Incidence of Ventricular Arrhythmias in Patients with Fragmented QRS Post ST Elevated Myocardial Infarction

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Ahmed Soliman Mohammed Youssif

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List of Abbreviations

ACC	:	American college of cardiology.
ACS	:	Acute coronary syndrome.
ADA	:	American diabetes association.
AHA	:	American heart association.
AIVR	:	Accelerated idioventricular rhythm
BBB	:	Bundle branch block.
CABG	:	Coronary arteries bypass grafting.
CAMIAT	:	Canadian Myocardial Infarction Amiodarone Trial
CHD	:	Coronary artery disease.
CK	:	Creatine kinase.
CRP	:	C-reactive protein.
CTnI	:	Cardiac specific troponin I
CTnT	:	Cardiac specific troponin T
EMIAT	:	European Myocardial Infarction Amiodarone Trial
ESC	:	European society of cardiology.
ESVEM	:	Electrophysiologic Study Versus Electrocardiographic Monitoring.
FH	:	Family history.
fQRS	:	Fragmented QRS.
FU	:	Follow up.
HDL	:	High density lipoprotein.
ICD	:	Implantable cardioverter/defibrillator
IVCD	:	intraventricular conduction delay.
JNC	:	Joint national committee.
LDL	:	Low-density lipoprotein.
LMCA	:	Left main coronary artery.
LVEF	:	Left ventricular ejection fraction.

List of Abbreviations (Cont.)

MADIT II	:	Multicenter Automatic Defibrillator Implantation Trial II
MI	:	Myocardial infarction.
MILIS	:	Multicenter Investigation of the Limitation of Infarct Size.
MUSTT	:	Multicenter UnSustained Tachycardia.
NCEP-ATP	:	National cholesterol education program, adult treatment panel.
NHLBIFHS	:	National heart, lung and blood institute Framingham heart study
NSTE-ACS	:	Non ST elevation acute coronary syndrome.
NSTEMI	:	Non ST elevation myocardial infarction
NSVT	:	Non sustained ventricular tachycardia.
STEMI	:	ST elevation myocardial infarction
TIMI	:	Thrombolysis in myocardial infarction.
UA	:	Unstable angina.
VF	:	Ventricular fibrillation
VT	:	Ventricular tachycardia.
WPW	:	Wolf Parkinson White syndrome

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Introduction

Despite impressive advances in the diagnosis and management over the last four decades, ST segment elevation myocardial infarction (STEMI) continues to be a major public health problem in the industrialized world and had become increasingly important problem in developing countries. ***(Luepker et al, 2003)***.

ST segment elevation myocardial infarction (STEMI) is a fatal event in approximately one-third of patients, with about half of the deaths occurring within one hour of the event from ventricular tachyarrhythmias because ST segment elevation myocardial infarction can strike an individual during the most productive years, it may have profound deleterious psychosocial and economic ramifications ***(Alpert et al.2000).***

Observations of both post-MI patients ***(Volpi A et al., 1989)*** and survivors of cardiac arrest that occurred during the acute phase of transmural MI ***(Liberthson RR et al., 1974)*** suggest that life-threatening ventricular tachyarrhythmias occurring during the first 24 to 48 hours of MI do not imply continuing risk over time.

Fragmented QRS complexes (fQRS) are defined as various RSR` patterns with or without Q waves on a 12-lead resting ECG. Based on their duration, they are sub-classified into fQRS complexes (QRS duration <120 ms) and fragmented wide-QRS complexes (f-wQRS; QRS duration >120 ms). Various RSR` patterns include an additional R wave (R`) or notching in the nadir of the S wave, or the presence of >1 R` (fragmentation) in 2 contiguous leads, corresponding to a major coronary artery territory. ***(Das et al., 2006)***

Recently, fragmented QRS (fQRS) has been shown to predict cardiac events in several populations. Pathophysiologically, fragmented QRS has been associated with regional myocardial scar, which is believed to be a substrate for ventricular arrhythmia. ***(Varriale et al, 1992)***

Clinically, fQRS has been associated with an increased mortality risk in patients with acute myocardial infarction. ***(Das et al, 2009)***

Slurring and notching of the QRS complexes similar to fQRS has long been associated with post myocardial infarction (MI) cardiac scars. However, fQRS has been proven to be a sign of a scar from a remote MI as detected by single photon emission computed tomography (SPECT); it shows greater sensitivity in detecting regional perfusion abnormalities than Q waves alone and of increasing the sensitivity in detecting MI scars when combined with Q waves. ***(Michael et al, 2007)***

In a population referred for stress testing, fQRS was associated with higher rates of cardiac events. ***(Das et al, 2007)***

More recent studies, in patients with a wide QRS (≥ 120 ms), fQRS was found to be an independent predictor of all cause mortality. ***(Das et al, 2008)***

In patients with left ventricular systolic dysfunction, fQRS has been shown to be a predictor of arrhythmic events but not mortality. ***(Das et al, 2010)***

Various prior studies have suggested that the region of a myocardial scar is associated with alteration in QRS morphology, leading to a terminal conduction delay or a fragmentation of QRS complexes on the 12-lead ECG. ***(Das et al, 2009)***

Fragmentation of QRS complexes is thought to be associated with ventricular tachyarrhythmias. Where the fragmentation of the QRS complex was quantified using a fragmentation index, was found a direct correlation between fQRS complexes and sustained, monomorphic ventricular tachycardia (V-tach) ***(Oeff , G¨odde et al,1997)***

Aim of the Work

To study the incidence of malignant ventricular arrhythmias (VT/VF/SCD) in post ST elevated myocardial infarction (STEMI) patients with fragmented QRS (fQRS) complex in resting electrocardiogram (ECG).

To study the presence or obscene of myocardial viability in areas with fQRS in the same group of patients compared to the other group with no fQRS.

Chapter (1)
ST elevation myocardial infarction.

Definition

Acute myocardial infarction can be defined from a number of different perspectives related to clinical, electrocardiographic (ECG), biochemical, and pathological characteristics. The present guidelines pertain to patients presenting with ischemic symptoms and persistent ST-segment elevation on the ECG (STEMI). The great majority of these patients will show a typical rise of biomarkers of myocardial necrosis and progress to Q-wave myocardial infarction. ***(Thygesen et al, 2007)***

The pathological diagnosis of myocardial infarction (MI) requires evidence of myocyte cell death as a consequence of prolonged ischemia. Characteristic findings include coagulation necrosis and contraction band necrosis, often with patchy areas of myocytolysis at the periphery of the infarct. During the acute phase of MI, the majority of myocyte loss in the infarct zone occurs via coagulation necrosis and proceeds to inflammation, phagocytosis of necrotic myocytes, and repair eventuating in scar formation. ***(Topol text book, 2007)***

The clinical diagnosis of MI requires an integrated assessment of the history with some combination of indirect evidence of myocardial necrosis using biochemical, electrocardiographic, and imaging modalities. The sensitivity and specificity of the clinical tools for diagnosing MI vary considerably and change at varying times after the onset of the infarction. ***(Topol text book, 2007)***

Aspects of Diagnosis of Myocardial Infarction by Different Techniques:

Table (1) Universal definition of myocardial infarction according to different techniques

TECHNIQUE	FEATURES
Pathology	Myocardial cell death
Biochemistry	Markers of myocardial cell death recovered from blood samples
Electrocardiography	Evidence of myocardial ischemia (ST and T wave abnormalities); evidence of loss of electrically functioning cardiac tissue (Q waves)
Imaging	Reduction or loss of tissue perfusion; cardiac wall motion abnormalities

(Thygesen K et al., 2007).

Table (2) Universal definition of myocardial infarction according to criteria

Criteria for Acute, Evolving, or Recent MI
Either of the following criteria satisfies the diagnosis for acute, evolving, or recent MI:
1 Typical rise and/or fall of biochemical markers of myocardial necrosis with at least one of the following:
a Ischemic symptoms
b Development of pathologic Q waves in the ECG
c Electrocardiographic changes indicative of ischemia (ST-segment elevation or depression)
d Imaging evidence of new loss of viable myocardium or new regional wall motion abnormality
2 Pathologic findings of an acute myocardial infarction

(Thygesen K et al., 2007)