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Prognostic Value of Fragmented QRS In Patients With Acute Coronary Syndrome – A Single Center Study

KEYWORDS: Acute Coronary Syndrome fQRS Ejection Fraction

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ABSTRACT ***Background:****Fragmented QRS (fQRS),with an R' or notching in the QRS are novel electrocardiographic signals, reflecting altered ventricular conduction delays around myocardial scar.****Methods:****A prospective observational study done on 100 ACS patients(50 fQRS and without fQRS),March 2014 to October 2015. The patients were followed up for 6 months and EF,Cardiac events were noted.****Results:****Mean age of presentation was insignificant between two groups.(p=0.8). M:F ratio is 3.2:1, 2.3:1 respectively.Most common risk factors were hypertension,smoking. Most common ACS is STEMI, Anterior wall MI, with single vessel involvement seen in half of the patients. Most common vessel involvement is LAD followed by LCX. Mean EF was 44.35±8.3 at admission, with insignificant increase at 6 months.No relation of fQRS noted with stent thrombosis, hospitalization due to heart failure or mortality.Total number of events were more in patients with fragmented QRS (11vs4, 2=0.02).****Conclusions:****The fQRS was not related to age, sex, hypertension, diabetes, smoking, ACS type, vessel involved, but associated with increased events and mortality.*

INTRODUCTION

India has highest burden of acute coronary syndrome(ACS) in the world, due to early occurrence of ischemic heart disease compared to counterparts around the world. Fragmented QRS complexes(Fqrs) are novel electrocardiographic signals reflecting the altered ventricular conduction delays around the regions of the myocardial scar. The RSR' pattern is because of injured tissue around the scar as a result of myocardial infarction. In patients with CAD, these were associated with myocardial conduction block detected by Single Photon Emission Computed Tomography. We aim to find the prognostic significance of fragmented QRS in patients with acute coronary syndrome.

METHODOLOGY

STUDY DESIGN AND PATIENT POPULATION

This is a prospective observational study in patients with ACS admitted to department of cardiology, Osmania General Hospital, Hyderabad were included in the study between march2014 to october2015. The diagnosis was based on clinical features, ECG, and 2DEcho findings. Patients with first episode of acute coronary syndrome, age>18 years were included. Those with past history of CAD, renal failure, hepatic failure, valvular heart disease, congenital heart disease, known electrical abnormalities on ECG were excluded from the study. Among 100 patients, patients with fragmented QRS were 50(group A), with out were 50(group B). Analysis was done with respect to demographic, clinical, electrocardiographic, echocardiographic findings, specific vessel involved on angiography. Each patient was followed up to 6 months and occurrence of cardiac events were noted. Informed and written consent was taken from each patient after their inclusion. The study was approved by institutional ethical committee.

STATISTICAL ANALYSIS

Statistical analysis was performed using SPSS software version17.0. Continuous variables are expressed as mean+standard deviation. Chi square test was used for testing proportion. Probability value was used to determine the value of significance, $p<0.05$ being significant and $p<0.01$ being highly significant.

RESULTS

Most common age group in group A was 41-50 yrs(23,46%) and in group B was 51-60 years(18,36%) (Table 1). Mean age of presentation was 52.6±9.8 yrs, 52.9±9.2 yrs respectively(p=0.884). Males were more common than females in both groups(38vs12,35vs15,p=0.49).Most common risk factor was hypertension (30vs22,p=0.10). Patients with out diabetes were more common in both the groups(35vs37p=0.65). Smokers were more common in group A(28,56%). ST elevation MI was the most common ACS in both groups(37vs32, p=0.6). Anterior wall MI was most common in both the groups(23vs18, p=0.63), with thrombolysis being more common than without thrombolysis(20vs19, p=0.65). On analysis of coronary angiogram single vessel involvement was seen in 25vs23, p=0.95, double vessel in 9vs6,p=0.95, triple vessel disease was noted in 1 patient in each group. The correlation of fragmented QRS was not significant with number of vessels involved (χ^2=1.2, p=0.7), with mean EF at admission(p=0.9), stent thrombosis(p=0.6) and hospitalization due to heart failure(p=0.4)individually. The correlation with mortality was insignificant (p=0.6). But the correlation with events when combined was significant (11vs4 ,χ^2=0.02). (Table 2)

Table 1:Demographic and Clinical features,Biochemical profile of patients in Group A and Group B.

Characteristic	Group A (fQRS) N(%)	Groupn B (without fQRS) N(%)	p value
Age (yrs)			
≤30	1(2)	1(2)	0.88
31-40	4(8)	5(10)	
41-50	23(46)	17(34)	
51-60	14(28)	18(36)	
>60	8(16)	9(18)	
sex			

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Males	38(76)	35(70)	0.49
females	12(24)	15(30)	
Risk factors			
hypertension	30(60)	22(44)	0.109
diabetes	15(30)	13(26)	0.65
Smoking	28(56)	25(50)	0.54
alcoholism	17(34)	19(38)	0.67
ACS			
ST elevation MI	37(74)	32(64)	0.6
NSTEMI	13(26)	18(36)	0.6
Anterior wall MI	23(62.2)	18(56.3)	0.63
Inferior wall MI	14(37.8)	14(43.8)	0.63
Thrombolysis	20(54.1)	19(59.4)	0.64
Angiography			
Single vessel	25(67.6)	23(71.9)	0.95
Double vessel	9(24.3)	6(18.8)	
Triple vessel	1(2.7)	1(3.1)	
Recanalised	2(5.4)	2(6.3)	
Type of vessel			
LAD	35 (70)	32 (64)	0.671
LCX	13 (26)	14 (28)	1.0
RCA	21 (42)	16 (32)	0.4
Ejection fraction			
At admission	44.35 ± 8.3	44.37 ± 6.9	0.9
At follow up	46.64 ± 8.9	50.97 ± 7.05	0.02

Table 2: correlation of fQRS with other parameters

Stent thrombosis	3	1	0.6
No stent thrombosis	47	49	
Heartfailure hospitalization	5	2	0.4
Mortality	3	1	0.6
Combined events	11	4	$0.02=\chi^2$

DISCUSSION:

Fragmented QRS has been shown to be associated with myocardial fibrosis in patients with Ischaemic or non-ischaemic left ventricular dysfunction[1]. Studies with cardiac magnetic resonance imaging (MRI)[2] and myocardial single-photon emission tomography (SPECT)[3] showed that fQRS was associated with myocardial scars and had higher sensitivity and specificity for detecting myocardial scars than Q wave. It is important to recognize that fQRS on 12-lead ECG occasionally may be a normal variant.[3]

Das et al.[3] compared sensitivity and specificity of Q wave and fQRS for detecting myocardial scar in a cohort of 479 consecutive patients with and without prior history of coronary disease who were referred for nuclear stress test. In this analysis, fQRS complexes had higher sensitivity than Q waves for detecting regional myocardial scar (fQRS *vs* Q wave 85.6% *vs* 36.3%) however, fQRS was less specific than Q wave for myocardial scar (85.6% *vs* 99.2%).

There was no significant difference in mean age between the patients with and without fQRS complexes as noted in a study by Sheng et al.[4]There was no significant difference in the sex distribution between two groups which was seen in study by Sheng et al.[4]

In the present study, there was no significant effect of hypertension on fQRS. (60% vs 44%,p = 0.19).The effect of diabetes on presence or absence of fQRS was nonsignificant (30% vs 26% ,p= 0.656). Rong Guo et al,[5] found in patients with NSTEMI, the presence of diabetes was significantly ($p<0.05$) associated with the presence of fQRS.

The incidence of fQRS based on the type of ACS (i.e.,) STEMI or NSTE-ACS was not significant {STEMI (74 % vs 64%),NSTEACS (26% vs 46%). Sheng et al,[4] showed no significant variation in the incidence of fQRS between STEMI and NSTE-ACS.

In the present study, there was no significant correlation of location of MI in STEMI with fQRS (62.2% AW STEMI,37.8% IW STEMI vs 56.3% AW STEMI,43.8% with IW STEMI,p=0.63).Sheng et al [4] showed that there was no relationship between fQRS and the location of MI.The presence of thrombolytic therapy did not influence the occurrence of fQRS.There was no significant difference of no. of vessels involved on the presence or absence of fQRS as noticed in a study by Akberzadeh et al.[6] There was no significant association with involvement of LAD (70% vs 64%,p=0.671) or LCX (26% vs28%,p=1.0) and RCA (42% vs 32%, p=0.4).

In the present study, the left ventricular EF at 6 months was significantly lower in Group A compared to group B. (46.1% vs 46.5%, p = 0.86). At follow up was 48% vs 52.3%,(p= 0.007).

In the present study, there were 11 events in fQRS group compared to 4 events in non fQRS group. Though non-significant, of the total 15 events, 11 events i.e., 73.3% events occurred in group A compared to 4 events i.e., 26.6% events in group B. There was a trend towards increased no. of events in Group A. As the no. of events are less, significance could not be obtained.

In the present study, there were 3 deaths in the group A and 1 death in the group B. Though there was slightly higher incidence of mortality in the group A there was no statistical significance. Stent thrombosis (3 vs 1); hospitalization for HF were 5 vs 2)

In the study by Sheng et al,[4] the STEMI patients of positive fQRS had four times the incidence of malignant cardiac arrhythmia in comparison to the non-fQRS group ($p<0.01$). The rate of LVSD of fQRS group was 7.5 times higher than that of the non-fQRS group ($p<0.01$). The mortality rate of fQRS group was 2.4 times greater than that of the non-fQRS group (OR 2.44, 95% CI 1.044–5.702,$p=0.006$).[4] Between the subgroups of fQRS and non-fQRS in the NSTEMI patients, there was no statistical significance in malignant cardiac arrhythmia, LVSD, and mortality. In patients with a positive fQRS, there were no differences in malignant cardiac arrhythmia between patients with and without percutaneous coronary intervention(PCI) ($p>0.05$). As for the LVSD and mortality, the *p* values between patients with and without PCI were 0.031 and 0.000, respectively, suggesting statistical significance.[4]

The results imply that AMI patients with positive fQRS especially for the patients with STEMI had higher rates of malignant cardiac arrhythmia, LVSD, and mortality than the non-fQRS group. Patients of AMI with positive fQRS, who underwent early revascularization, could lower the incidence of the cardiovascular event.[4]

Liu *et al*. (2010)[7] studied the effect of revascularization treatment at different periods for AMI patients and pointed out that early therapy could indeed reduce the fQRS rate and even improve the LVEF for patients. Therefore, by identifying fQRS, it can guide physicians in prescribing early revascularization treatment for patients and can improve their life quality, as well as the survival rate of AMI.[7]

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Pietrasik *et al.*,[8] studied the predictive value of fQRS in patients with Q wave MI. In this population, fQRS predicted over two fold higher risk (adjusted hazard ratio 2.68, P=0.004) of recurrent cardiac events (cardiac death and non fatal MI) compared with those without fQRS and persistent Q waves.

Brenyo *et al.*, [09] in their study of 1,040 ECG's review of MADIT II enrollment of ischemic cardiomyopathy patients showed presence of fQRS in 33% of patients in any leads with a normal QRS. Inferior location of fQRS was found to be predictive of SCD/ICD shock (hazard ratio 1.46, P=0.032), SCD (HR 2.05, P= 0.007), and total mortality (HR1.44, P=0.036). However, there was significant increase in the risk of sudden cardiac death and all-cause death, in MADIT II patients with LBBB and inferior wide QRS complex fragmentation, indicating regional variability in the risk.

LIMITATIONS

The study had a Small cohort with small duration of follow up and was a single center study.

CONCLUSION

Fragmented QRS was not associated with mean age, gender, hypertension, diabetes, smoking or alcoholism. It was not associated with type of ACS or the thrombolysis and also number of vessel involvement and type of vessel. The EF at admission was not correlative, but was having negative correlation at 6 months. Though the events noticed in both the groups did not reach the significance, there were more events noticed in fragmented QRS patients there by denoting the increased adverse events in the particular group.

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