



A STUDY ON POST-OPERATIVE ATRIAL FIBRILLATION AMONG PATIENTS UNDERGOING CARDIAC SURGERY AT A TERTIARY LEVEL HOSPITAL IN WEST BENGAL

Cardiovascula

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ABSTRACT

Background: Post-operative atrial fibrillation (POAF) is a common, persistent and dreaded complication after cardiac surgeries. Multiple factors have been implicated with its causation. The present study was conducted to determine the incidence of POAF among patients undergoing cardiac surgery procedures and to identify and evaluate preoperative, intraoperative and postoperative factors associated with the occurrence of POAF. **Materials and methods:** The present descriptive observational study with prospective design was conducted at a tertiary level healthcare institute in the city of Kolkata, West Bengal, over a period of one and half year. A total of 126 subjects undergoing cardiac surgery in the department of Cardio-thoracic and Vascular surgery at the institute were interviewed using a pre-tested and pre-designed schedule and observing and recording the clinical variables after obtaining the ethical clearance from the institute and informed consent from each subject. Inferential statistics either by parametric or non-parametric tests according to the data distribution for continuous variables and Chi-square test categorical variables was performed to elicit association; p value of less than 0.05 was considered statistically significant. **Results:** The mean ($\pm$ SD) age of the study population was 38.55 ± 19.23 years. The incidence of POAF was 26.2% at the immediate post-operative period up to 3 days, 30.1% during 3-7 days and 20.6% at one month follow up period. The association between POAF incidence and factors like older age, overweight/obese, presence of any chronic co-morbidity, poor left ventricular dysfunction and negative history of prior beta blocker medication, increased left atrial size, higher cross clamp and cardio-pulmonary bypass time were statistically significant. **Conclusion:** POAF is a common consequence after cardiac surgery reaching its peak between 3rd to 7th post-operative days. There are many factors which are significantly associated with its occurrence and also prolong the morbidity by lengthening the hospital stay.

KEYWORDS

Post-operative atrial fibrillation, cardiac surgeries, incidence, risk factors

INTRODUCTION

The occurrence of atrial arrhythmia after any major cardiac surgery remains a troublesome complication globally, affecting significantly the morbidity and mortality of patients during the post-operative period. Among all the atrial arrhythmias, Post-Operative Atrial Fibrillation (POAF) is the most common complication seen after cardiac surgeries¹. POAF has been strongly linked to various adverse cardiovascular events including stroke, heart failure, and an increased risk of mortality²⁻³. The incidence of POAF after cardiac surgeries varies depending on the type of cardiac operation, but it has been approximately 30% overall⁴. The incidence of POAF observed to be higher after valve replacement surgery (50% and above), and lower after coronary artery bypass grafting (CABG: 20%)⁴.

The occurrence of POAF after cardiac surgery is a result of a complex pathophysiology, in which factors like inflammation, vasoactive medications, ischemia, metabolic disturbances, volume overload, operative manipulation of the heart and fixed substrate like valvular disease, atrial myopathy and hypertension are thought to interact to provoke atrial arrhythmia^{5,6}.

Several risk factors have been reported to be significantly associated with incidence of POAF; include older age, gender, higher body mass index (BMI), history of chronic diseases (hypertension, diabetes and chronic obstructive pulmonary disease) prior history of AF, left atrial size, and poor left ventricular ejection fraction⁷⁻⁹. There are some intra-operative and post-operative parameters also that have been implicated with POAF e.g. aortic cross clamp time, cardio-pulmonary bypass time and post-operative ventilation duration^{10,11}.

Although POAF is often transient, it is associated with increased morbidity and prolonged intensive care unit and hospital stay especially in patients with multiple risk factors described above. Therefore, early identification of these risk factors among high risk patient needs to be assessed promptly to reduce the incidence and complication of POAF. In this context, the current study was conducted to determine the incidence of POAF among patients undergoing cardiac surgery procedures and to identify and evaluate

preoperative, intraoperative and postoperative factors which are known to have significant association with the occurrence of POAF.

MATERIALS AND METHODS:

The present descriptive observational study was conducted at Nilratan Sirkar Medical College and hospital, a tertiary level healthcare institute in the city of Kolkata, West Bengal, over a period of one and half year. In This prospective study, all the patients undergoing cardiac surgery in the department of Cardiothoracic and Vascular surgery at the institute during the period of data collection were approached as the sample population and after applying inclusion and exclusion criteria, finally 126 subjects were included by total enumeration technique and analysed to measure the study outcome.

Exclusion criteria:

Patients having refusal to give consent for participation in the study, chronic atrial fibrillation, very severe cases, post-operative deaths, sample with incomplete data.

The process of data collection was started after getting the ethical clearance from the institute and obtaining all the necessary permission and informed consent from each study participant. Subjects were interviewed using a pre-tested and pre-designed schedule and observing and recording the clinical variables. Some major study parameters were: *Pre-operative* - Age, sex, BMI, type of heart disease, any chronic co-morbidity, history of beta blocker use and echocardiographic findings; *intraoperative* - Cross clamp (min) and Cardio-pulmonary bypass time(min); and *postoperative factors* -Incidence of POAF, Post-operative ventilation duration (hours) and Hospital stay (days).

Data were entered into Microsoft Excel sheet and analysed using the SPSS version 20 software. Descriptive analysis in the form of proportion for categorical variables, mean or median for continuous variables was performed. Data were checked for normal distribution using tests for normality and comparison was done either by parametric or non-parametric tests accordingly for continuous variables and Chi-square test was done to elicit association between

categorical variables; p value of less than 0.05 was considered statistically significant.

RESULTS:

In this present study, 126 subjects undergoing cardiac surgery were studied to determine and evaluate the incidence and risk factors for POAF at a tertiary level healthcare institute in the city of Kolkata, West Bengal.

The mean (SD) age of the study population was 38.55 ± 19.23 years. The majority of the subjects were in the age group of 40-59 years (46%) and 51.6% were males. In the study, there were 36.5% overweight subjects, while 8% were obese. In the study, 38.9% patients were admitted with Vulvular heart diseases, 31.7% with congenital heart diseases and 29.4% with Ischaemic heart diseases. 74.6% subjects were having positive history of prior beta blocker use (Table-1).

On pre-operative echocardiography, 34.2% of the patients with mild, 11.2% with moderate and none of the patients were having severe left ventricular dysfunction. The mean (SD) Left atrium size was 4.44 ± 0.51 cm (Table-2).

The incidence of POAF was 26.2% (n=33) at the immediate post-operative period up to 3 days, 30.1% (n=38) during 3-7 days and 20.6% (n=26) at the one month follow up period (Figure-1).

Among the risk factors, occurrence of POAF was found to be significantly more among the patients with older age (≥ 60 years), Overweight/obese, presence of any chronic co-morbidity, more severe left ventricular dysfunction and among those who were not taking prior beta blocker medication (Table-3). The mean (SD) Cross clamp time, Cardio-pulmonary bypass time, Post-operative ventilation duration and Hospital stay was found to be significantly higher among the patients developing POAF (Table-4).

Table 1: Distribution of study subjects according to Background variables (n=126)

Background variables	Frequency	Percentage
Age (years)		
<20	28	22.2
20-39	24	19.1
40-59	52	46.0
≥ 60	22	12.7
Sex		
Female	61	48.4
Male	65	51.6
BMI (kg/meter ²)		
Normal (18.5-22.9)	70	55.5
Overweight (23-24.9)	48	36.5
Obese (≥ 25)	8	8.0
Type of heart diseases		
Congenital heart diseases	40	31.7
Ischaemic heart diseases	37	29.4
Vulvular heart diseases	49	38.9
Chronic Co-morbidities		
None	79	62.8
Diabetes	7	5.5
Hypertension	11	8.7
Diabetes + Hypertension	23	18.2
COPD	1	0.8
Diabetes + Hypertension + COPD	5	4.0
Beta blocker use		
Yes	94	74.6
No	32	25.4

Table 2: Distribution of study subjects according to pre-operative echocardiographic characteristics (n=126)

Background variables	Frequency	Percentage
LVEF* (%)		
Normal (51-70)	68	53.9
Mild dysfunction (41-50)	44	34.9
Moderate dysfunction (31-40)	14	11.2
Severe dysfunction (≤ 30)	-	-
Left atrium size (mean $\pm$ SD) (cm)	4.44 $\pm$ 0.51	

*LVEF=Left Ventricular ejection fraction

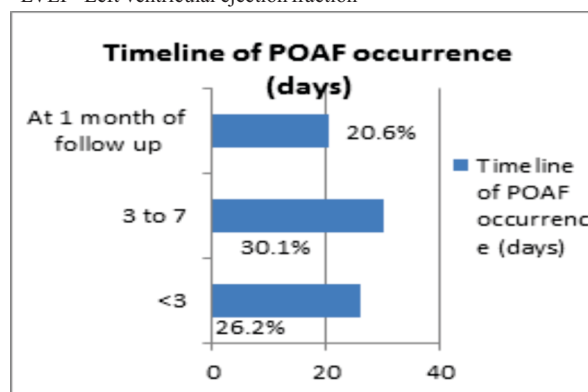


Figure 1: Distribution of study subjects according to incidence of post-operative atrial fibrillation (n=126)

Table 3: Distribution and association of POAF at follow up according to risk factors (n=126)

Risk factors	POAF n (row %)		p value*
	Yes	No	
Age (years)			<0.001
<60	9 (8.6)	95 (91.4)	
≥ 60	17 (77.2)	5 (22.8)	
Sex			0.287
Female	15 (24.6)	46 (75.4)	
Male	11 (16.9)	54 (83.1)	
BMI			0.001
Normal	6 (8.6)	64 (91.4)	
Overweight/obese	20 (35.7)	36 (64.3)	
Type of heart diseases			0.096
Congenital heart diseases	4 (10)	36 (90)	
Ischaemic heart diseases	8 (21.6)	29 (78.4)	
Vulvular heart diseases	14 (28.6)	35 (71.4)	
Any chronic co-morbidity			0.001
Absent	7 (8.9)	72 (91.1)	
Present	19 (40.4)	28 (59.6)	
LVEF (%)			0.001
Normal	7 (11.5)	61 (88.5)	
Mild dysfunction	10 (22.7)	34 (77.3)	
Moderate dysfunction	9 (64.3)	5 (35.7)	
Beta blocker use			0.006
Yes	14 (14.9)	80 (85.1)	
No	12 (37.5)	20 (62.5)	

*Chi Square test

Table 4: Distribution and association of POAF according to pre/intra/post-operative variables (n=126)

Variables mean (SD)	POAF		p value*
	Yes	No	
Left atrium size (cm)	5 (0.31)	4.44 (0.5)	0.001
Cross clamp time (min)	50.14 (13.25)	33.16 (12.59)	<0.001
Cardio-pulmonary bypass time (min)	82.48 (19.26)	60.18 (20.24)	0.001
Post-operative ventilation duration (hours)	12 (2.50)	8.59 (2.20)	<0.001
Hospital stay (days)	7 (1.39)	4 (1.70)	0.001

*Mann Whitney U test

DISCUSSION

Postoperative atrial fibrillation (POAF) is the most commonly occurring arrhythmia post cardiac surgery. It predisposes to thromboembolism and stroke in the postoperative period and prolongs post-operative hospital stay. Being a multifactorial rare phenomenon, the associated risk factors need to be identified early and need early intervention. The present prospective study was designed and conducted to evaluate the incidence and risk factors of POAF.

In the present study, we observed that the mean (SD) age of the study population was 38.55 ± 19.23 years and the majority of them were in the age group of 40-59 years (46%) and occurrence of POAF was found to be significantly more among the patients with older age (≥ 60 years). Hashemzadehet al.¹¹ in their study observed the age (55.1 ± 15.7) was higher than our study, but the association between older age and occurrence of POAF was significant. Advanced age has been the most consistent predictor of POAF¹². Ghurram A et al.¹³ observed the mean age of their study population was 62 years ± 10 which, although here, the study sample was only the patients undergoing coronary artery bypass grafting. Daveet al.¹⁴ in their study found similar observation of mean age of 46.7 years with standard deviation of 13.3 years, and the male to female ratio was 70:80. In the present study we could not find any significant difference in sex distribution among the subjects, which corresponds to the study done by Hashemzadehet al.¹¹. The proportions of overweight and obese peoples were alarming and we also found significant association of being overweight and obese have higher occurrence of POAF, corresponds to the study done by Zacharias A et al.⁹. In the present study, the difference in distribution of type of heart diseases was not significantly associated with POAF.

We observed that the incidence of POAF was 26.2% at the immediate post-operative period up to 3 days, 30.1% during 3-7 days and 20.6% at one month follow up period. It was evident from the study that the peak incidence of POAF is from 3rd to 7th post-operative day and. Among the risk factors, presence of any chronic co-morbidity, more severe left ventricular dysfunction and higher left atrial size and those who were not taking prior beta blocker medication, longer Cross clamp time and Cardio-pulmonary bypass time, longer post-operative ventilation duration were found to be significantly higher among the patients developing POAF. These findings were in similar to the studies done by Mathew JP et al.⁸. Hashemzadehet al.¹¹ showed that POAF occurred in 13.6% of patients and most of them (68.4%) developed within the first two days after surgery. Our study finding corresponds with other studies showing similar incidence of POAF^{7,8,10}. Almassiet al.¹⁵ found the incidence of POAF to be 29.6%. Dave et al.¹⁴ reported that the incidence of POAF after cardiac surgery was 40.7%, and pre-operative LVEF < 0.4 , prior MI, CPB time > 100 min and extended ventilation for > 24 h were significantly associated with POAF. Studies by Zaman et al.¹⁶ and Yi Ting Tsai et al.¹² reported significantly lower incidence of POAF in patients on β blockers, which correspond to our study finding. Creswell LL et al.¹⁷ and Aranki SF et al.¹⁸ observed that the POAF also increased the post-operative hospital stay significantly, similar to our study finding.

CONCLUSION:

Post-operative atrial fibrillation is a common manifestation after cardiac surgeries having a peak incidence within first week post-operatively. There are many risk factors associated significantly with POAF occurrence; advancing age, overweight or obesity, concomitant presence of chronic diseases, poor left ventricular function, increased left atrial size were some major pre-operative risk factors. Intra-operative risk factors like higher cross clamp and cardio-pulmonary bypass time and some post-operative risk factors like prolong post-operative ventilation were associated with the POAF incidence. POAF also significantly prolongs the hospital stay which may negatively impact the healthcare resources. Thus, prior identification of the pre-operative risk factors need to be addressed promptly and more cautious approaches are to be taken regarding the intra-operative and post-operative risk factors to prevent mortality and morbidity.

Conflict of Interest: None to declare

Source of Funding: Nil

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