Original Research Article

Incidence and Characteristics of Postoperative Atrial Fibrillation in Sudanese Patients Undergoing Heart Valve Surgery: A Descriptive Retrospective Study

Abstract

Introduction: Postoperative atrial fibrillation (POAF) is one of most common complications in the hospital setting after cardiac surgery in general and valve surgery in particular. The incidence estimates POAF after valve surgery has been described to be as high as 50%. However, no study has done to assess the incidence of POAF it in Sudanese population. Thus, this study aimed to assess the incidence and risk factors of POAF in Sudanese patients undergoing heart valve surgery.

Methods: A descriptive retrospective hospital-based study was conducted at two governmental hospitals (Alshaab Teaching Hospital and Ahmed Gasim Cardiac Surgery and Renal transplantation Centre), Khartoum, Sudan. All patients undergoing valve surgery between Jan 2017 and March 2019 were included and reviewed, and checklist was used to collect data, then descriptive and inferential statistics were analyzed using SPSS.

Results: POAF incidence in patients undergoing valve surgery was 39.9% (164/411). The majority of them (56.1%), were females, and the highest population (47.6%) were aged 41-60 years. Mitral valve surgery was the most frequent (61%) site of valve surgery. Moreover, among the independentvariables, age, and the site of valve surgery were statistically significant (P-value < 0.05) associated with POAF development. Bisoprolol was the most frequently used medication to manage POAF. Heart failure was the most frequent complication of POAF (29.3%) followed by death (25.6%).

Conclusion: The incidence of POAF is 39.9%. Age and the site of valve surgery were significantly associated with POAF in patients undergoing heart valve surgery. Moreover, prevention and treatment against POAF were suboptimal.

Keywords: Postoperative atrial fibrillation, Heart valve surgery, Bisoprolol, Mitral valve surgery

1. Introduction

Postoperative atrial fibrillation (POAF), defined as new-onset AF in the typically between day 2 and day 4 after surgery. POAF occurs in about half, near one-third, and up to 10% of patients undergoing cardiac, non-cardiac, and vascular surgeries [1]. The myth of POAF is benign and self-limiting due to spontaneous restoration of sinus rhythm before hospital discharge, has been dispelled by several short- and long-term cardiovascular consequences including higher risk to develop permanent AF, increase in 30-day mortality, stroke, extended hospital stay, increase in hospital readmissions, and greater health care costs [2,3].

Although the exact mechanism is less well understood. It was found that the intra- and postoperative changes affecting AF triggers and pre-existing atrial substrate may increase atrial susceptibility to POAF [1,4].According to the last Eurpean Society of cardiology guidelines highly recommend the perioperative use of amiodarone or beta blockers for the prevention of AF after cardiac surgery, while beta-blockers are highly not recommended for routine prevention of POAF in patients undergoing non-cardiac surgery [1]. Additionally, considering the expected clinical benefit of oral anticoagulant medication and informed patient preference, long-term anticoagulation should be explored for patients at risk for stroke with postoperative AF after non-cardiac surgery [1].

Cardiac surgery service started since 63 years in Sudan, and rebirthed with new facilities in 1998 with esblaishment of Ahmed Gasim Hospital (AGH), then two hospitals were provided the services. At this time 2,868 open heart operations were done in the three centers in Khartoum. Currently, five centres are avialableparalled with increasing number of cardiac surgeons [5]. Despite the localization of the cardiac surgery will reduce burden of patients from sake aboard services, it will lead to increase the incidence of POAF.Additionally, there is a lack of national research for all cardiovascular diseases, including AF, and most of the data is derived from small

hospital-based studies [6,7]. To the best of our knowledge, there are no available studies about this topic in Sudanese patients. Hence, our study aimed to determine the incidence and characteristics of POAF for Sudanese patients undergoing heart valve surgery at two major governmental hospitals in Khartoum, Sudan.

2. Methods

2.1. Study design and setting

This study was a descriptive retrospective hospital-based study. It was carried out in two largest governmental hospitals (Alshaab Teaching Hospital and Ahmed Gasim Cardiac Surgery and Renal Transplantation Center), Khartoum state, Sudan. The study population was all patients who developed atrial fibrillation (AF) after heart valve surgery in the period between January 2017 to June 2019.

2.2. Participants and study size

The study participants were those underwent heart valve surgery at the two hospitals during the study period. A total coverage sampling was applied based on the inclusion criteria and exclusion criteria. The inclusion criteria were patients aged >18 years and underwent heart valve surgery, whereas patients who had AF before the surgery, and the medical files containing missing information were excluded from this study.

2.3. Data collection methods

A pre-designed checklist was used as a data collection form, and it consisted of patients' characteristics includingage, gender, and the type of comorbid diseases. The second part contained disaese'scharacterstics assite of valve surgery, complications, and medications used to prevent POAF development. The main outcomes were incidence and characterstics were retrieved from those with documented POAF.

2.4. Statistical analysis

Data were analyzed by the IBM Statistical Package for Social Sciences (SPSS), Version 22.0 software (SPSS Inc., Chicago, Illinois, USA). The number and percentages of study variables were represented in frequency tables. The Chi-square test was used to test the statistical significance differences between demographics, clinical characteristics, and site of valve surgery with AF development. P-value ≤ 0.05 was considered to indicate the statistical significance.

2.5. Ethical Approval

Ethical approval (FPEC-23-2019) was obtained from the Ethical Committee of the Faculty of Pharmacy, University of Khartoum. Prior to data collection, additional approvals for checking the medical files were obtained from the administrations of Alshaab teaching hospital and Ahmed Gasim cardiac surgery and renal transplantation center. All collected data were encoded to ensure confidentiality throughout the study.

4. Results

The total number of patients who were undergoing heart valve surgery in the two hospitals during the study period was 411 patients (298 patients at Ahmed Gasim Cardiac Surgery and Renal Transplantation Center, 113 patients at Alshaab teaching hospital). Out of these 411 patients, 164 (104 from Ahmed Gasim Cardiac Surgery and Renal Transplantation Center, and 60 patients from Alshaab teaching hospital) patients were developed AF, which indicated the incidence of POAF was 39.9% (164/411). As shown in Table 1, most patients were females (56.1%), and the highest population (47.6%) were aged 41-60 years. Clinically, hypertension was the most frequent comorbid disease and was found in (14.6%) of the patients, congestive heart failure and coronary artery disease were found in 5.5% and 4.2% in patients, respectively (Table 1).

Regarding the valve surgery, mitral valve surgery was the most common site of valve surgery among the studied patients (61%), followed by aortic valve surgery, which was reported in 15.2% of patients (Table 1).

Concerning medications, only there were 35 (21.3%) patients used medications after surgery as a prophylactic to prevent AF development, while the majority of patients (78.7%) didn't use any medication to prevent AF (Table 2). Among those who used AF prophylactic medications, Bisoprolol was the most frequently used medication and reported in 32 patients, and it had been used with a dose of 2.5 mg/day for two days in 26 patients. Whereas digoxin (0.25 mg/day) was only used in 3 patients, for one or two days following valve surgery (Table 2). Heart failure was the most frequent documented complication (29.3%), followed by death which was reported in 25.6% of patients. Ischemic stroke was reported in 14% of patients, whereas hemorrhagic stroke was the least frequent complication, which was only documented in one patient.

As demonstrated in Table 1, Chi-square analysis showed that patients' age was significantly associated with AF (p= 0.001), and the prevalence of AF was the most common in the patients with age group of 41-60 yrs. Furthermore, site of valve surgery was significantly associated with AF (p=0.001), as the mitral valve surgery was the most common site of valve surgery among the participants. However, patients' gender insignificantly associated with the presence of AF (p= 0.064).

4. Discussion

One of the most common postoperative complications of cardiac surgery is postoperative atrial fibrillation (POAF) [8].Despite the availability of current anti-arrhythmic medicines for the prevention of AF, the prevalence of POAF has not changed. Patients who develop POAF have a significantly worse prognosis than those who do not have AF [9].Among cardiac surgeries, heart

valve surgery, represents the highest risk for developing POAF [10,11]. The current study is the first report that estimated the incidence of POAF in Sudanese population after heart valve surgery. POAF can be seen throughout the postoperative period following heart surgery, with a peak of incidences between the 2nd and 5th days [12].Our findings indicate that the incidence of POAF in the studied population was 39.9%, which is higher than conducted in United states (24%) [13],Canada (27.9%) [14], Romania (28.7%) [4],and Italy (23.1%) [15]. However, it is lower than a large cohort study done in the United States that showed 50% of patients developed atrial fibrillation during hospitalizations for aortic valve surgery [16].

Demographic characteristics of patients showed a higher incidence of POAF in females; however, this difference was statistically insignificant (p= 0.064), which is also observed in other reports that showed no significant difference observed between sexes and POAF [8,17]. In contrast, another study showed that females experienced shorter episodes and had a lower risk of developing POAF [18].Increasing patient age is a critical risk factor that raises the incidence of POAF, as aging may lead to structural changes of myocardial cells that trigger arrhythmias [14]. Previous literature supports the association between advanced age and POAF development [8,19,20]. Similarly, our findings also revealed that age was significantly associated with POAF development (p= 0.001).

Several comorbid diseases have been reported to be associated with the development of POAF, such as renal dysfunction and cardiovascular diseases e.g., hypertension and left ventricular hypertrophy [11,21,22]. In this study, hypertension was the most frequent concomitant disease (14.6%) among the studied patients. However, it was non-significantly associated with the distribution of POAF, similar to a previous report that indicated no relationship between hypertension and POAF [8].Nevertheless, previous studies showed that hypertension has

significantly associated POAF and is considered a preoperative predictor for POAF development [23,24].According to the literature, the site of heart valve surgery is likely to be a risk factor as well [25].POAF is more common in patients with mitral valve disease, particularly for older patients [26]. In the same line, our study revealed that mitral valve surgery was the most common site of valve surgery for those who developed PAOF, and reported in 61% of patients.

Applying of pharmacotheraputic prophylactic measures in heart surgery patients is essential to prevent POAF and its complications, and reduce cost to the patients, families and heath system. The European guidelines highly recommend beta-blockers or amiodarone for the prevention of POAF, and do not recommend the use of digoxin [1]. In our study, we found that 78.7% of POAF patients did not receive any preventive medications.For those who on preventive medications, beta-blockers were the majority (91.4%), while amiodarone was not prescribed in a single patient. Unexpectly, digoxin was used in 8.6% of patients, which necessitate more efforts to upgrade the practice towards POAF prevention in Sudanese setting.

The occurrence of POAF is associated with poor prognosis and increased morbidity and mortality [16,27]. Current study showed that there were many serious documented complications among POAF patients; heart failure was the most frequent complication that occurred in 29.3% of patients, followed by death and stroke. Our results were consistent with previous studies that showed sveral complications were associated with POAF as heart failure [11,13], increased incidence of stroke [16,28,29], and high mortality rate [16,30].Furthermore, another research reported that the risk of long-term mortality is 48% higher in patients with POAF than those without it [17].

The current study has some limitations. Firstly, the observational study design didn’t allowthe explorationof the causality between POAF and the factors related to mortality. Secondly, data

about other preventive measures against POAFwere not provided. Thirtly, due to the study's retrospective nature, some data of eligible patients were missed. For example, left atrial volume was not documented in patient's file.In spite of these limitations, this is the first study to assess the incidence of POAF following heart valve surgery in Sudanese patients. However, we recommend more multicenter controlled studies with a larger population to analyze the causes and risk factors for POAF development and investigate the rates and effectiveness of preventive and treatment measures against POAF.

5. Conclusion

In conclusion, the study showed that POAF incidence in patients who underwent heart valve surgery was high (39.9%). Old age, mitral valve surgery were significantly associated with POAF devolvement. Moreover, prevention and treatment against POAF were suboptimal in this study.

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Table 1. Distribution and associations of socio-demographic, clinical characteristics with AF following heart valve surgery among the study patients (n=164)

Demographic and clinical data	Number (Frequency %)	P value
Gender		
Males	72 (43.9)	0.064
Females	92 (56.1)	
Age (years)		
18-40	49 (29.9)	
41-60	78 (47.6)	0.001
61-70	24 (14.6)	
> 70	13 (7.9)	
Comorbid Disease		
Chronic Kidney Disease	6 (3.7)	
Hypertension	24 (14.6)	0.183
Congestive Heart Failure	9 (5.5)	
Coronary Artery Disease	7 (4.2)	
No comorbidity	118 (72)	
Site of valve surgery		
Mitral valve	100 (61)	
Tricuspid valve	1 (0.6)	
Aortic valve	25 (15.2)	
Mitral & Aortic valves	20 (12.2)	0.001
Mitral & Tricuspid valves	1 (0.6)	
Aortic & Tricuspid valves	17 (10.4)	

Table 2. Medications used to prevent atrial fibrillation following heart valve surgery among the study patients (n=164)

Variable	Number (Frequency %)
Medications used to prevent POAF	
No	129 (78.7)
Yes	35 (21.3)
Type of medications (n= 35)	
Bisoprolol	32 (91.4)
Digoxin	3 (8.6)
Doses of the medications	
Bisoprolol (n= 32)	
2.5 mg/day	26 (81.2)
5 mg/day	4 (12.5)
10 mg/day	2 (6.3)
Digoxin (n= 3)	
0.25 mg/day	3 (100)
Duration for using the medication preoperatively	
Bisoprolol (n= 32)	
One day	2 (6.3)
Two days	27 (84.3)
Three days	3 (9.4)
Digoxin (n= 3)	
One day	1 (33.3)
Two days	2 (66.7)