout the study period. Data was entered and analyzed using SPSS version 25.0 and *p*-value <0.05 taking the level of significance. **Results:** A total of 110 patients were enrolled for the research, the average age of patients was 48.56±3.11 (age range 30–70), and there were 38 (34.55%) & 72 (65.45%) male and female patients observed respectively. The atrial fibrillation developed in 3 (5.45) patients in without a long CPB time group as compared with the long CPB time group as 8(14.54%) with a statistically significant *p*-value of 0.043, postoperative IABP support with an insignificant *p*-value of 0.234. **Conclusion:** Postoperative atrial fibrillation in patients undergoing coronary artery bypass graft is significantly higher with long CPB time as compared with without long CPB time.

Keywords: CABG; CPB; POAF

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INTRODUCTION

Postoperative atrial fibrillation (POAF), also known as acute or new-onset AF, is a frequent complication that occurs in approximately 35% of cardiac surgery cases. It is a contributing factor to many co-morbidities. By comparison, the occurrence of postoperative atrial fibrillation (POAF) after thoracic surgery is estimated to be between 10 and 30%, while the occurrence after non-cardiac, non-thoracic surgery varies from 1–15%.[1] The occurrence rate of this condition ranges from 20–50% among patients, typically appearing on the second to third day after surgery. Approximately 40% of patients encounter several episodes. While this arrhythmia is typically harmless and resolves on its own, it can lead to unstable blood flow, blood clotting events, prolonged hospitalization and increased healthcare expenses.[2] Old age, history of atrial fibrillation (AF), heart failure, Chronic Obstructive Pulmonary Disease (COPD), prolonged Cardiopulmonary Bypass Time (CPB), and discontinuation of beta-blockers after surgery are all contributing risk factors for postoperative atrial fibrillation (POAF). On the other hand, a shorter period of Cardiopulmonary Bypass administering beta-blockers during the perioperative period, ACE inhibitors after surgery, and potassium supplements, has beneficial effects in decreasing the occurrence of postoperative atrial fibrillation.[3–5]

While uncommon in the preoperative phase, investigations have shown that it occurs 20–50% of the time following coronary artery bypass grafting. There is not much data from India on this topic, however, one study found that 8% of cases occur during the postoperative phase Atrial fibrillation lowers cardiac output and increases the patient's risk of a cerebrovascular embolism.[6] Patients with structural heart disease have an increased frequency of atrial fibrillation, which is associated with an increasing prevalence with age.[6] Patients with valvular heart disease have a higher incidence of atrial fibrillation.[7] Patients with atrial fibrillation have poor long-term outcomes, particularly when their heart rate is unregulated, according to the Framingham Heart Study. The quality of life does, however, increase if atrial fibrillation is managed with readily available energy devices.[8]

MATERIAL AND METHODS

This prospective comparative study was conducted at Cardiac Surgery Department in Bahawalpur- Pakistan in a tertiary care healthcare sector from April 2020 to February 2021 after approval from the hospital ethical committee. A total of one hundred and ten patients were enrolled through non-probability consecutive sampling. Patients of both genders having an age range of 30–70 years undergoing isolated coronary artery bypass, grafting and normal sinus rhythm were included. Patients with a previous history of heart valve disease, cardiac reopening and emergency surgery were excluded from this study. After taking the informed consent, the patients were enrolled in the Cardiac Surgery Department, Bahawalpur, Punjab. Patients were treated according to the standard departmental protocols. Echocardiography and angiography were done according to the departmental protocol. Coronary artery dominance was observed. A proforma was completed for each patient, specifically patients' personal information such as their name, age, gender, and admission number. The data were entered and analyzed by using SPSS Ver. 25.0. For demographic information like age, haemoglobin, number of grafts and cross-clamp time were presented mean±SD, for qualitative variables i.e. gender, hypertension, diabetes mellitus, smoking, family history of IHD etc. were presented as frequencies and percentages. Qualitative data were shown in frequency and percentage. The chi-Square test was applied after stratification. *p*-value ≤ 0.05 was taken as significant.

RESULTS

Table-1: Comparison of demographic and preoperative data

Research Variables		**Without long CPB time (< 90 minutes)**	**With Long CPB time (> 90 minutes)**	***p*-value**
Age (years ± SD) 48.56±3.11 (age range 30-70)		51 ± 1.7	46 ± 2.9	<0.001
Gender	**Male**	16(29.09%)	22(40.00%)	0.3161
	Female	39(70.09%)	33(60.00%)	
Diabetes Mellitus, n (%)		15 (27.27%)	24 (43.63%)	<0.001
Hypertension, n (%)		30(54.54%)	31(56.36%)	0.548
Smoking		27(49.09%)	26(47.27%)	0.089
Family History IHD		36 (65.45%)	39(48.3)	0.002
Haemoglobin level (g/dl ± SD)		11.4 ± 2.8	16.5 ± 3.8	<0.001
Chronic Pulmonary disease, n (%)		31(56.36%)	28 (50.90%)	0.387
Renal Failure, n (%)		4(7.27%)	2(3.63%)	0.031
Recent MI, n (%)		9(16.36%)	7(12.72%)	0.0001

Table-2: Comparison of post-operative A. Fib with and without Long CPB Time

Variables	**Without long CPB time (< 90 minutes)**	**With Long CPB time (> 90 minutes)**	***p*-value**
Number of Grafts used	5.52 ± 6.1	4.8 ± 2.8	0.647
Cross clamp time (minute)	72.3 ± 24.5	66.1 ± 27	0.843
Postoperative IABP support	9 (18.8%)	11 (23.9%)	0.234

Table-3: Comparison Postoperative Atrial Fibrillation in Patients Undergoing CABG With And Without Long CPB Time

Atrial Fibrillation	**Research Group**		***p*-value**
	Without long CPB time (< 90 minutes)	With Long CPB time (> 90 minutes)	
Yes	3(5.45%)	8(14.54%)	0.043
No	52(94.54%)	47(85.45%)	

DISCUSSION

An increased risk of death, stroke, and length of hospital stay is associated with atrial fibrillation after CABG. The current study was focused on Postoperative atrial fibrillation (POAF). A total 110 patients who underwent CABG were enrolled. The average age of patients was 48.56±3.11 with an age range was 30–70 years. The statistically significant difference was found in Diabetes mellitus, history of IHD, renal failure and recent MI. There is strong evidence indicating a heightened susceptibility to AF in individuals with ischemic heart disease.

A study involved 150 individuals who underwent coronary artery bypass grafting (CABG) and subsequently acquired postoperative atrial fibrillation (POAF). 60% of the patients underwent surgery with a cardiopulmonary bypass (CPB) over 100 minutes, while the remaining 40% had surgery with a CPB duration below 100 minutes. A separate investigation revealed that the research sample comprised 1254 individuals. Postoperative atrial fibrillation (POAF) was observed in 171(13.6%). The majority of these cases (68.4%) occurred within the initial two days following surgery.[9]

A multivariate logistic regression analysis was conducted to determine the longer cardiopulmonary duration in the longer CPB group. The mean CPB time in the longer group was 116.8±40.6, compared to 89.2±29.9 in the shorter group, with a statistically significant *p*-value (<0.05). The number is 6. A retrospective investigation was carried out, with a total of 230 cases being included. Among the 19 patients in the shorter group, atrial fibrillation occurred. The average duration of cardiopulmonary bypass (CPB) was 81±23.69 minutes, compared to 104.41±26.6 minutes in the longer group, where 38 patients developed atrial fibrillation. However, it is worth noting that the *p*-value of 0.511 was not statistically significant. Seven Understanding the incidence of atrial fibrillation (AF) after prolonged cardiopulmonary resuscitation (CPR) after coronary artery bypass grafting (CABG) will aid in the strategic management and prevention of this problem in CABG patients.[10]

Dave *et. al*, conducted a research study, in 150 patients undergoing CABG who developed postoperative atrial fibrillation (POAF) 60% had surgery with CPB time >100 minutes and the remaining 40% had surgery with CPB time <100 minutes.[11] POAF, or postoperative atrial fibrillation, is a predictable irregular heartbeat that occurs after the use of cardiopulmonary bypass and the restoration of blood flow following a period of reduced blood supply to the heart.[12] The study found that an increase in cardiopulmonary bypass time resulted in a higher incidence of postoperative atrial fibrillation (POAF), which is consistent with earlier research.

Another study conducted by Hesternzadah *et. al*, showed that the research population consisted of 1254 patients. POAF occurred in 171 (13.6%) and most of them (68.4%) developed within the first two days after surgery Multivariate logistic regression analysis was used to identify the longer cardiopulmonary time in the longer CPB group, the mean CPB time was 116.8±40.6 compare with shorter group 89.2±29.9 with significant *p*-value (<0.05).[13]

A retrospective study was conducted and 230 patients were enrolled. In the shorter group, 19 patients developed atrial fibrillation, and the mean CPB time was 81±23.69 vs 104.41±26.6 in the longer group 38 patients were developed atrial fibrillation, although the *p*-value not significant (*p*-value = 0.511).[14]

A study by Maryam Rajabi *et. al* proposed the first objective of the research, which was "to determine the relationship between duration of the CPB pump (min) and incidence of AF after open heart surgery", the obtained results indicated no significant relationship between duration of the CPB pump and incidence of AF.[15] This finding is consistent with the study of Thoren, which did not have a significant relationship CPB time and with incidence of AF after heart surgery.[16]

CONCLUSION

The comparison of postoperative atrial fibrillation in patients undergoing coronary artery bypass graft is significantly higher with long CPB time as compared without long CPB.

AUTHORS' CONTRIBUTION

AF: Conceptualization of the study design. AA: NI: Data collection, data analysis. SJ, MA, SRB: Data interpretation, write-up, proofreading.

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