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The impact of coronary reperfusion status as assessed by ST segment resolution in the development of acute atrial fibrillation as a complication of ST Elevation Myocardial Infarction.ST Elevation myocardial infarction Acute Atrial Fibrillation (STAAF) study

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ABSTRACT

Background: Acute atrial fibrillation is an important and frequent complication of ST Elevation myocardial Infarction.Atrial fibrillation is an independent predictor of both short termand long term mortality. The study addresses the question whether the reperfusion strategy and reperfusion as assessed by ST resolution affect the development of AF as a complication of STEMI.

Materials and methods: It was a single center, prospective cohort study, conducted from October 2014 to January 2016. The patients were divided into three groups1. Those with AF at admission. 2. those developing AF within 24 hours of admission. 3. Those developing AF after 24 hours and till discharge. The patient's clinical and echocardiographic profile were documented. They were followed up for development of complications.

Results: 49 patients had AF within 24 hours of admission and 10 patients developed AF after 24 hours. There was no significant difference between the rates and mode(primary PCI and fibrinolysis) of revascularization in patients developing AF and those without AF. The total ischemic period prior to revascularization did not influence the development of AF. The post-reperfusion ST segment resolution was not different in the two groups.

KEYWORDS : Atrial fibrillation, Myocardial infarction,coronay reperfusion,ST resolution

1. INTRODUCTION

ST elevation myocardial Infarction (STEMI) is an important cause of cardiac mortality and morbidity. Arrhythmias, heart failure, shock and mitral regurgitation are the common complications of STEMI that contribute to the morbidity and mortality of STEMI. Among the arrhythmias, acute atrial fibrillation is an important and frequent complication. It complicates STEMI in 6.8-21%[1,2,3,4]. In the Fibrinolytic era, the GUSTO I trial which included 40981 patients with STEMI, eligible for thrombolysis, the incidence of atrial fibrillation was 10.4%[5]. In the modern era of Primary Percutaneous Coronary Intervention (Primary PCI), in the OACIS study, among the 2475 patients with STEMI treated with Primary PCI, atrial fibrillation occurred in 12%[6].

Atrial fibrillation in the setting of STEMI is associated with pulmonary oedema, cardiogenic shock and increased re -infarction rates.[7]. Atrial fibrillation is an independent predictor of both short term[8,9]and long term mortality[10,11].

Does the reperfusion strategy and reperfusion as assessed by ST resolution affect the development of AF as a complication of STEMI? There are a few studies that address this issue. The present study aims to bridge this gap in knowledge.

2. MATERIALS AND METHODS

It was a single center, prospective, cohort study. It was conducted at Government Medical College (GMC) Thiruvananthapuram a teaching hospital in Kerala, South India from October 2014 to January 2016. The study group consisted of ST Elevation Myocardial Infarction (STEMI) patients having acute Atrial Fibrillation (AF) during their hospitalization phase. Exclusion criteria included chronic atrial fibrillation, rheumatic heart disease involving the mitral valve (mitral stenosis and mitral regurgitation), dilated cardiomyopathy, hypertrophic cardiomyopathy, pulmonary hypertension, congenital heart disease, post cardiac surgery, thyrotoxicosis, chronic renal failure and recent malignancy. A sex matched control cohort was selected from patients with STEMI but without Atrial Fibrillation.

The patients were divided into three groups. 1. Those with AF at admission. 2. Those developing AF within 24 hours of admission. 3. Those developing AF after 24 hours and till discharge. During the coronary intensive care stay for a minimum of 48 hours, the patients' electrocardiogram was continuously monitored. After that, daily electrocardiograms were taken. The patient's clinical and echocardiographic profile were documented. The angiographic profile of the patients who underwent primary Percutaneous Coronary Intervention (PCI) or planned PCI were also recorded.

2.1 Definitions

STEMI was defined as having 1. Prolonged angina within 48 hours. 2. Diagnostic electrocardiographic changes- ST segment elevation in two contiguous leads and 3. Two fold elevation in serum creatine kinase or positive high sensitivity troponin.

Atrial fibrillation was diagnosed with a standard 12- lead electrocardiogram (ECG) showing absence of 'P' wave and a variable degree of baseline fibrillatory activity with irregular R-R intervals.

2.2 Sample size

The sample size calculated using Pocock formula was 54 STEMI patients with Atrial fibrillation and 54 STEMI control patients without Atrial fibrillation.

2.3 Statistics

The study cohort and comparison cohort were analyzed with Chi-square test and Fischer's exact test.

3. RESULTS

3.1 Patient demographics

A total of 118 patients with STEMI were included in the study. This included 59 patients with atrial fibrillation and 59 patients without atrial fibrillation. The mean age of the patients was 59.6 years. There were 47 males and 12 females in the atrial fibrillation arm and an equal number in the control group. Anterior wall and non- anterior wall were almost equal-anterior wall 28 patients (47.5%) and non-anterior wall 31 patients (52.5%).Patients were grouped into >/=70 years and <70 years of age. 18 (30.5%) patients in AF group was 70 years or above where as only 8 (13.6%) of non AF patients were in this age group and the difference was statistically significant (p=0.026).

3.2 Temporal pattern of occurrence of atrial fibrillation

Patients in Atrial Fibrillation group was divided into those having AF at admission, those developing AF within 24 hours and those

developing AF after 24 hours till predischarge.19 (32.2%)patients had atrial fibrillation on admission, 30 (50.8%) developed atrial fibrillation in 24 hours and 10 (16.9%)patients developed atrial fibrillation after 24 hours.

AF patients were also studied in 2 groups-AF developing within 24 hours and after 24 hours of admission and prior to discharge. 49 patients had AF within 24 hours of admission(group 1) and 10 patients developed AF after 24 hours (group 2).

3.3 Immediate Reperfusion strategies

Nearly half of the STEMI patients underwent primary angioplasty. See table 1. There was no difference in the reperfusion strategies(primary PCI or fibrinolysis) in the AF and non AF groups.

Table.1 Immediate Reperfusion strategy

	AF group,n=59	Non AF group,n=59	P value
Primary PCI	28 (47.5%)	30(50.8%)	0.187
Fibrinolysis	20 (33.9%)	12(20.3%)	
Other medical management	11(18.6 %)	17(28.8%)	

3.4 Comprehensive invasiverevascularization

Nearly two-thirds of STEMI patients both in AF group and non- AF group underwent complete revascularization by either Primary PCI or systematic PCI later. See table 2. There was no significant difference between the rates of revascularization in the two groups. One patient in the AF group underwent Coronary Artery Bypass Graft surgery.

Table 2 Invasive revascularization (Primary PCI/ CABG/ Systematic PCI after fibrinolysis)

	AF group, n=59	Non AF group, n=59	P value
Primary PCI of IRA only	22(37.3%)	24(40.7%)	0.194
Primary PCI followed by non IRA PCI	6 (10.2%)	6 (10.2%)	
Systematic PCI following fibrinolysis	8(13.6%	16 (27.1%)	
Primary CAG followed by CABG	1 (1.7%)	0	
No invasive revascularization	22 (37.3%)	13 (22%)	

IRA = Infarct related artery, CABG=Coronary Artery Bypass Graft Surgery

3.5 Total ischemic period

The total ischemic period was not significantly different between AF and Non- AF groups. See table 3.

Table 3:Total Ischemic period

	AF group		Non AF group		P value
<4 hours	14	(23.7%)	18	(30.5%)	0.328
4-8 hours	36	(61%)	28	(47.5%)	
>8 hours	9	(15.3%)	13	(22%)	

Table 4: electrocardiographic ST resolution

	AF group	Non AF group	P value
</= 70%	21 (40.4%)	28(54.9%)	0.140
>70%	31(59.6)	23(45.1%)	

DISCUSSION

Development of atrial fibrillation is a well-known complication in acute STEMI patients. The adverse hemodynamic consequences of AF can quickly lead to pulmonary edema and shock.

A total 118 patients were included in the study, 59 in AF and 59 in Non AF group. Most of the patients were in 50-70 age groups, with mean age being 59.6 years. The mean age in AF group was 62 years. There were 47 males and12 females in each group. Nineteen (32.2%) patients had AF on presentation, 30(50.8%) developed AF within 24 hours and 10(16.9%) developed AF after 24 hours.

There was no significant difference in total ischemic period.(TIP) > 8hrs (15.3% vs. 22.8%, p=ns) and TIP <8 hrs (84.7% vs. 77.2%) in AF and non AF groups. There was no significant difference in ST resolution (STR), STR >70 (40.4% VS.54.9%) and STR<70(59.6% vs. 45.1%) in AF and non AF groups. The reasons why good reperfusion indicated by ST segment resolution does not preclude development of AF may be that the development of AF is also dependent on the amount of myocardium already jeopardised by ischemia (prior to reperfusion) and its mechanical consequences.To support this hypothesis is the finding from the GUSTO 1 trialthe development of new-onset AF was more likely in patients with extensive myocardial damage as assessed by peak creatine kinase level[4]. This has further support from the OACIS study, which observed that the patency of the infarct-related artery was not an independent predictor of AF in STEMI[6].

CONCLUSIONS

The nature of immediate reperfusion strategy (primary PCI or fibrinolysis) for STEMI had no influence on the development of AF as a complication of STEMI. There was no difference in complete revascularization (primary PCI followed by planned PCI for non infarct related vessels, systematic PCI following fibrinolysis and CABG) between the two groups. The total ischemic period prior to revascularization did not influence the development of AF. The post-reperfusion ST segment resolution was not different in the two groups.

Previous studies have proved that the factors that decide AF in STEMI are mitral regurgitation, hypertension, residual LV function and presence of significant MR.

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