



THE ECHOCARDIOGRAPHIC AND CORONARY ANGIOGRAPHIC FEATURES OF PATIENTS SUFFERING FROM ACUTE ATRIAL FIBRILLATION DURING ST ELEVATION MYOCARDIAL INFARCTION(STEMI)

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ABSTRACT

Background: Acute Atrial Fibrillation is an important complication of ST Segment Elevation Myocardial Infarction even in the Primary percutaneous coronary angioplasty era. Studies on the echocardiographic and coronary angiographic characteristics of the STEMI patients who develop acute atrial fibrillation as a complication are limited. The present study aims to bridge this gap in knowledge.

Materials and methods: It was a single center, prospective cohort study, conducted from October 2014 to January 2016. The patients were divided into three groups -those with AF -at admission, within 24 hours of admission and after 24 hours and till discharge. The patient's clinical, echocardiographic and angiographic profile (of those who underwent primary Percutaneous Coronary Intervention (PCI) or planned PCI) were recorded.

Results: The study included 59 STEMI patients with atrial fibrillation and 59 STEMI patients without atrial fibrillation. There was significant Left Atrial dilatation (39% vs. 18.6%, $p=0.015$) and ischemic Mitral Regurgitation (32.2 % vs. 15.3% $p=0.030$) in AF group. Ejection fraction and LV internal dimensions, did not show significant difference between the two groups. Single Vessel Disease (53.6% vs. 62.5%) and Multivessel disease (46.2% vs. 37.5%) were not significantly different between 2 groups. There was no difference in the culprit artery between patients who developed AF and those who did not.

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INTRODUCTION

Acute atrial fibrillation is an important and frequent complication of ST Segment Elevation Myocardial Infarction (STEMI). It complicates STEMI in 6.8-21%^{1,2,3,4}. In the Fibrinolytic era, the GUSTO I trial which included 40981 STEMI patients eligible for thrombolysis, the incidence of atrial fibrillation was 10.4%⁴. 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%⁵.

Atrial fibrillation in the setting of STEMI is associated with pulmonary edema, cardiogenic shock and increased reinfarction rates.⁶ Atrial fibrillation is an independent predictor of both short term^{7,8} and long term mortality^{9,10}.

What are the echocardiographic and coronary angiographic characteristics of the STEMI patients who develop acute atrial fibrillation as a complication? There are a few studies that address this issue. The present study aims to bridge this gap in knowledge.

MATERIALS AND METHODS

It was a single center, prospective cohort study. It was conducted at Government Medical College Thiruvananthapuram, a tertiary care teaching hospital in Kerala, South India from October 2014 to January 2016. The study group consisted of patients with ST Elevation Myocardial Infarction (STEMI) having acute Atrial Fibrillation (AF) during hospitalization phase. Exclusion criteria included chronic atrial fibrillation, rheumatic heart disease involving the mitral valve (mitral stenosis and mitral regurgitation), hypertrophic cardiomyopathy, dilated cardiomyopathy, congenital heart disease, post cardiac

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surgery, pulmonary hypertension, thyrotoxicosis, chronic renal failure and recent malignancy. Sex matched control cohort was selected from patients with STEMI 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 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.

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 12- lead electrocardiogram showing absence of 'P' wave and a variable degree of baseline fibrillatory activity with irregular R-R intervals.

Sample size

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

Statistics

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

RESULTS

Patient demographics

There were 118 patients in the study. This included 59 STEMI patients with atrial fibrillation and 59 STEMI 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 sex matched number in the control group. Table 1 shows the coronary artery disease (CAD) risk factors in the patient groups. There were more hypertensives in the atrial fibrillation group and this was statistically significant.

Table 1 Atherosclerotic risk factors in AF group and non- AF group

	AF group	No AF group	P value
Systemic hypertension	38 (64.4%)	25 (42.4%)	0.016
Diabetes mellitus	25 (42.4%)	28(47.5%)	0.0579
Dyslipidemia	50(84.7%)	43(72.9%)	0.115
Smoking	35(59.3%)	39(66.1%)	0.446

Echocardiography- LA, LV dimensions and LV ejection fraction

LV internal dimensions (LVID) both in systole and diastole, did not show significant difference in those with and without AF. The LV ejection fraction was less than

40 % in a higher proportion of STEMI patients with AF (borderline significance). See table 2.

Table 2 Echocardiographic parameters

	AF group	Non AF group	P value
Increased LVID Diastole	4 (6.8%)	1 (1.7%)	0.170
Increased LVIDSystole	9 (15.3%)	5 (8.5%)	0.255
Low LV EF (<40%)	18 (30.5%)	10 (16.9%)	0.083
MR grade ≥2	19 (32.2%)	9 (15.3%)	0.030
Dilated LA	23 (39%)	11 (18.6%)	0.015
RA dilatation	7 (11.9%)	3 (5.1%)	0.186
RV dysfunction	9 (15.3%)	4 (6.8%)	0.142

Echocardiography -mitral regurgitation and Left Atrial dilatation

There was significant Left atrial (LA) dilatation (39% vs. 18.6%, p=0.015) and ischemic mitral regurgitation (MR) (32.2 % vs. 15.3% p=0.030) in AF group. See table 2

Echocardiography- Right atrial and Right ventricular dysfunction

There was no significant difference in right atrial dilatation of right ventricular dysfunction in the two groups. See table 2

Coronary involvement

Single Vessel Disease (SVD)(53.6% vs. 62.5%,p=ns) and Multivessel disease (MVD) (46.2% vs. 37.5%,p=ns) were not significantly different between 2 groups. See table 3. There was no significant difference in the culprit artery between patients who developed AF and those who did not. See table 4. There was no significant difference between RCA and LCX as infarct related arteries in IWMI with atrial fibrillation

Table 3 Extend of coronary involvement and risk of STEMI patients developing AF

	AF group	Non AF group	P value
Single vessel	21 (35.6%)	30 (50.8%)	0.415
Multi-vessel	18 (46.2%)	18 (37.5%)	
No CAG	20 (33.95)	11 (18.6%)	

Table 4 Infarct related artery in inferior wall STEMI patients developing AF

Infarct related artery in inferior wall STEMI	AF present	AF absent	P value
RCA	17(77.3%)	24(88.9%)	0.274
LCX	5(22.7%)	3(11.1%)	

DISCUSSION

The LV ejection fraction was less than 40 % in a higher proportion of STEMI patients with AF (30.5%). This difference was only of borderline significance. (p=0.0830).

The parameters that were significantly different between both the groups were LA dilatation (39% vs. 18.6% p=0.015) and significant mitral regurgitation (>= grade 2) (32.2% vs.15.3%,p=0.030)

Among the 87 patients who underwent CAG, (39 in AF and 48 in non AF group), twenty one patients (53.8%) in AF group and thirty patients (62.5%) in non AF group had

single vessel disease (SVD). Eighteen patients (46.2%) in AF group and eighteen patients (37.5%) in non AF group had multivessel disease (MVD). But the difference was not significant. In the GUSTO I⁴, a randomized trial of 4 thrombolytic regimens, patients with AF were more likely to have multivessel coronary involvement and left main coronary artery disease

CONCLUSIONS

Acute atrial fibrillation complicating STEMI occurs more frequently in those having significant mitral regurgitation (\geq grade2). Approximately 1/3 of these patients have significant mitral regurgitation. The incidence of acute atrial fibrillation was slightly more (borderline significance) in those with low Left ventricular ejection fraction.

There is no difference in occurrence of acute AF in single vessel disease and multivessel diseases. Contrary to most reports there was no statistically significant higher incidence of acute atrial fibrillation in those having left circumflex disease as infarct related vessel and there was no significant difference between RCA and LCX as infarct related arteries in IWMI with atrial fibrillation

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