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Original Research Article

POSTOPERATIVE ATRIAL FIBRILLATION FOLLOWING OFF-PUMP CORONARY ARTERY BYPASS GRAFT SURGERY IN YOUNG AND OLD AGE GROUPS

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Abstract

Background: Atrial fibrillation (AF) is one of the common rhythm disturbances that occur after coronary artery bypass graft (CABG) surgery. Postoperative atrial fibrillation (POAF) can lead to thromboembolic events, hemodynamic instability, and prolonged hospital stay, affecting morbidity and influencing short and long-term outcomes after CABG.

Methodology: This prospective comparative study was conducted between Oct 2021 and May 2023. This study aimed to compare the prevalence of POAF following off-pump coronary artery bypass graft surgery (OPCAB) between elderly and young patients. Additionally, we aimed to determine the risk factors associated with POAF following OPCAB in the elderly compared to young patients. Patients aged ≥65 years were considered elderly, and those aged <65 years were considered young. A total of 120 patients (60 in the elderly group and 60 in the young group) were included in this study and evaluated to correlate the preoperative and intraoperative risk factors with postoperative outcomes during the hospital stay.

Results: The prevalence of POAF following OPCAB in the elderly was significantly higher compared to young patients (48.3% vs. 20%, p = 0.002). The elderly group also had a significantly longer intensive care unit stay (p = 0.001) and hospital stay (p = 0.001). In an unadjusted logistic regression model, age (odds ratio (OR) = 3.74, 95% confidence interval (CI) = 1.66-8.41, p = 0.001), preoperative plasma B-type natriuretic peptide (OR = 1.01, 95% CI = 1.00-1.01, p = 0.001), and left atrial diameter (OR = 1.10, 95% CI = 1.03-1.17, p = 0.001) were significantly associated with POAF. However, in an adjusted logistic regression model, age was found to be an independent predictor (OR = 1.31, 95% CI = 1.14-1.52, p < 0.0001) of POAF following OPCAB. Although stroke developed in the elderly (p > 0.05), no mortality was observed postoperatively.

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Conclusions: The risk factors identified in our review could be used to improve monitoring of at-risk patients for early detection and treatment of new-onset POAF after CABG, reducing the risk of other complications and negative clinical outcomes.
Keywords: Predictor, Atrial fibrillation, Coronary artery bypass graft, Systematic review

Introduction

Coronary artery bypass grafting (CABG) is the standardof care for the treatment of advanced coronary artery disease [1, 2]. Despite its value, CABG is associated with a high risk of postoperative cardiac and non-cardiac complications, including dysrhythmia, the need for re-operation, cognitive decline, and mortality [3–5]. New- onset postoperative atrial fibrillation (POAF) is the most common cardiac dysrhythmia to occur after CABG [6,7]. Defined as POAF developing within two to four days after CABG, new-onset POAF is identified in 10–40% of patients in the early postoperative period after CABG, with the peak onset at two days postoperatively [4, 8]. POAF after CABG increases the length of postoperative hospital stay and is associated with an increased risk of hospital readmission, stroke, and early and late mortality[8–10]. Recent research has also indicated that new-onset POAF after CABG has a long-term thromboembolic risk profile similar to that of non-valvular atrial fibrillation (AF) [11, 12]. Accordingly, identification of patients who are at risk of new-onset POAF after CABG is clinically important to ensure adequate precautions during theperioperative period to optimize clinical outcomes. The following predisposing factors for POAF after CABG have previously been identified: advanced age,obesity, and comorbidities, such as hypertension, diabe- tes mellitus, and chronic obstructive pulmonary disease (COPD) [4, 7, 13, 14]. However, the risk factors for new- onset POAF after CABG remain inconclusive. System- atic reviews regarding the relationship between POAFand adverse outcomes after CABG have largely focused on mortality [8, 12, 15]. One systematic review whichdid seek to identify risk factors for POAF after CABG included studies for only on-pump CABG with all typesof cohort study designs [4]. The impact of cardiopulmo- nary bypass (CPB) on the clinical outcomes of CABG, including POAF, is still being debated [16]. As risk mod- els based only on preoperative risk factors cannot iden- tify all patients who develop POAF [17], it is necessary toidentify the risk factors that can be continuously moni- tored during and after CABG for optimal care.

Materials & Methods

This prospective comparative study was conducted Dept. Of CTVS, Sri Jayadeva Institute of cardiovascular sciences and research, Bangalore, from Oct 2021 and May 2023. According to the definition of elderly by Geriatrics and Gerontology International, patients aged 65 years and above were considered elderly. Patients aged <65 years were considered young. The purposive sampling method was followed as the sampling technique. The study population (n = 120) was grouped into the elderly group (n = 60) and the young group (n = 60).

Data collection was done through face-to-face interviews and a semi-structured questionnaire. Inclusion criteria were all admitted patients scheduled for elective isolated OPCAB. Exclusion

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criteria included pre-existing AF and other arrhythmias, taking antiarrhythmic drugs except for β-blockers, pre-existing thyroid disorders, congestive cardiac failure, other concomitant cardiac procedures, acute coronary syndrome within two months, emergency OPCAB, hepatic impairment, chronic kidney disease stage 3b-5, previous stroke, significant carotid artery disease, and intraoperative conversion to on-pump CABG. We utilized both primary and secondary data sources for this study. The primary sources were gathered via face-to-face interviews and semi-structured questionnaires, and the secondary sources were acquired through clinical observations and laboratory workup.

Results

A total of 120 patients (elderly group: 60 patients and young group: 60 patients) underwent elective isolated OPCAB. All patients were evaluated for preoperative clinical data, intraoperative risk factors, and postoperative outcomes.

Table 1:

BMI: body mass index; MI: myocardial infarction; COPD: chronic obstructive pulmonary disease; BNP: B-type natriuretic peptide; CTR: cardiothoracic ratio; LA: left atrial; LVIDD: left ventricular internal diameter at end-diastole; LVEF: left ventricular ejection fraction; DVD: double vessel disease; TVD: triple vessel disease: RCA: right coronary artery

Variables	**n = 60 f (%)**	**Mean±SD**
Age (years)		67.83±4.06
Sex		
Male	52 (86.6%)	
Female	08(13.3%)	
BMI(Kg/m^2)		25.59±3.01
Smoking	27(45%)	
Alcohol consumption	03(5%)	
Shortness of breath	11(18.3%)	
Chest pain	55(91.7%)	
Hypertension	49(81.7%)	
Diabetes Mellitus	28(46.7%)	
Dyslipidemia	46(76.6%)	
COPD	05(8.3%)	
History of old MI	55(91.7%)	
Higher cardiothoracic ratio (CTR)	18(30%)	
Serum creatinine (mg/dl)		1.29±0.23
Plasma BNP (pg/ml)		150.24±81.34

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Table 2:

Variables	Mean±SD	n = 60 f (%)
LA diameter (mm)	43.61±6.48	
LVEF (%)	41.42±7.29	
Number of diseased vessel	2.77±0.42	
DVD		14(23.30%)
TVD		46(76.70%)
Left main stem involvement		27(45%)
RCA total/near total occlusion		26(43.33%)
In-stent restenosis		10(16.7%)

***Table* 3:**

Variables	n = 60 f (%)	n = 29 f (%)	Mean±SD
Hemoglobin (gm/dl) in POD 1			12.03±1.33
Plasma BNP (pmol/L) in POD 1			198.31±97.64
POAF	29 (48.3%)		
POAF episodes duration (<24 hours)		21(72.41%)	
POAF episodes duration (24-48 hours)		01(3.44%)	
POAF episodes duration (2-7 days)		01(3.44%)	
POAF episodes duration (>7 days)		06(20.68%)	
Restoration of sinus rhythm from POAF (≤7 POD)		23(79.31%)	
Duration of ICU stay (days)			3.43±1.61
Duration of Hospital stay (days)			10.03±2.12
Stroke	01(1.7%)		
Mortality	0(0%)		

Discussion

Postoperative atrial fibrillation (POAF) contributes significantly to postoperative morbidity following coronary artery bypass graft surgery. AF is a disorder of cardiac rhythm characterized by rapid, irregular, disorganized atrial impulses and ineffective atrial contractions. Advanced age is an independent predictor of POAF patients undergoing CABG. The mean age of the elderly was 67.83±4.06 years. Among the study population, male was predominant, which reflects the male predominance for CAD [18,19]. BMI is not associated with POAF [20]. Hypertension is related to the development of POAF [21]. We found that most of our patients are hypertensive, which indicates a possible association with POAF. Our study observed a higher prevalence of old MI in the elderly. The observations of our study are similar to previous studies [22]. Tavakol and colleagues found plasma BNP values were insignificantly higher preoperatively and postoperatively in patients with AF [23]. We observed higher mean plasma BNP levels in the preoperative period, which might be associated

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with POAF, although other conditions may cause an elevation of plasma BNP. Xu and colleagues reported that increased LA size is related to POAF [11]. We found increased mean LA size among our study populations, and these findings have also been confirmed [7]. RCA occlusion has no significant relationship with POAF [24]. But our study observed RCA occlusion in more than one-third of subjects which might correlate with the prevalence of POAF. We found left main stem involvement in 45% of the study population, which includes both significant (≥50% luminal stenosis) and non-significant (<50% luminal stenosis) left main disease. This relatively high prevalence of left main stem involvement most likely indicates the influence of the aging process on coronary circulation. The frequency of in-stent restenosis is 3%-20% of the study population [25]. Our observations match previous studies Coronary endarterectomy is associated with POAF [26]. One-third of the study population underwent coronary endarterectomy, which might influence the prevalence of POAF. We didn't find any obvious imbalance in mean serum electrolytes (Na+, K+, and Ca++) level up to the third postoperative day and assumed that electrolyte imbalance might not be associated with POAF. Athanasiou and colleagues reported the incidence of POAF is 22% in elderly people undergoing OPCAB [27]. Advanced age independently predicts the prevalence of POAF in patients undergoing CABG. In our study, new onset POAF has been seen in 48.3% elderly. The higher frequency of POAF in this study was similar to the observed frequency (20%-40%) by Kouchoukos and colleagues. This study's higher prevalence of POAF strongly predicts the influence of advanced age-related association with POAF. The episodes duration of the majority of POAF was within the first 24 hours following OPCAB. Most of the observed POAFs were paroxysmal AF. We used amiodarone as a rhythm control strategy for managing POAF. With conservative management using amiodarone, 79.31% of the POAF reverted spontaneously to normal sinus rhythm. The mean ICU stays and duration of hospital stays were 3.43±1.61 and 10.03±2.12 days, respectively, comparable to the study conducted by Mathew and colleagues [28]. In this study, only one patient developed a stroke postoperatively as a consequence of POAF. No mortality was observed in this study

Conclusions

Careful stratification of patients to identify those in the high-risk group, using the criteria identified in this study, may lead to rapid recognition and treatment of new-onset POAF after CABG, reducing the risk of other complications and negative clinical outcomes. Our review highlights the high prevalence of new-onset POAF following CABG and the risk factors identified which could be included in a comprehensive screening tool. Our findings form a sound basis for guiding future multicenter prospective studies to strengthen the evidence base for risk of new-onset POAF after CABG. For healthcare professionals, strategies to monitor for and detect new-onset POAF should include management of preoperative risk factors, such as age-related health comorbidities, and a proactive management of periand postoperative complications.

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