

# Predictive Factors for Post - Operative Atrial Fibrillation after By - Pass Surgery

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**Abstract:** Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by uncoordinated atrial activation with subsequent deterioration of mechanical function. Atrial fibrillation (AF) occurs in 20% till 40% of patients, mainly occurring in 2 - 4 days after coronary artery bypass grafting CABG. Despite the absence of universal pathophysiological concept describing POAF development, it is assumed that it is based on a combination of altering factors of local and systemic inflammation. This study aims to explore the risk factors of new - onset FOAP after CABG. In our study, significant independent predictors of atrial fibrillation were found LA, Hypertension and BMI>31 that can increase the incidence of atrial fibrillations after coronary artery bypass grafting with subsequent impact on hemodynamic stability, thromboembolic events and the hospital stay.

**Keywords:** Coronary artery bypass grafting (CABG); atrial fibrillation (AF)

## 1. Introduction

Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterized by uncoordinated atrial activation with subsequent deterioration of mechanical function (1, 2). Atrial fibrillation (AF) occurs in 20% till 40% of patients, mainly occurring in 2 - 4 days after coronary artery bypass grafting CABG (3, 4). Incidence of arrhythmia has not changed despite, improvements in anesthetic and surgical techniques (5). AF in the postoperative period of cardiac surgery (postoperative atrial fibrillation (POAF) is associated with worse clinical outcomes, causing a high financial repercussion to health systems (6). Although many of these episodes are short lived and self - terminating, at times it may result in significant hemodynamic compromise as well as further complications. Studies have shown that patients developing atrial fibrillation following cardiac surgery have a significant increased risk of thromboembolic phenomenon, stroke, congestive heart failure, myocardial infarction and mortality compared to patients who maintained sinus rhythm (7). This study aims to explore the risk factors of new - onset FOAP after CABG. Despite the absence of universal pathophysiological concept describing POAF development, it is assumed that it is based on a combination of altering factors of local and systemic inflammation. A wide range of potential perioperative predictors has been analyzed in various studies to stratify the risk of POAF (8).

## 2. Material and Methods

This is a prospective study conducted at American Hospital No 3 in Tirana, Albania. A total of 543 patients who underwent selected and isolated OPCAB from March 1, 2017 to December 30, 2020 were selected for this study. The excluded criteria, included history of AF, non - sinus rhythm, congenital heart disease, concomitant surgery, valvular heart disease, cardiac pacemaker implantation. Patients were divided into AF group and non - AF group according to whether they had new - onset AF after OPCAB. AF was denied as any episode of AF noted by continuous ECG/

telemetry monitoring, or documented by a physician in the chart, lasting for 30 s or more. The present study includes multiple pre, intra, and post OPCAB variables. The laboratory and ultrasound data are the values of the check before surgery. Perioperative medicine history and in - hospital complications were recorded carefully. In our study, two researchers collected clinical data, and the data between them had a high consistency. All patients were admitted into ICU after surgery and underwent continuous hardwire monitoring of blood pressure, pulse, electrocardiogram. After the patient leaved the ICU, continuous telemetry monitoring of blood pressure, pulse, electrocardiogram would be performed until discharge. Patients were checked for blood tests, liver and kidney function immediately and daily after surgery. If the patient did not have any contraindications, nitroglycerin,  $\beta$  - blocker, and antiplatelet drugs were routinely given after the operation. No other prophylactic therapies were taken to prevent postoperative arrhythmia. Other drugs were given according to the patient's condition. If ECG monitoring showed that AF occurred, a 12 - lead ECG and blood gas examination would be performed at the same time. And the patient would be given oral or intravenous amiodarone. All patients were converted into sinus rhythm before discharging. No patients required electrical cardioversion.

### Statistical analysis

The SPSS 25.0 statistical software was used for data analysis. Kolmogorov - Smirnov test was used to test the normality of distribution of continuous variables. Means and standard deviations were reported. Chi square test was used to compare the proportion of categorical variables. Multivariate logistic regression was used to determine the independent predictors of atrial fibrillation. A p value  $\leq 0.05$  was considered statistically significant.

## 3. Results and Discussion

Eighty - nine (16.4%) were females and 454 (83.6%) males. Table 1 shows the comparison of the mean values of variables of patients with and without fibrillation. In

univariate analysis patients with atrial fibrillation had a higher mean age ( $p=0.001$ ), a lower mean level of Hgb ( $p=0.005$ ), a higher mean time of extubating ( $p=0.006$ ) and a higher mean time of LA ( $p=0.01$ ). No significant differences were found regarding other continuous variables. Association of categorical variables with fibrillation is shown in table 2. The frequency of atrial fibrillation was significantly higher among females (53.9%) ( $p=0.001$ ) and among patients with BMI>31 (53.7%) ( $p=0.001$ ). No significant difference was found for other categorical variables. A multivariate regression model that controls for all possible confounders was used including all significant variables from the univariate analysis (table 3). Significant independent predictors of atrial fibrillation were found LA, Hypertension and BMI>31. Atrial fibrillation is considered the commonest arrhythmia after cardiac surgery. It has an impact on the clinical situation, hemodynamic stability, thromboembolic events, the hospital stay as well as a direct impact on hospital cost (9). AF is a main contributing factor for increasing postoperative morbidity and mortality (10). Despite advances in techniques of surgery, CPB, and cardioplegic arrest, the occurrence of post cardiac surgeries AF has significantly increased (11). This happened because of patients, tend to be older and iller, with a great frailty index, and this high - risk subgroup is more liable for complications. It is also of note that, the use of telemetry (continuous ECG monitoring) has improved its early detection (12). Abundant studies were implemented to identify the predictors of atrial fibrillation for the creation of an atrial fibrillation risk score. In this retrospective research, we are trying to investigate the perioperative predictors of AF for our patients with on - pump CABG (13). The increasing incidence of AF after heart procedures is yet to be elucidated; many factors were contemplated to work in the pathogenesis of postoperative AF like changes of the atria (increased fibrosis and atrial dilatation). These changes are thought because of age, mechanical damage, volume overload, intraoperative atrial ischemia, electrolyte imbalances, hypertension and pericardial lesions (pericarditis) (14). Additionally, the significant rise in the perioperativesympathetic tone, plays a major role in the development of AF (15). All the abovementioned factors when occurring alone or in different combinations result in a high likelihood of development of POAF. Many Perioperative variables have been proposed as predictors that increase the appearance of postoperative AF after cardiac surgery like advanced age (16), hypertension (17),  $\beta$  - blocker drug withdrawal (8), respiratory complications (5), right coronary artery stenosis (18), and bleeding (19). Age has been a convenient independent predictor of AF in general (20). Moreover, increased age is the most frequently recognized risk factors for the incidence of AF after CABG. This higher occurrence of AF with older age could be attributed to Age - related comorbidities (21). This has long been explained by the fact that aging causes degenerative changes in the atrium as well as changes in atrial physiology. Amar and colleges, 2002, concluded these changes as “shorter effective refractoriness, delayed SA and AV nodal conduction times, atrial stiffening, and splitting of the atrial excitation waveform caused by the pectinated trabeculae” (22). Additionally, Trauma to sympatho - vagal fibres of the cardiac plexus during surgery may be

contributed to the aging of patients that can lead to POAF (23).

#### 4. Conclusion

In our study, significant independent predictors of atrial fibrillation were found LA, Hypertension and BMI>31 that can increase the incidence of atrial fibrillations after coronary artery bypass grafting with subsequent impact on hemodynamic stability, thromboembolic events and the hospital stay.

Prophylactic measures including, pharmacological strategies as early resumption of beta Blockers and early correction of electrolyte imbalance particularly targeting patients at risk can decrease the financial burden and more importantly decrease postoperative morbidity and mortality.

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blockers. *Pharmacotherapy.*2010; 30 (7): 274e–318e. Review.

**Table 1:** Comparison of the mean values of variables of patients with and without fibrillation

Variables	POAF No		POAF Yes		P
	Mean	SD	Mean	SD	
Age	59.5	7.7	62.9	7.9	<b>0.001</b>
LDL	123.5	33.1	122.3	33.1	0.7
HbA1c	6.7	1.3	6.8	1.4	0.2
Hgb	14.2	0.9	14.0	1.1	<b>0.005</b>
EF	49.9	7.4	49.0	7.1	0.2
Time of ECC	105.1	31.2	107.6	37.7	0.5
Extubating time	10.4	2.2	11.0	2.5	<b>0.006</b>
LA	35.1	2.8	36.9	3.2	<b>0.001</b>

**Table 2:** Association of categorical variables with fibrillation

Variables	FA - POAF No		FA - POAF Yes		P
	N	%	N	%	
Gender					<b>0.001</b>
Female	41	46.1	48	53.9	
Males	338	74.4	116	25.6	
Hypertension	199	59.8	164	40.2	<b>0.001</b>
Smoker	234	79.3	61	20.7	<b>0.001</b>
DM	213	68.5	98	31.5	0.4
Renal failure	82	60.3	54	39.7	<b>0.005</b>
Clearance <50	7	70.0	3	30.0	0.9
Clearance 50 - 85	75	59.5	51	40.5	<b>0.004</b>
Clearance >85	299	73.3	109	26.7	<b>0.002</b>
BMI>31	31	46.3	36	53.7	<b>0.001</b>
BMI 25 - 30	338	73.8	120	26.2	<b>0.001</b>
BMI < 25	7	58.3	5	41.7	0.4
COPD	77	70	33	30	0.9
Arteriopathy	209	67.6	100	32.4	0.2
Post MI preoperative	293	68.5	135	31.5	0.2
HTP	178	66.2	91	33.8	0.07
Complete revascularization	339	69.5	149	30.5	0.6
Partial revascularization	35	74.5	12	25.5	0.5
Post operative MI	36	81.8	8	18.2	0.07

**Table 3:** Risk factors for Fibrillation. Multivariate logistic regression

Variable	Odds ratio	95% CI	P
Gender	0.3605	0.2067 to 0.6289	<b>0.0003</b>
LA	1.2060	1.1230 to 1.2951	<b>&lt;0.0001</b>
Hypertension	3.0795	1.8623 to 5.0921	<b>&lt;0.0001</b>
Smoker	0.4554	0.2907 to 0.7134	<b>0.0006</b>
BMI>31	3.6687	2.0554 to 6.5483	<b>&lt;0.0001</b>