The Prognostic Value of the Left Ventricular End Diastolic Volume, Ejection Fraction and the Development of Dyarrhythmia in Ischemic Heart Disease.

Basil N. Saeed* **MRCP, MD, FACC**

Summary:

Background: Study the correlation between the left ventricular end diastolic volume (LVEDV), ejection fraction (EF) and the development of arrhythmia.

Patients and methods: Two hundreds patients with documented acute coronary syndrome and myocardial infection with dysrhythmia documented by ECG and holter monitoring assessed at the cardiac department at Baghdad teaching hospital over the period Jan-Dec 2007. These dysrhythmias were corelated with left ventricular end diastolic volume and ejection fraction.

Results: The patients were divided into 4 groups according to LVEDD and EF. The 1st group, 40 patients (20%) found to have non sustained ventricular tachycardia was associated with higher LVEDD (62-72mm) and low EF (30-39%) in comparison with other groups. A 2nd group of 80 patients (40%) have occasionally ventricular ectopic, their left ventricular end diastolic dimension is (52-58 mm) and ejection fraction in higher than the 3rd group 10 patients (5%) who had atrial fibrillation were having normal left ventricular end diastolic volume but ejection fraction was 45%. A 4th group of 40 patients (20%) were having occasional atrial ectopic have both normal ejection fraction and left ventricular end diastolic volume, the remaining 30 patients (15%) from the total did not develop any arrhythmia and their left ventricular end diastolic volume and ejection fraction were normal considered an control groups.

Conclusion: It was found that the development of arrhythmia is very significantly correlated with the abnormal increased left ventricular end diastolic volume and more lowering of ejection fraction.

Key wards: Arrhythmia left ventricular end diastolic volume, ejection fraction.

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Introduction:

arrhythmia is a common clinical problem after any acute ischemic episode[1,2] death is frequently implicated from the malignant arrhythmia[3,4, 5, 6] the heart function is usually governed by heart rate, the myocardial contractile status (i.e. the prior length of myocardial fiber according to starting law) which is affected by increased preload or after load pressure leading to increase in the end diastolic volume and pressure followed by reduced systolic shortening and the left ventricle will be chronically dilated [7, 8]. Accordingly cardiac output will be reduced, blood pressure will be reduced, hypoperfusion of vital organs, release of neural and humoral factors, like renin, angiotensin II, aldosteron, stimulation of sympathetic nervous system [9] .Such a pathophysiological process lead to development of atrial and ventricular arrhythmia these attacks of arrhythmias especially ventricular tachycardia could be due to adrenergic activation of the myocardial cells or due to genetic abnormality by identification of RyR2 receptor mutation leading to development of bidirectional ventricular tachycardia. Especially if patients were on drugs like digoxin and diuretics [10, 11].

* *Department of medicine, College of medicine, Baghdad University.*

Patients and methods:

two hundred patients who were admitted to the CCU at Baghdad teaching hospital with the diagnosis of acute coronary syndrome (ACS) their ages range (29-65 yrs), mean and stander deviation (23±14), male were 160 (80%), female was 40 (20%) patients with ratio at 4/1. They went through a uniform questionare consisting of full history, clinical examination, investigations, including chest X-Ray, electrocardiography, echocardiograph, holter monitoring, and complete blood tests list. All patients admitted in this study were excluded from having other chronic disease which may precipitate myocardial damage like thyroid disease, malignant diseases, renal disorders and connective tissue diseases. Holter monitoring for (24-48yrs) was done by using cardiosoft holter version ([2b.20071:5.010] version the holter results were corelated with LVEDV & EF parameters analyzed by consult out cardiologist). The result were regarded statically significant when the P value was <0.05.

Results:

It was found that 60% of the patients whom were having increased left ventricular end diastolic dimension >45mm & ejection fraction have <50% developed non sustained ventricular tachycardia and or multiple ventricular ectopics, while the remaining 40% of patient (groups 3&4) who have normal left ventricular end diastolic volume and ejection

fraction of >50% have occasional atrial ectopics occasional, ventricular ectopics, or transient atrial fibrillation. Also the group of patients who had the non sustained ventricular tachycardia or multiple ventricular ectopics, have the highest measurement of the left ventricular endistolic volume and lowest ejection fraction (62-72mm) (30-39%) respectively. The group of patients with occasional ventricular ectopic have Ejection fraction >50%. Table I show the type of arrhythmia and changes in left ventricular end diastolic dimension and ejection fraction during the acute ischemic episode in all groups(1-4).

Table I: The prevalence of arrhythmia in correlation to the left ventricular end diastolic volume and ejection fraction measurement after the acute ischemic episode (p <0.05 significet).

Type of arrhythmia	Left ventricular end diastolic dimension (mm)	ejection fraction	P value
Non sustained ventricular tachycardia.	62-72	30-39 %	0.001
Atrial fibrillation	54-59	40-45 %	0.001
Atrial ectopics	42-49	60-65 %	0.09
Frequent ventricular ectopics	52-58	40-50 %	0.05
Sinus arrhythmia	39-42	65-75 %	0.04

This table showed there is strong correlation between the type of arrhythmias and changes of left ventricular and diastolic volume and ejection fraction with highly significant when p valus <0.05. Table II showed that correlating the drugs used mainly B blocker& ACE inhibitors were significantly associtated with reduction of incidence and arrhythmia mainly non sustained ventricular tachycardia & multiple ventricular ectopics and p value are (<0.005, 0.002) respectively.

Table II: Associtation between prerealence arrhythmia and use of cardiac drugs after the acute ischemic episode (P= present, A= absent).

The Drugs	Ventricular tachycar-dia.	A trial fibrilla-tion	Ventri-cular ectopics	A trial ectopics	Sinus Arrhy-thmia
B-blocker	P20	P5	P60	P9	P66
	A180	A195	A140	A191	A134
Vasodilator	P70	P10	P40	P50	P30
	P130	P190	P160	P150	P170
ACE inhibitor	P63	P20	P30	P36	P71
	A137	A180	A170	A164	A126
Diuretics	P40	P30	P41	P45	P34
	A160	A170	A159	A155	A166
P. Value	<0.005	<0.005	0.002	0.005	P0.005

Discussion:

This study showed that the incidence of arrhythmias are more frequently seen in patients who were having increased left ventricular end diastolic volume and lower ejection fraction. This seen especially with recurrent non-sustained ventricular tachycardia. These two parameters can be used an independent risk factors for development of these arrhythmia. Our results fit with studies done by Moss et al study [12] Bardy et al study [13]. And Bristow et al [14] in which all they reached the conclusion that abnormal left function (measured by left ventricular end diastolic volume & low ejection fraction) will be associtated with increased incidence of ventricular tachycardia. Other studies like by Biggar et al [15], mitrovl and Buxton[16] found that of ejection fraction less than 30% there will be more incidence of arrhythmia than patients with ejection fraction of >40% and this fit with our study in which the short run of ventricular tachycardia were more common in patients with ejection of <40%. Also must not forget that part of the mechanism to enhance the development of arrhythmia is related to the myocardial fiber status (i.e. length, and the ionic channels mechanism), activation of sympathetic nervous system with increased level of catachalamine like substensis leading to progressive myocardial damage and further detoriation of LT ventricular function with further recurrence of arrhythmia especially ventricular tachycardia. This situation lead to the development of arrhythmias while are resistant to medical treatment due to abnormal wall notion such a condition also associated with failure of ablation therapy and more haenodynamic instability and prohibit LT ventricular thrombus formation and patients will be candidates for surgery an planned[17] by ACC/AHH guidelines.

Conclusion:

The Measurement of left ventricular end diastolic dimension and ejection fraction can give a sign to the possibility of development of arrhythmia. The malignant ectopics were more prevalent in patients with increased left ventricular end diastolic volume and severely low ejection fraction and selecting drugs according to the measurement used in this study can reduce the incidence of arrhythmia and its complications.

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