ATRIAL FIBRILLATION;
TO DETERMINE THE FREQUENCY AND ITS PREDISPOSING FACTORS IN PATIENTS AFTER CORONARY ARTERY BYPASS GRAFTING.

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ABSTRACT… Introduction: Atrial Fibrillation (AF) is one of the most common arrhythmia after coronary artery bypass grafting (CABG). Many risk factors have been identified for the development of postoperative AF with varied level of evidence. AF is associated with increased risk of morbidity and mortality causing prolong hospital stay and utilizing more resources. Our study was aimed to identify high risk population for developing post-operative AF and to draw recommendations for its prevention. **Objectives:** Our objective was to determine the frequency of Atrial Fibrillation (AF) and its predisposing factors in patients after Coronary Artery Bypass Grafting (CABG). **Setting:** The study was conducted at Cardiac Surgery Department / Faisalabad Institute of Cardiology, Faisalabad. **Duration of Study:** 15-12-2014 to 14-07-2015. **Study Design:** Cross sectional study. **Results:** The result showed that out of 130 patients undergoing CABG surgery, 104 (80.3%) male and 26 (19.7%) females, 9(7%) patients suffered AF in post-operative phase. A significant association was found between postoperative AF and advanced age ($p = 0.011$), obesity ($p = 0.028$), low EF ($p = 0.000$), and post-operative use of β-blocker ($p = 0.007$). Significant difference was found between postoperative AF and days stayed in hospital ($p = 0.000$) and magnesium level at first day ($p = 0.038$). On the other hand there was no significant relationship found between AF and prolongs cross clamp and bypass time. **Conclusion:** Advance age, obesity, congestive heart failure, low ejection fraction and withdrawal from beta blockers in post-operative period have been identified as a significant risk factors for the development of post-operative atrial fibrillation.

Key words: Atrial Fibrillation, Coronary Artery Bypass Grafting, Postoperative Arrhythmia.

INTRODUCTION

Atrial fibrillation is frequent arrhythmic complications of coronary artery bypass grafting (CABG) as its incidence varies from 20 to 40 % primarily within 2 to 3 days.[1,2] The incidence of AF has been estimated to be 26.7% in a meta-analysis of 24 trails.[3] Over the past decades the incidence of post CABG AF is continuously increasing.[3]

For the development of postoperative AF with varied level of evidence many risk factors have been identified. The strong association of prior AF, advanced age, male gender, obesity, postoperative beta blocker withdrawal have been established, while other factors such as congestive heart failure (CHF), chronic lung disease, systemic emboli, decreased (LV/EF),

increased left atrial (LA) size, hypomagnesaemia, myocardial infarction peri and postoperative, prolong cross clamp and bypass time have shown less likely association with this arrhythmia.[4]

These frequent post-operative cardiac arrhythmias linked and consequently prolong the hospital stay. The episodes of AF are usually symptomatic as patients experience palpitation, nausea and malaise.[5]

Identification and thus reduction of predisposing factors may result in better treatment strategies for the common cardiac arrhythmia. Furthermore, few local studies are available which can identify the frequency and the predisposing factors of post-operative AF in our patient population.[6]

The current study was aimed to evaluate the

frequency of Atrial Fibrillation in post CABG and to determine the inclining factors associated with AF after CABG in population understudy.[7] The resulting commendations may aid in reduction of morbidity and mortality as it will enable us to predict the patient may at the risk of developing AF and hence, save them from having consequential arrhythmia. This will lead in minimize the duration of hospital stay and cost, both to the patient and the hospital.[8]

PATIENTS AND METHODS

OBJECTIVE
Our objective was to determine the frequency of Atrial Fibrillation (AF) and its predisposing factors in patients after Coronary Artery Bypass Grafting (CABG).

OPERATIONAL DEFINITIONS

Atrial Fibrillation
On the electrocardiogram (ECG) the irregularity of P – waves that vary in timing would be considered as presence of Atrial Fibrillation (AF) in first 3-5 post-operative days of ICU stay.

Predisposing Factors
Advanced age
Patient with age $\geq$ 50 years was taken as advanced age patients.

Obesity
Patient with BMI $\geq$ 30 was taken as obese patients.

Decreased LV/EF
Patient with EF$\leq$ 40 % was taken as patients with decreased LV/EF.

Hypomagnesaemia
Patients having serum level of magnesium$\leq$1.6mmol/L was taken as Hypomagnesaemia.

Post-operative withdrawal from β- blockers
Patient who were taking beta blockers for more than 6 weeks was selected

Perioperative Myocardial infarction (MI)
Patients with chest pain and ST elevation more than 2mm in any lead on ECG or with raised cardiac enzymes was taken as patients of perioperative MI.

MATERIAL AND METHODS

Setting
The study was conducted in Cardiac Surgery Department / Faisalabad Institute of Cardiology, Faisalabad.

Duration of Study
15-12-2014 to 14-07-2015

Study Design
Cross sectional study

Sampling Technique
Non-probability consecutive sampling.

Sample Size
130 consecutive Patients
(The sample size has been calculated using WHO Sample size calculator)
Absolute precision required 6%, P=13.7%, Confidence level 95%

Sample Selection

Inclusion Criteria
All Patients undergo electively CABG on both genders in age group 30-80 years.

Exclusion Criteria
• Patients undergoing for Re – do CABG
• Patients having IHD with concurrent valvular heart disease
• Patient having prior documented history of AF

Methodology
Informed consent was taken from all the patients fulfilling the inclusion criteria. Patients' clinical data (age, sex) and information regarding factors, which can predispose the patient to AF, these have include (advanced age, male gender, obesity, CHF, chronic lung disease, systemic emboli, decreased LV/EF, hypo-magnesaemia,

peri and post-operative MI, prolong cross clamp and bypass-time) were recorded in the pre-designed Proforma.

Post operatively Patients were monitored in the Cardiac Surgery ICU / Ward information about the presence of factor which predisposes AF was recorded. Occurrence of AF was noted and patients were divided into two groups in the presence or absence of AF.

Data Collection Tools
Quantitative and qualitative variables were entered into the predesigned proforma which is attached as appendix

STATISTICAL ANALYSIS
The data was entered and analyzed using SPSS (Statistical Package for social Sciences) 18.0. Mean +SD was calculated for quantitative variables like age. Frequencies and percentage was calculated for qualitative parameters like gender, AF, Obesity, decreased EF, withdrawal from beta blocker, prolong pump or cross clamp time and hypomagnesaemia. Effect modifiers like age and gender was controlled by stratification and post stratification chi-square test was applied. A P – Value of ≤0.05 was considered as statistically significant.

RESULTS
The result shows that out of 130 patients undergoing CABG surgery, 104 (80%) male and 26 (20%) were females, 9(7%) patients suffered AF in post-operative phase. The mean and standard deviation of age was observed as 55.81± 9.00 years. A significant association was found between postoperative AF and advanced age (p = 0.011), obesity (p = 0.028), low EF (p = 0.000), and post-operative use of β-blocker (p = 0.007). Significant difference was found between postoperative AF and days stayed in hospital (p = 0.000) and magnesium level at first day (p = 0.038). On the other hand there was no significant relationship found between AF and prolonged cross clamp and bypass time. No patient suffered from perioperative MI so no data regarding its relationship could be established with post-operative AF.

A total of 7 male patients and 2 female patients suffered from AF post operatively and there was no significant association found between post CABG AF and gender (p=0.475).

All the patients were divided into two groups regarding age. There were 102 (78.4%) patients having age of 50 years or more and 28 (21.6%) patients having age less than 50 years. There was significant association between post operative AF and advanced age (p=0.04) as %) 7 patients (88 %) were in older group (>50 years), while only 2 patients (22%) were in younger group (<50 years).

Statistically significant relationship has been observed between obesity and development of AF post operatively (p=0.022) as out of 13 obese patients (BMI >30) 4 (11%0 developed AF.

There was no significant difference found between post-operative AF and pre-operative hypomagnesaemia. But there was significant difference found between postoperative AF and magnesium level at first day (p=0.017).

A total of 17 patients (13%) had ejection fraction (EF) <40% whereas 113 (87%) patients with EF >40%. There was significant association observed between post-operative AF and low EF (p=0.000), AF occurred in 6 (35.2 %) patients with low EF.

A total of 30 patients (24%) were on Beta blocker pre-operatively and 100 (76%) patients were not taking beta blocker. There was significant association between post CABG AF and use of β-blocker withdrawal (p=0.03). AF has occurred in 4 patients out 30 patients using β-blocker pre operatively.

No patient suffered from myocardial infarction peri and post operatively in each condition. So no association can be determined.

Cardiopulmonary bypass (CPB) time (>120 min) was documented in 12 (10.1%) patients, while CPB time less than 120minutes was observed in 118 (90%) patients. This study failed to observe

any statistically significant association between post-operative AF and prolong CPB time (p=0.057).

35 (25%) patients required more than 90 minutes of aortic cross clamp time, while the majority of the (75%) 95 patients required less than 90 minutes to complete their grafting. No significant association was observed between post-operative AF and prolong ACC time (p=0.376).

The mean and standard deviation of days stayed in ICU 5.22+ 2.6. It is observed that in patients who developed AF the ICU stay as well the hospital stay was prolonged.

Variable	Minimum	Maximum	Mean	Standard Deviation
Age	30	80	55.1	9.002
Height	122	190	164.66	13.13
Weight	35	118	73.6	9.35
BMI	14.3	47.9	27.1	4.56
Magnesium level	1.3	3.4	2.012	0.29

Table-I. Mean and std. deviation of quantitative variables

Gender		Frequency		Percentage
Male		104		80.3%
Female		26		19.7%
Total		130		100%
Gender* AF during ICU stay				
		AF during ICU stay		Total
		Yes	No	
Gender	Male	7	97	104
	Female	2	24	26
Total		9	121	130
P value 0.475* Chi Square (>0.05)** Not Significant				

Table-II. Distribution of patient by gender (n=130)

Age in years		Frequency		Percentage
Age 50 years and above		33		25%
Age less than 50 years (30-49)		97		75%
Total		130		100%
Age * AF during ICU stay				
		AF during ICU stay		Total
		Yes	No	
Age	>50 years	7	26	33
	<50 years	2	95	97
Total		9	121	130
P value 0.04* Chi Square (>0.05)** Significant				

Table-III. Distribution of patients by age

Obesity	Frequency	Percentage
BMI more or equal 30	34	26%
BMI less than 30	96	74%
Total	130	100%

Obesity * AF during ICU stay				
		AF during ICU stay		Total
		Yes	No	
Age	BMI>30	4	30	34
	BMI<30	5	91	96
Total		9	121	130

P value
0.022* Chi Square
(>0.05)** Significant

Table-IV. Distribution of patient by obesity

DISCUSSION

The present research has been conducted at Faisalabad Institute of Cardiology Faisalabad which is one of the largest hospitals only dedicated to deal with patients having heart diseases. AF has been considered as most common arrhythmia to occur after CABG and is associated with increased morbidity and mortality and longer, more expensive hospital stays.[9,10] The incidence of post-operative AF (POAF) varies between 20-40% as reported in different studies. The incidence of POAF has increased continuously over the past decades and it's believed to be either due to aging of the population undergoing heart surgery or deployment of more sensitive methods of surveillance of AF, such as telemetric monitoring.[11,12]

According to MEDLINE database reports published between 2010 and June 2014 by using the keyword atrial fibrillation, coronary artery bypass grafting. The author found 10 to 65 % of patients developing AF post operatively depending on patient's profile, type of surgery, method of arrhythmia surveillance and definition of arrhythmia.[3] Patient undergoing CABG alone have lower incidence of post-operative AF than patients undergoing valve surgery or combined CABG–valve operations. The Meta analysis of 24 trails included in this study estimated the incidence of AF at 26.7% in patients undergoing CABG alone.[4] The present study has also revealed less incidence of AF in our population as 9 out of 130 patients (7 %) developed AF post operatively.

Review of literature has consistently shown the advance age as predisposing factor for the development of AF after CABG. A study suggested that older age is the most effective predisposing reason for AF because ageing may lead to dilatation and an enhancement in fibrosis.[16] It shown significant effect of advanced age for post-operative AF with $p < 0.001$. A similar trend also reported, in which he found the significant association between advance age and post-operative atrial fibrillation (OR for 10-year increase, 1.75; 95% CI, 1.59-1.93). It is also reported that the overall frequency of AF rising 1.8% with age. The incidence of AF in patients <70 years is estimated to be 0.4%, whereas for patients >70 years, the incidence is 2% to 4%.[17] It was searched that based on the patient's age, the frequency of AF deviated from 13% for patients younger than 50 years of age to 52% for those 80 years of age or older, with an OR of 1.60 for each decade of additional life. Some said that older age may cause structural changes in the heart such as an increase in chamber size and fibrosis. They reported that along with these changes other age related comorbidities seems to be responsible for increased incidence of AF with increasing age.[18,19] Consistent with other reports in which older age constantly has been discovered to be a self-determining predictor for post CABG AF, our research also revealed that advance age (more than 50 years) has significant association for the occurrence of post operative AF (95% CI 1.02 to 1.08, 0.04).

The patients having BMI >30kg/m2 undergoing

CABG have consistent reports regarding development of POAF. Studies showed that mild obesity and moderate severe obesity were independent risk factors for POAF in a retrospective study in 4583 patients over 50 years of age, undergoing CABG. Moreover, some found BMI to be an independent predictor for new-onset AF in the general population.[21] Studies found that obesity, age and male gender to be independent predictors of post-operative AF.[13,14,15] Similarly in our study, we have observed the preoperative obesity (body mass index >30 kg/m2) in which there were 24.7% patients having obesity. By using chi- square analysis we came to know that obesity have a significant association for post-operative AF having p-value = 0.022, as body mass index enhances the risk of post-operative AF. So obesity is considered as one of the risk factors for the post-operative AF after CABG.

Prior studies have determined that Low left ventricular ejection fraction (LVEF) is an important risk factors which may predispose patients undergoing CABG to develop POAF. Research work reported in their study that low ejection fraction is a significant risk factor, predisposing POAF. Similarly some other studies have also shown the significance of EF <40% regarding POAF. They found that patients with an LVEF <30% predisposes post-operative AF and had slightly increased mortality.[20]

Another risk factor that has been evaluated regarding POAF was beta blocker (BB) withdrawal after surgery. In a meta analysis of thirty one trails evaluated has shown that beta blocker withdrawal predisposing POAF (OR 0.30, 95% CI 0.22 to 0.4). ACC/ AHA quoted that withdrawal of beta-blockers double the risk of AF after CABG. Thus, early re-initiation of beta blockers is critical for avoidance of this complication.[22,23] Similarly we also observed that withdrawn of beta blocker post operatively predisposes the risk of POAF. (OR 1.112, 95% CI 1.16 to 1.24, p=0.03).

It has been proposed that prolong CPB and cross clamp time might impact post CABG AF incidence, but didn't achieve accepted levels for statistical significance (p=0.57) and (p=0.376).

Existing literature also shows that the administration of magnesium level reduces the post-operative risk of AF. Studies have noticed that the management of magnesium level reduces the frequency of AF in patients undergoing CABG.[24] In the present research we found significant difference between the magnesium level at day 1 post-operative AF (p=0.017) which shows that there is significant effect of low magnesium level on post-operative AF. We also observed that there was significant difference found between postoperative AF and days stayed in hospital (p = 0.000) and magnesium level at first day (p = 0.038).

CONCLUSION
Atrial Fibrillation is common complication following coronary artery bypass grafting surgery. Which not only increases morbidity and mortality but also increase financial burden on account of longer ICU and hospital stay. Advance age, obesity, congestive heart failure, low ejection fraction and dilated LA have been identified as a significant risk factors for the development of post-operative atrial fibrillation. So different modalities such as administration of beta blockers, amoidarone, magnesium, can be utilized to prevent POAF in the groups of high risk patients undergoing CBAG. This will reduce not only morbidity and mortality in these high risk patients but also help to reduce cost of surgery which is of great importance especially in our part of the world.

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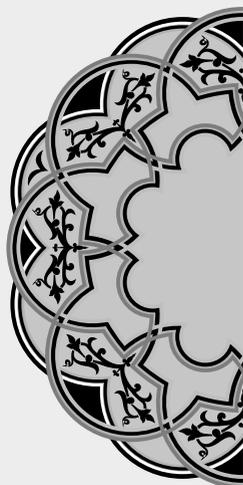
"Comparison is the thief of joy."

Unknown

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