Predictors of Atrial Fibrillation after Coronary Bypass Surgery

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Abstract: Atrial fibrillation is the most common arrhythmia after coronary artery bypass grafting (CABG), with a rate of occurrence of 17% to 33% in different studies. Post-CABG AF is known to be a potential risk for systemic thromboembolism, CABG and combined valve surgery have a higher incidence of postoperative AF than do patients having CABG alone. We studied sixty patients with ischemic heart disease diagnosed by coronary angiography and underwent coronary artery bypass surgery,30 patients had post operative AF and another 30 patients didn't have post operative AF. The results of this study as regard preoperative assessment of studied groups showed increased age, body mass index, presence of hypertension, dyslipedemiam, reduced ejection fraction, increased left atrial dimension and increased number af affected vessels were statistically significant while intraoperative failed RCA grafting was statistically significant and lastly postoperative increased duration of positive inotrope, decreased magnesium level, reduced ejection fraction and increased left atrial size were statistically significant. The conclusion from our results suggested that preoperative, intraoperative and postoperative Assessment of the surgical patients may be useful in risk stratification for the occurrence of post CABG AF

1. Introduction

Atrial fibrillation (AF) is the most common arrhythmia after coronary artery bypass grafting (CABG), with a rate of occurrence of 17% to 33% in different studies (Hakala *et al.,*2003). Patients undergoing CABG and combined valve surgery have a higher incidence of postoperative AF than do patients having CABG alone (Creswell *et al.,* 2001).The peak of AF incidence occurs between 2 and 4 days after operation, with <10% happening on the first postoperative day (Aranki *et al.,*1996). AF after CABG is self-limiting in most cases, but even when it is uncomplicated, it requires additional medical treatment and a prolonged hospital stay and has the concomitant extra costs of operative treatment (Creswell *et al.,*2001). Post-CABG AF is known to be a potential risk for systemic thromboembolism, hemodynamic compromise, and even stroke (Hravnak *et al.,*2002).Therefore, it is advisable that prophylactic therapy with amiodarone or atrial pacing be administered to decrease its incidence (Guarnieri *et al.,*1999).However, prophylactic treatment to prevent AF with intravenous amiodarone is not cost-effective if given to all patients. In addition, such treatment may have unfavorable side effects. On the other hand, the prophylaxis of the whole patient population undergoing CABG is not reasonable and this renders the identification of at risk patients of post-CABG AF very helpful (Mahoney *et al.,* 2002). Therefore much attention has focused on the identification of those at a higher risk of the occurrence of the post-operative AF,

so multiple investigations have attempt to find out the demographic risk factors and the predictors of post-operative AF, and different results were obtained.These discrepancies may be explained by difference in the patient profiles, the methods of detection and definition of AF (Hogue *et al.,* 2005).

2. Patients and Methods

We studied sixty patients with ischemic heart disease diagnosed by coronary angiography and underwent coronary artery bypass surgery in Cairo university hospital during the period between June 2011 to Marsh 2012. We collected the data of 30 patients who had post operative AF and another 30 patients who didn't have post operative AF.

Exclusion criteria of these patients include History of AF, atrial flutter, PACs or PVCs, cardiac rhythm other than sinus rhythm, associated surgery e.g. mitral valve repair, previous usage of anti arrythmic drugs other than B.B,uncontrolled heart failure, death occurred intra operative and presence of implanted pacemaker.

All patients included in the study were subjected to preoperative assessment, intra operative data, and post operative assessment to detect the predictors of AF after CABG.

A-Preoperative assessment:

1- Preoperative history, Demographic data (Age, Gender, Weight, Height,Body mass index BMI). History of hypertension, diabetes, smoking,

Dyslipidemia, previous myocardial infarction (MI), Other diseases

2-Preoperative laboratory investigations,Complete blood count, serum urea and creatinine, Na, K+, Mg ++.serum albumin,liver enzymes,coagulation profile (PC, Pt, INR) and lipid profile (Serum cholesterol, Triglycerides, HDL and LDL)

3-Preoperative ECG, P wave size, Myocardial infarction(MI) and Bundle branch block (BBB).

Abnormal P-wave morphology, is defined as P-wave duration of more than 110 ms with interpeak notch of more than 40 ms and duration of terminal negative P-wave deflection in lead V1 more than 40 ms.

4-Pre operative echocardiography: All patients underwent a preoperative transthoracic echocardiography with measuring the following data, left ventricular end diastole dimension (LVEDd), Left ventricular end systole dimension (LVESd), posterior wall (PWT), inter ventricular septum (IVS), Right ventricular dimension (RV), Left atrium dimension(LAD), Regional wall motion abnormality (RWMA),Fraction shortening (FS) and ejection fraction (EF).

5-Pre operative Coronary angiography.

B- Intra-operative assessment:

All patents underwent on pump CABG a median sternotomy was performed in all the patients. Standard cardiopulmonary bypass was established by ascending aortic cannulation and with a single 2-stage venous cannulation of the right atrium. Myocardial protection was achieved by ante-grade intermittent warm blood cardioplegia every 15 minutes.

All the patients received total revascularization.

We collect data intra operative such as failure of RCA grafting, numbers of Blood transfusion and other complication to detect intra operative predictors of post operative AF.

C- Post operative assessment:

All patients underwent full laboratory investigations, duration of inotrops, ECG and full detailed Echo.

1-Post operative laboratory investigations:Complete blood count including, haemoglobin,total leukocytic count and platelets counts, serum urea and creatinine,serum Na, K+ and Mg ++, serum albumin,liver enzymes, Co-agulation profile (PC, PT, INR) and lipid profile including, serum cholesterol and Triglycerides.

2-Post operative inotrop duration:

We observe the duration of the inotrops post operative.

3-Post operative ECG:

To detect occurrence of the new-onset AF during the first 3 days following CABG surgery. AF was defined as absent P wave before the QRS complex together with irregular ventricular rhythm on the rhythm strips.Only AF episodes lasting longer than 5 minutes were counted.

4-Post operative echocardiography:

Post operative 2D conventional echo was done to exclude any intra-operative structural lesions or post operative left ventricular dilatation and to assess cardiac function post CABG. The following data were measured: LVEDd, LVESd, PWT, IVS, RV, LAD, RWMA, FS and EF.

Statistical Analysis:

Data were collected and submitted to statistical analysis.

Mean + standard deviation (SD), the student t-test, categorical variable were compared by mean of chi-square.

3.Results

We studied Sixty patients with ischemic heart disease diagnosed by coronary angiography and underwent coronary artery by- pass surgery in Cairo university hospital from June 2011 to March 2012.

Patients were divided into two groups as following (Group A) included 30 patients which developed AF post CABG and (Group B) included 30 patients which didn't develop AF post CABG.

Characteristics of both groups:

I- Demographic data of both groups.

II- Clinical data of both groups.

III- Pre-operative laboratory data.

IV- Preoperative ECG.

V- Preoperative Echo.

VI- Preoperative Coronary angiography.

VII-Intra–operative RCA grafting.

VIII- Postoperative laboratory data.

IX- Postoperative inotropic duration.

X- Post operative Echo.

I-Demographic data of both groups:

Twenty three (77%) patients out of thirty patients were males and seven patient (23%) were females in group A while there were twenty one (70%) were males and nine patients (30%) were female sin group B which was statistically insignificant (*p* value 0.771). The age in group A ranged from fifty five year to sixty seven year with mean ± standard deviation (61.3 ± 5.9) while in group B ranged from thirty seven year to fifty seven year with mean ± standard deviation (46.8 ± 9.9) which was statistically significant (*p* value < 0.01).

The body mass index in group A ranged from twenty seven to thirty five with mean ± standard deviation (30.9 ± 3.9), while in group B ranged from twenty three to twenty eight with mean ± standard deviation (25.4 ± 2.2) which was statistically significant (*p* value < 0.01) (Table1).

Table 1:Demogrphic data between two groups:

Groups Variables	Group A (N. 30)		Group B (N. 30)		P value
	Male	Female	Male	Female	
Gender	23 (77%)	7 (23%)	21 (70%)	9 (30%)	0.771 N.S
	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
Age	55 → 67	61.3 ± 5.9	37 → 57	46.8 ± 9.9	< 0.01 S
BMI	27 → 35	30.9 ± 3.9	23 → 28	25.4 ± 2.2	< 0.01 S

II- Clinical data of both groups:

Twenty four (80%) patients out of thirty patients were smokers and six patients (20%) were non smokers in group A while twenty (66.7%) were smokers and ten patients (33.3%) were non smokers in group B which was statistically insignificant (*p* value 0.382). Eighteen (60%) patients out of thirty patients were hypertensive and twelve patients (40%) were not hypertensive in group A, while nine (30%) were hypertensive and twenty one patients (70%) were not hypertensive in group B which was statistically insignificant (*p* value 0.037). Sixteen (53.3%) patients out of thirty patients were diabetic and fourteen patients (46.7%) were not diabetic in group A while twelve (40%) were diabetic and eighteen patients (60%) were not diabetic in group B which was statistically insignificant (*p* value 0.438).

Twenty three (77%) patients out of thirty patients were dyslipidemic and seven patients (23%) were not dyslipidemic in group A while eleven (37%) were dyslipidemic and nineteen patients (63%) were not dyslipidemic in group B which was statistically significant (*p* value 0.004).

Ten (33.3%) patients out of thirty patients were suffering from previous MI and twenty patients (66.7%) were not suffering from previous MI in group A while seven (23%) patients were suffering from previous MI and twenty three patients (77%) were not suffering from previous MI in group B which was statistically insignificant (*p* value 0.567) (Table 2).

Table 2:Clinical data of study patients:

Groups Variables	Group A (N. 30)		Group B (N. 30)		P value
	Present	Absent	Present	Absent	
Smoking	24 (80%)	6 (20%)	20 (66.7%)	10 (33.3%)	0.382 N.S
HTN	18 (60%)	12 (40%)	9 (30%)	21 (70%)	0.037 S
D.M.	16 (53.3%)	14 (46.7%)	12 (40%)	18 (60%)	0.438 N.S
Dyslipidemia	23 (77%)	7 (23%)	11 (37%)	19 (63%)	0.004 S
Previous MI	10 (33.3%)	20 (66.7%)	7 (23%)	23 (77%)	0.567 N.S

III-Preoperative laboratory characteristics:

The serum hemoglobin in group A ranged from 12 mg/dl to 16 mg/dl with mean ± standard deviation (13.9 ± 2.1) while in group B, it ranged from 12 mg/dl to 15 mg/dl with mean ± standard deviation (13.7±1.7 which was statistically insignificant (*p* value 0.829).

The total leukocytic count in group A ranged from 6 /mcl to 10 /mcl with mean ± standard deviation (7.7 ± 2.1) while in group B, it ranged from 4 /mcl to 10 /mcl with mean ± standard deviation (7.4 ± 2.7 which was statistically insignificant (*p* value 0.571).

The platelets count in group A ranged from 172 /uL to 276 /uL with mean ± standard deviation (224 ± 52) while in group B; it ranged from 184 /uL to 295 /uL with mean ± standard deviation (293 ± 109) which was statistically insignificant (*p* value 0. 123).

The serum creatinine in group A ranged from 0.8 mg/dl to 1.2 mg/dl with mean ± standard deviation (1 ± 0.2) while in group B, it ranged from 0.7 mg/dl to 1.3 mg/dl with mean ± standard deviation (1 ± 0.3) which was statistically insignificant (*p* value 0.322).

The serum urea in group A, ranged from 26 mg/dl to 53 mg/dl with mean ± standard deviation (39 ± 13.5) while in group B, it ranged from 29 mg/dl to 49 mg/dl with mean ± standard deviation (39 ± 9.9) which was statistically insignifican (*p* value 0.888).

The serum Na in group A ranged from 134 meq/L to 142 meq/L with mean ± standard deviation (138 ± 4.1) while in group B, it ranged from135 meq/L to 144 meq/L with mean ± standard deviation (140 ± 4.6) which was statistically insignificant (*p* value 0.123).

The serum K in group A, ranged from 3.5 meq/L to 4.5 meq/L with mean ± standard deviation (4 ± 0.5) while in group B, it ranged from 4.6 meq/L to 4.4 meq/L with mean ± standard deviation (4 ± 0.4) which was statistically insignificant (*p* value 0.138).

The serum Mg in group A ranged from 1.9 meq/L to 2.1 meq/L with mean ± standard deviation (2 ± 0.1) while in group B, it ranged from 1.8 meq/L to 2.2 meq/L with mean ± standard deviation (2 ± 0.2) which was statistically insignificant (*p* value 0.427).

The serum AST in group A ranged from 15 IU/L to 34 IU/L with mean ± standard deviation (25 ± 9) while in group B, it ranged from 10 IU/L to 58 IU/L with mean ± standard deviation (24 ± 34) which was statistically insignificant (*p* value 0.163).

The serum ALT in group A ranged from 18 IU/L to 38 IU/L with mean ± standard deviation (28 ± 10) while in group B; it ranged from 16 IU/L to 34 IU/L with mean ± standard deviation (30 ± 14) which was statistically insignificant (*p* value 0.513).

The INR in group A ranged from 1.2 to 1.4 with mean ± standard deviation (1.2 ± 0.2) while in group B, it ranged from 1 to 1.2 with mean ± standard

deviation (1.1 ± 0.1) which was statistically insignificant (*p* value 0.325).

The serum Albumin in group A ranged from 3.4 mg/dl to 4.4 mg/dl with mean ± standard deviation (3.9 ± 0.5) while in group B, it ranged from 3.8 mg/dl to 4.8 mg/dl with mean ± standard deviation (4.3 ± 0.5 which was statistically insignificant (*p* value 0.212).

The serum Cholesterol in group A ranged from 199 mg/dl to 333 mg/dl with mean ± standard deviation (266.27 ± 66.728) while in group B, it ranged from 99 mg/dl to 302 mg/dl with mean ± standard deviation (200.43 ± 102.219) which was statistically significant (*p* value < 0.021) (Table 3).

IV- Pre operative ECG data in both groups:

Twenty seven (90%) patients out of thirty patients were with normal p wave and three patients (10%) are with enlarged p wave in group A while all patients (100%) were with normal p wave in group B which was statistically insignificant (*p* value 0.237).

Ten (33.3%) patients out of thirty patients had "q waves" as a sign of old MI in ECG and twenty patients (66.7%) didn't have MI criteria in ECG in group A while ten (33.3%) had MI criteria in ECG and twenty patients (66.7%) didn't have MI criteria in ECG in group B which was statistically insignificant (*p* value 1.001).

Both groups did not have BBB in ECG with insignificant *p* value 0.567 (Table 4).

Table 3:Laboratory data of study patients:

Groups Variables	Group A (N. 30)		Group B (N. 30)		*P* value
	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
S. Hb	12 → 16	13.9 ± 2.1	12 → 15	13.7 ± 1.7	0.829 N.S
TLC	6 → 10	7.7 ± 2.1	4 → 10	7.4 ± 2.7	0.571 N,S
Platelets	172 → 276	224 ± 52	184 → 295	293 ± 109	0.123 N.S
Creatinine	0.8 → 1.2	1 ± 0.2	0.7 → 1.3	1 ± 0.3	0.322 N.S
Urea	26 → 53	39 ± 13.5	29 → 49	39 ± 9.9	0.888 N.S
Na	134 → 42	138 ± 4.1	135 → 144	140 ± 4.6	0.123 N.S
K	3.5 → 4.5	4 ± 0.5	3.6 → 4.4	4 ± 0.4	0.138 N.S
Mg	1.9 → 2.1	2 ± 0.1	1.8 → 2.2	2 ± 0.2	0.427 N.S
AST	16 → 34	25 ± 9	10 → 58	34 ± 24	0.163 N.S
ALT	18 → 38	28 ± 10	16 → 34	30 ± 14	0.513 N.S
INR	1.2 → 1.4	1.2 ± 0.2	1 → 1.2	1.1 ± 0.1	0.325 N.S
Albumin	3.4 → 4.4	3.9 ± 0.5	3.8 → 4.8	4.3 ± 0.5	0.212 N.S
Cholesterol	199 → 333	266,27 ± 67	98 → 302	200,43 ± 102	0.021 S

Table 4: ECG of both groups:

Groups Variables	Group A (N. 30)		Group B (N. 30)		*P* value
	Normal	Enlarged	Normal	Enlarged	
P wave	27 (90%)	3 (10%)	30 (100%)	0 (0%)	0.237 N.S
	Present	Absent	Present	Absent	
MI	10 (33.3%)	20 (66.7%)	10 (33.3%)	20 (66.7%)	1.00 N.S
BBB	0 (0%)	30 (100%)	0 (0%)	30 (100%)	0.576 N.S

V-Preoperative echo characteristics of both Groups:

The LVED dimensions in group A ranged from 5 cm to 6.8 cm with mean ± standard deviation (5.9 ± 0.9) while in group B, it ranged from 5.1 cm to 6.1 cm with mean ± standard deviation (5.7 ± 0.6) which was statistically insignificant (*p* value 0.35).

The LVES dimensions in group A ranged from 3.6 cm to 5.4 cm with mean ± standard deviation (4.5 ± 0.9) while in group B, it ranged from 3.8 cm to 4.8 cm with mean ± standard deviation (4.3 ± 0.5) which was statistically insignificant (*p* value 0.343).

The IVS dimension in group A ranged from 0.7 cm to 1.1 cm with mean ± standard deviation (0.9 ± 0.2) while in group B, it ranged from 0.7 cm to 1.3 cm with mean ± standard deviation (1 ± 0.3) which was statistically insignificant (*p* value 0.055).

The PW dimension in group A ranged from 0.7 cm to 1.1 cm with mean ± standard deviation (0.9 ± 0.2) while in group B, it ranged from 0.8 cm to 1.1 cm with mean ± standard deviation (1 ± 0.2) which was statistically insignificant (*p* value 0.165).

The RV dimension in group A ranged from 1.4 cm to 2.4 cm with mean ± standard deviation (1.9 ± 0.5) while in group B; it ranged from 1.2 cm to 2.2 cm with mean ± standard deviation (1.7 ± 0.5) which was statistically insignificant (*p* value 0.281).

The EF in group A ranged from 36% to 62% with mean ± standard deviation (48.5 ± 12.8) while in group B; it ranged from 56% to 66% with mean ± standard deviation (60.7 ± 5.3) which was statistically significant (*p* value 0.001).

The LA dimensions in group A ranged from 3.6 cm to 5.2 cm with mean ± standard deviation (4.41 ± 0.82) while in group B; it ranged from 3.6 cm to 4 cm with mean ± standard deviation (3.75 ± 0.248) which was statistically significant (*p* value 0.001) (table 5).

VI-Preoperative coronary angiography of both Groups:

Fourteen (47%) patients out of thirty patients had two vessel disease and sixteen patients (53%) had

multi vessel disease lesion in group A while there were thirteen patients (43%) had one vessel disease and twelve patients (40%) had two vessel disease and five patients (17%) had multi vessel disease in group B which was statistically significant (*p* value < 0.001) (Table 6).

VII- Intra operative characteristics of the patients:
Seventeen (60%) patients out of thirty patients were successfully grafted for RCA and twelve patients (40%) were failed in RCA grafting in group A while nineteen (95%) were successfully grafted for RCA and one patient (5%) was failed in RCA grafting in group B which was statistically significant (*p* value 0.001) (Table7).

Table (5)

Groups	Group A (N. 30)		Group B (N. 30)		*P* value
Variables	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
LVED	5 → 6.8	5.9 ± 0.9	5.1 → 6.1	5.7 ± 0.6	0.35 N.S
LVES	3.6 → 5.4	4.5 ± 0.9	3.8 → 4.8	4.3 ± 0.5	0.343 N.S
IVS	0.7 → 1.1	0.9 ± 0.2	0.7 → 1.3	1 ± 0.3	0.055 N.S
PW	0.7 → 1.1	0.9 ± 0.2	0.8 → 1.1	1 ± 0.2	0.165 N.S
RV	1.4 → 2.4	1.9 ± 0.5	1.2 → 2.2	1.7 ± 0.5	0.281 N.S
EF	36 → 62	49 ± 13	56 → 66	61 ± 5	0.001 S
LA	3.6 → 5.2	4.4 ± 0.8	3.6 → 4	3.8 ± 0.2	0.001 S

Table 6: C.A characteristics of both groups:

Groups Variables	Group A	Group B	*P* value
One vessel disease	0 (0%)	10 (33%)	
Two vessel disease	14 (47%)	12 (40%)	<0.001 S
Multi vessel disease	16 (53%)	8 (27%)	

Table (7)

Groups	Group A (N. 30)		Group B (N. 30)		*P* value
Variables	Success	Failed	Success	Failed	
RCA grafting	17 (60%)	12 (40%)	19 (95%)	1 (5%)	0.001 S

VIII- Postoperative laboraory characteristics of both groups:
The serum hemoglobin in group A ranged from 10 mg/dl to 15 mg/dl with mean ± standard deviation (12.6 ± 2.3) while in group B, it ranged from 12 mg/dl to 15 mg/dl with mean ± standard deviation (12.3 ± 2) which was statistically insignificant (*p* value 0.52).

The total leukocytic count in group A ranged from 11.6 /mcl to 17 /mcl with mean ± standard deviation (14.6 ± 3) while in group B, it ranged from 10 /mcl to 11.8 /mcl with mean ± standard deviation (14± 4) which was statistically insignificant (*p* value 0.417).

The platelets count in group A ranged from 168 /uL to 264 /uL with mean ± standard deviation (216 ± 48) while in group B, it ranged from 134 /uL to 322 /uL with mean ± standard deviation (228 ± 94) which was statistically insignificant (*p* value 0. 543).

The serum creatinine in group A ranged from 0.8 mg/dl to 1.2 mg/dl with mean ± standard deviation (1 ± 0.2) while in group B, it ranged from 0.7 mg/dl to 1.3 mg/dl with mean ± standard deviation (1 ± 0.3) which was statistically insignificant (*p* value 0.322).

The serum urea in group A ranged from 31 mg/dl to 53 mg/dl with mean ± standard deviation (42 ± 11) while in group B; it ranged from 32 mg/dl to 58 mg/dl with mean ± standard deviation (45 ± 13) which was statistically insignificant (p value 0.465).

The serum Na in group A ranged from 134 meq/L to 142 meq/L with mean ± standard deviation (138 ± 4.1) while in group B, it ranged from 136 meq/L to 145 meq/L with mean ± standard deviation (141 ± 4.5) which was statistically insignificant (*p* value 0.122).

The serum K in group A ranged from 3.5 meq/L to 4.5 meq/L with mean ± standard deviation (3.9 ± 0.5) while in group B, it ranged from 4.6 meq/L to 4.4 meq/L with mean ± standard deviation (4 ± 0.4) which was statistically insignificant (*p* value 0.137).

The serum Mg in group A ranged from 1.4 meq/L to 2 meq/L with mean ± standard deviation (1.7 ± 0.3) while in group B; it ranged from 2 meq/L to 2.4 meq/L with mean ± standard deviation (2.2 ± 0.2) which was statistically significant (*p* value 0.008).

The serum AST in group A ranged from 27 IU/L to 53 IU/L with mean ± standard deviation (40 ± 13) while in group B, it ranged from 33 IU/L to 67 IU/L with mean ± standard deviation (50 ± 17) which was statistically insignificant (*p* value 0.356).

The serum ALT in group A ranged from 23 IU/L to 47 IU/L with mean ± standard deviation (35 ± 12) while in group B; it ranged from 22 IU/L to 58 IU/L with mean ± standard deviation (40 ± 18) which was statistically insignificant (*p* value 0.200).

The INR in group A ranged from 1 to 1.2 with mean ± standard deviation (1.1 ± 0.1) while in group B, it ranged from 1 to 1.2 with mean ± standard deviation (1.1 ± 0.1) which was statistically insignificant (*p* value 0.281) (Table 8).

Table 8:Laboratory data of study patients:

Groups	Group A (N. 30)		Group B (N. 30)		P value
Variables	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
S. Hb	10 → 15	12.6 ± 2.3	12 → 15	12.3 ± 2	0.52 N.S
TLC	11.6 → 17	14.6 ± 3	10 → 11.8	14 ± 4	0.417 N,S
Platelets	168 → 264	216 ± 48	134 → 322	228 ± 94	0.543 N.S
Creatinine	0.8 → 1.2	1 ± 0.2	0.7 → 1.3	1 ± 0.3	0.322 N.S
Urea	31 → 53	42 ± 11	32 → 58	45 ± 13	0.465 N.S
Na	134 → 142	138 ± 4.1	136 → 145	141 ± 4.5	0.122 N.S
K	3.4 → 4.4	3.9 ± 0.5	3.6 → 4.4	4 ± 0.4	0.137 N.S
Mg	1.4 → 2	1.7 ± 0.3	2 → 2.4	2.2 ± 0.2	0.008 S
AST	27 → 53	40 ± 13	33 → 67	50 ± 17	0.356 N.S
ALT	23 → 47	35 ± 12	22 → 58	40 ± 18	0.200 N.S

IX-Post operative inotropic duration in hours of study patients:

The duration of inotrops in group A ranged from 28 hours to 81 hours with mean ± standard deviation (54.4 ± 26.69)) while in group B; it ranged from 12 hours to 21 hours with mean ± standard deviation (16.5 ± 4.8) which was statistically significant (p value 0.001) (Table 9).

Table 9:Post operative inotropic duration in hours of study patients:

Groups	Group A (N. 30)		Group B (N. 30)		P value
Variables	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
Inotropic duration in hours	27.7→ 81.1	54.4± 26.69	11.7→ 21.3	16.53 ± 4.8	0.001 S

X-Postoperative echo characteristics of both Groups:

The LVED dimensions in group A ranged from 5 cm to 6.5 cm with mean ± standard deviation (5.9 ± 0.9) while in group B, it ranged from 5.4 cm to 6 cm with mean ± standard deviation (5.8 ± 0.3) which was statistically insignificant (p value 0.371).

The LVES dimensions in group A ranged from 3.6 cm to 5.4 cm with mean ± standard deviation (4.5 ± 0.9) while in group B; it ranged from 3.6 cm to 5 cm with mean ± standard deviation (4.3 ± 0.7) which was statistically insignificant (p value 0.123).

The IVS dimension in group A ranged from 0.7 cm to 1.1 cm with mean ± standard deviation (0.9 ± 0.2) while in group B, it ranged from 0.8 cm to 1.2 cm with mean ± standard deviation (1 ± 0.2) which was statistically insignificant (p value 0.064).

The PW dimension in group A ranged from 0.9 cm to 1.1 cm with mean ± standard deviation (0.9 ± 0.2) while in group B; it ranged from 0.9 cm to 1.1 cm with mean ± standard deviation (1 ± 0.2) which was statistically insignificant (p value 0.794).

The RV dimension in group A ranged from 1.3 cm to 2.3 cm with mean ± standard deviation (1.8 ± 0.5) while in group B, it ranged from 1.4 cm to 2.2 cm with mean ± standard deviation (1.8 ± 0.4) which was statistically insignificant (p value 0.85).

The EF in group A ranged from 35% to 59% with mean ± standard deviation (49.97 ± 12.319) while in group B, it ranged from 53% to 65% with mean ± standard deviation (59.27 ± 6.02) which was statistically insignificant (p value 0.001).

The LA dimensions in group A ranged from 39 mm to 53 mm with mean ± standard deviation (46 ± 7) while in group B; it ranged from 36 mm to 4 mm with mean ± standard deviation (38 ± 2) which was statistically insignificant (p value 0.001) (Table 10).

4. Discussion

Atrial fibrillation is one of the most common complications occurring after cardiac surgery. As many as 10% to 40% of all patients undergoing CABG experiencing new onset post-operative AF with the arrhythmia usually occurring between second and fourth postoperative days (Svedjeholm *et al.,* 2000). With a peak incidence on postoperative day 2, Seventy percent of patients develop this arrhythmia before the end of post-operative day 4 (Aranki *et al.,*1996).

Although this arrhythmia is usually benign, it may result in hemodynamic compromise, thromboemboli, stroke and an increase in hospital stay(Fuller *et al.,*1989). More over (Rollo *et al.,*2004) stated that postoperative AF was found to be an independent predictor of long-term mortality.

Preventing the onset of AF and avoiding its complications are of great importance. Postoperative intravenous amiodarone followed by oral amiodarone, appears to be effective in the prevention of new-onset postoperative AF. It also reduces the ventricular rate

and duration of AF after CABG (Yagdi *et al.,* 2003). Despite these benefits, amiodarone has some serious side effects that limit its application; hence it is necessary to administer amiodarone only to patients at high risk of post-CABG AF. Nonetheless, identifying such patients at whom a prophylactic measure

(including amiodarone, β-blockers, and atrial pacing) for preventing AF could be targeted remains a challenge for modern heart surgery. (Jafari *et al.,* 1998).

Table 10: Post operative echo characteristics of both groups:

Groups Variables	Group A (N. 30)		Group B (N. 30)		P value
	Ranged	Mean ± S.D	Ranged	Mean ± S.D	
LVED	5 → 6.8	5.9 ± 0.9	5.4 → 6	5.7 ± 0.3	0.371 N.S
LVES	3.6 → 5.4	4.5 ± 0.9	3.6 → 5	4.3 ± 0.7	0.123 N.S
IVS	0.7 → 1.1	0.9 ± 0.2	0.8 → 1.2	1 ± 0.2	0.064 N.S
PW	0.9 → 1.1	0.9 ± 0.2	0.9 → 1.1	0.9 ± 0.2	0.794 N.S
RV	1.3 → 2.3	1.8 ± 0.5	1.4 → 2.2	1.8 ± 0.4	0.85 N.S
EF	35 → 59	47 ± 12	53 → 65	59 ± 6	0.001 S
LA	39 → 53	46 ± 7	36 → 4	38 ± 2	0.001 S

The aim of this work was to investigate pre-operative, intra-operative and post-operative factors that could be related to the occurrence of post CABG atrial fibrillation.

This study included sixty patients with ischemic heart disease diagnosed by coronary angiography and underwent coronary artery by- pass surgery in Cairo university hospital during the period between June 2011 to Mars 2012. We collected the data of 30 patients who had post operative AF and another 30 patients who didn't have post operative AF.

AF group will be called (Group A) & Non AF group will be called (Group B).In the present study, age was a risk factor for postoperative AF. Group A was significantly older (61.33.88) than group B (46.8±9.88) with *p* Value > 0.001.This was in agreement with Almassi *et al.* (1997) Mathew *et al.* (2004) and Shariff *et al.* (2010).

In the present study, BMI was higher in patients who developed AF post CABG (group A) (30.9 ±3.9) than patients who did not developed AF post CABG (group B) (25.43 ± 2.21) with *p* value > 0.001. This was in agreement with Echahidi *et al.* (2006) and this also was concordant with Wigfi eld et al. *et al.* (2007).

In the present study, Gender difference was not risk factor for postoperative AF. This was in agreement with Shen *et al.* (2007) and Shariff *et al.* (2010).

In the present study, hypertension was a risk factor for postoperative AF. Eighteen (60%) patients out of thirty patients were hypertensive and twelve patients (40%) were not hypertensive in group A while nine (30%) were hypertensive and twenty one patients (70%) were not hypertensive in group B which was statistically insignificant (p value 0.037).

These result was in agreement with those reported by Shen *et al.* (2007) who studied 312 patients, also with Amar *et al.* (2002), Aranki *et al.* (2006) and Shariff *et al.* (2010).

In this study, Dyslipidemia was a risk factor for postoperative AF. Twenty three (77%) patients out of thirty patients were dyslipidemic and seven patients (23%) were not dyslipidemic in group A while eleven (37%) were dyslipidemic and nineteen patients (63%) were not dyslipidemic in group B which was statistically significant (*p* value 0.004).This was not in agreement with Majid *et al.* (2008) who studied 302 patients undergoing CABG of whom 46 patients (15%) developed AF this may be because of small patient numbers in the current study (only 60 patients).

In the present study, D.M, smoking and previous myocardial infarction was not risk factors for postoperative AF. This study was in agreement with Shen *et al.* (2007) and the study done by Shariff *et al.* (2010) which include 757 patients. 262 patients out of

757 patients were diabetic. AF group in this study include 56 diabetic patients while non AF group included 206 diabetic patients with *p* value 0.21.

There were 476 smokers patients out of 757 patients; 86 patients were complicated with AF post CABG while 390 patients were not complicated with AF post CABG with *p* value 0.45.

In the present study, All pre operative laboratory data including (Serum hemoglobin, total leukocytic count,platelets,serum creatinine, serum urea, Na level, K level, Mg level, AST, ALT, INR, serum Albumin) were not predictors for postoperative AF.This was in agreement with Majid *et al.* (2008).

In the present study, pre-operative p wave and QRS morphology (LBBB, RBBB, MI criteria) were not predictors of AF post CABG.This was discordant with Majid *et al.* (2008) this most probably due to small number of patients (sixty patients) in our study.

In the present study, pre-operative LA diameter was predictor of AF post CABG (LA in group A (4.41±0.82 cm) while in group B (3.75 ± 0.25 cm) with p value < 0.001. This was concordant with Halil *et al.* (2008) which shows larger left atrium (46±5mm) versus (39±5 mm), *p* value < 0.001.

In the present study, pre operative EF was Found to be significantly lower in group A (46 ±12.32%) than group B (59 +/- 6.02%) with *p* value < 0.001.The results of the present study are in agreement with the results of Fleming *et al.,* 2008 & also was concordant with (Halil *et al.,* 2008). In that study Postoperative AF developed in 17 (24%) cases of 70 patients where The AF group had left ventricular systolic dysfunction (56±13%) versus (56±8%) with *p*=0.042. In the present study, pre operative LVEDd, LVESd, PWT, IVS were not predictors of AF post-CABG. This study was in agreement with Qijun et al., 2007 while this study was not in agreement with *(Halil et al., 2008)* study which showed that the PWT, IVS, LVEDd and LVESd were significant in predicting post-CABG AF, this may be due to small patients numbers (60 patients) and also may be due to exclusion of patients with CHF, history of AF and valvular lesion.

In the present study, Patients with Multi vessels disease are more subjected to AF post CABG than others with one or two vessels diseases. Fourteen (47%) patients out of thirty patients had two vessel disease and sixteen patients (53%) had multi vessel disease lesion in group A while there were thirteen patients (43%) had one vessel disease and twelve patients (40%) had two vessel disease and five patients (17%) had multi vessel disease in group B which was statistically significant(*p* value < 0.001) This study was in agreement with (Majid *et al.,* 2008).

In the present study, There was significant difference between patients with intra operative failure of RCA grafting and others with successful grafting to RCA. Seventeen (60%) patients out of thirty patients were successfully grafted for RCA and twelve patients (40%) were failed in RCA grafting in group A while nineteen patients (95%) were successfully grafted for RCA and one patient (5%) was failed in RCA grafting in group B which was statistically significant (*p* value 0.001). This was in agreement with Lisa *et al.* (1995), Kudret *et al.* (1998), they showed that RCA disease was found in 12.63% of patients who developed post operative AF versus 7.2% of patients without post operative AF. The difference was statistically significant(*p* value =0.003).This was concordant with Majid *et al.* (2008) which showed that failure to graft right coronary artery was other main predictor of postoperative AF. It may be due to intraoperative atrial ischemia by SA node branch from circumflex AV node branch from RCA diseased

In the present study, lower level of total serum magnesium was predictor of post operative AF. serum Mg [1.717± 0.301)] in group A while in group B it was [2.173 ±0.191)] with *p* value 0.008. This result was supported by another study done by (Mahdi *et al.,* 2007). They studied 170 patients undergoing CABG of whom 53 patients (31%) developed AF. They reported that post-CABG serum Mg was lower in patients who developed AF (2. 37 mg/dl Vs 2.49 mg/dl) in those who didn't develop post CABG AF with *p* value of 0.001.

In the present study, there was a significant relation between postoperative AF and prolonged postoperative adrenergic use. Patients who take long time on inotropes [54.40 ±26.691)] are more subjected to AF post CABG than those take short time on inotropes [16.53 ±4.840)] with p value 0.001. This was supported by a study done by (Salaria et al.2005) investigated the influence of postoperative adrenergic use in 199 patients after cardiac surgery. These investigators showed that adrenergic use was an independent predictor of postoperative AF with *P* value 0.001.

In the present study, post operative LAD was larger in group A (4.623± 0.71) than group B (3.84 ± 0.22) with *p* value < 0.001.This was concordant with (Halil *et al.,* 2008) Study which shows (44±7mm) versus (39±5 mm), p=0.046.

In the present study; post operative EF was found to be significantly lower in group A (48 ± 12%) than group B (60 ± 5.3%) with p value < 0.001.The result of the present study was in agreement with the results of (Halil *et al.,* 2008). In that study Postoperative AF developed in 17 (24%) cases of 70 patients where The AF group had left ventricular systolic dysfunction (49±8%) versus (60±10%) with *P*=0.001.

Conclusion:

The conclusion from our results suggested that preoperative,intraoperative and postoperative asssessment of the surgical patients were useful in risk stratification for the occurrence of post CABG AF. As post-CABG AF is known to be a potential risk for systemic thromboembolism, hemodynamic compromise, and even stroke

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