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Correlation between High Syntax score and Reciprocal Changes in Patients with ST-Segment Elevation Myocardial Infarction

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Abstract

Background and aim: We sought to determine the association of reciprocal change in the ST-segment with myocardial injury assessed by syntax score in patients with ST-segment elevation myocardial infarction (STEMI) undergoing primary percutaneous coronary intervention (PCI).

Patients and methods: The studyincluded sixty patients who were presented to Emergency room with STEMI and underwent primary PCI.Echocardiographic evaluation was performed within 24 h of PPCI. We assessed the severity of CAD using syntax and gensini score.

Results: There was significant difference regarding echocardiographic data and gensini scorebetween the two studied groups.

Conclusion: We concluded that patients with high syntax score with reciprocal ST segment changes had worse echocardiographic finding and high gensini score in patients undergoing primary PCI for ST elevation myocardial infarction.

Keywords: STEMI, Syntax score, Reciprocal changes.

INTRODUCTION:

Myocardial infarction is one of the most important causes for hospitalization and is commonly seen in all populations worldwide **(1).**

The clinical approach to a patient suspected to have an acute coronary syndrome consists of detailed history taking, ECG changes, cardiac biochemistry evidence and imaging. The reliability of each of these modalities as a diagnostic tool is dependent on multiple factors, the most signifcant being the window period between the time of infarction and the time the patient seeks medical attention. The current approach to patients presenting with typical or atypical features of myocardial ischemia or infarction starts with making the provisional diagnosis of acute coronary syndrome (**2).**

The simplest and oldest diagnostic tool for myocardial infarction is the 12 lead ECG. In daily practice, even though the ECG remains an important test in diagnosis and detection of progression of disease, there still remains ample potential for its role as a prognostic marker. The fundamental advantage that stands to be gained by realizing this potential is the time it saves for immediate intervention. In addition, it can serve as an instant and cost effective method for risk assessment instead of waiting for biochemical and angiography results (**3).**

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Electrocardiographically, acute transmural myocardial infarction is associated with incomplete depolarization of the ischemic area and ST-segment elevation in the leads overlying the affected area (STEMI) (**4).**

This change is often accompanied by reciprocal ST-segment depression, occurring in opposite facing leads, whose significance has been debated for decades. The reciprocal changes (RC) in STEMI may be caused by ischemia in opposing areas (ischemia at distance), by direct extension of the ischemic area or through collateral arteries that divert blood to the infarcted region from other areas. It could also represent an electrical phenomenon resulting from a reciprocal reflection of the ST-elevation in opposing leads (**5,6).**

The purpose of this study is to investigate the association between reciprocal ST segment changes and syntax score in patients undergoing primary PCI for ST elevation myocardial infarction.

PATIENT AND METHODS:

This Cross sectional study was conducted on 60 patients with ST elevation myocardial infarction and underwent primary PCI in Cardiology Department, Faculty of Medicine, Zagazig University

Patients were classified according to the syntax score into two groups:group (I): 30 patients with Syntaxequal or more than 33and group (II): 30 patients with syntax score less than 33.

Inclusion criteria: Patients presented with ST elevation myocardial infarction whounderwent primary PCI.STEMI: It was defined as symptoms of ischemia associated with ST-segment elevation in two contiguous lead (measured at J-point) of ST-segment elevation ≥ 2.5 mm in men younger than 40 years, ≥ 2 mm in men older than 40 years, or ≥ 1.5 mm in women in leads V2-V3 and/or≥ 1 mm in all other leads in the absence of LVH or LBBB. **(7).**

Exclusion criteria: Patients with unstable angina and non-STEMI, admission for more than 12 hours after symptom onset and previous myocardial infarction, patients treated with thrombolytics or conservative methods prior to PCI, coronary artery by-pass, patients with atrial fibrillation, grafting, significant valve lesion, LV dilatation and electrolyte disturbance.

All patients were subjected to:

Full history taking, demographic data andclinical examination including the risk factors for CAD like smoking, dyslipidemia, hypertension,diabetes and family history of CAD. Routine laboratory investigations were done and a standard transthoracic echocardiogram was performed using GE Vivid E9 (Norway).All patients presenting within 12 h of onset of symptoms were considered for primary PCI. Severity of CAD was assessed using gensini Score **(8)** and syntax score **(9).**

RESULTS:

Table (1): Comparison between demographic data and risk factors between patients with Syntax Equal &more than 33 versus Less than 33.

Variables	Syntax Equal &more than 33 (n=20)	Syntax Less than 33 (n=40)	t	P value
Age (years)	60.9 ± 11.9	60.43 ± 11.5	0.1	0.92

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Sex male	18 (90%)	34 (85%)	X^2 0.28	0.59
Hypertensive	14 (70%)	26 (65%)	X^2 0.15	0.69
Diabetic	10 (50%)	22 (55%)	X^2 0.13	0.71
Smokers	17 (85%)	29 (72.5%)	X^2 1.16	0.28

Data are represented by mean ± SD or number (%). Data analyzed using independent t test and chi square test.

Table 1;showed that therewas nostatisticallysignificantdifferencebetweenboth groups regarding demographicdata and risk factors p >0.05.

Table (2): Comparison clinical databetween patients with Syntax Equal &more than 33 versus Less than 33.

Variables	**Syntax Equal &more than 33 (n=20)**	**Syntax Less than 33 (n=40)**	**t**	**P value**
Symptom to door time (hours)	6.5 ± 1.8	5.8 ± 2.3	1.1	0.26
Systolic blood pressure (mmHg)	113.5 ± 13.1	115.5 ±16.3	0.47	0.63
Diastolic blood pressure, (mmHg)	69 ± 10.7	71 ± 10.3	0.69	0.48
Pulse (bpm)	78.7 ± 11.4	77.6 ± 12.3	0.32	0.74
Killip class **1** **2**	 17 (85%) 3 (15%)	 24 (60%) 16 (40%)	**X^2** 0.14	 0.7

Data are represented by mean ± SD. Data analyzed using independent t test

Data are represented as number (%). Data analyzed using chi square test 2X2

Table 2;showed that therewas nostatisticallysignificantdifferencebetweenboth groups regarding clinicaldata p >0.05.

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Table (3): Comparison laboratory databetween patients with Syntax Equal &more than 33 versus Less than 33.

Variables	Syntax Equal &more than 33 (n=20)	Syntax Less than 33 (n=40)	t	P value
Cholesterol (mg/dl)	208.2 ± 28.6	222.1 ± 48.5	1.1	0.24
Triglycerides (mg/dl)	170.1 ± 65.3	185.3 ± 59.3	0.9	0.36
HDL (mg/dl)	31.9 ± 4.6	31.3 ± 5.7	0.3	0.71
LDL (mg/dl)	123.6 ± 34.7	139.9 ± 40.1	1.5	0.12
WBCS	14.1 ± 2.3	13.4 ± 1.3	1.3	0.17
Hb	14.2 ± 2.09	14.3 ± 1.8	0.18	0.85
Platelets	296.8 ± 98.4	295.4 ± 69.6	0.06	0.94
Creatinine (mg/dl)	1.11 ± 0.3	1.05 ± 0.16	1.03	0.3
Troponin	237.4 ± 38.4	221.3 ± 34.8	1.6	0.21

Data are represented by mean ± SD. Data analyzed using independent t test

Table 3;showed that therewas nostatisticallysignificantdifferencebetweenboth groups regarding laboratorydata.

Table (4): Comparisonelectrocardiographic data between patients with Syntax Equal &more than 33 versus Less than 33.

	Syntax Equal &more than 33 (n=20)	Syntax Less than 33 (n=40)	X^2	P value
Q Wave **Yes** **No**	 20 (100%) 0 (0%)	 31 (77.5%) 9 (22.5%)	 5.2	 **0.023**
Corrected QT interval	435.16 ± 19.3	422.2 ± 28.3	1.8	0.075
Anterior	15 (75%)	28 (70%)	0.16	0.68
Inferior	5 (25%)	12 (30%)		

Data are represented by mean ± SD or number (%). Data analyzed using independent t test and chi square test.

Table 4;showed that therewas nostatisticallysignificantdifferencebetweenboth groups regarding electrocardiographic data except Q wave that was significantly higher in patients with Syntax equal &more than 33 versus Less than 33.

Table (5): Comparisonechocardiographic data between patients with Syntax Equal &more than 33 versus Less than 33.

	Syntax Equal &more than 33 (n=20)	**Syntax Less than 33 (n=40)**	**t**	**P value**
Wall motion score index	1.4 (1.3 – 1.4)	1.25 (1.2 -1.37)	MW=299.5	**0.02**
LVEDD	53.05 ± 3.2	49.5 ± 4.3	3.1	**0.003**
LVESD	36.9 ± 2.6	33.8 ± 4.6	2.8	**0.007**
LVEF	47.9 ± 4.5	51.5 ± 5.9	2.3	**0.02**
LV mass index	115± 8	98 ± 6	9.3	**0.0001**

Data represented by mean ± SD are analyzed using independent t test.

Data represented as median (25^{th} -75^{th} Percentiles) are analyzed using Mann Whitney test.

Table 5;showed that therewas statisticallysignificantdifferencebetweenboth groups regarding echocardiographic data.

Table (6): Comparison angiographic data between patients with Syntax Equal &more than 33 versus Less than 33.

Culprit lesion	**Syntax Equal &more than 33 (n=20)**	**Syntax Less than 33 (n=40)**	**X^2**	**P value**
LAD	15 (75%)	28 (70%)	3.77	0.15
LCX	0	6 (15%)		
RCA	5 (25%)	6 (15%)		
Gensini Score	28.97 (5-55)	18.1 (5 – 42)	MW	**<0.001**

Data represented as number (%) are analyzed using Fischer exact test. Data represented as median (25^{th} -75^{th} Percentiles) are analyzed using Mann Whitney test.

Table 6;showed that therewas nostatisticallysignificantdifferencebetweenboth groups regarding site of lesion while there was significantdifference regarding to gensini score.

DISCUSSION:

Acute myocardial infarction (AMI) is one of the leading causes of morbidity and mortality throughout the world. Acute transmural myocardial infarction induces ST-segment elevation, enlargement of the R wave, and widening of the QRS complex in electrocardiogram (ECG) leads directly related to the ischemic region**(10).**

Moreover, leads not related to the ischemic area can show concurrent reciprocal ST-segment depression. Numerous studies have aimed to determine the clinical implications of reciprocal change on ECG. However, the clinical significance of reciprocal change on ECG such as ST-segment depression remote from the infarct site remains controversial, as reflected in a more extensive infarct size or the benign mirror phenomenon**(11).**

The reciprocal change is a surrogate marker of the severity of the disease; patients exhibiting this reciprocal change tend to have a larger infarction, poorer left ventricular systolic function, higher incidence of proximal left anterior descending artery (LAD) lesions, multivessel diseases, and worse prognosis. Patients in the previously mentioned ECG studies usually received conservative or thrombolytic therapy, followed by coronary intervention. At present, patients with STEMI usually receive primary percutaneous coronary intervention **(4).**

So we aimed to find the association between reciprocal ST segment changes and syntax score in patients undergoing primary PCI for ST elevation myocardial infarction (STEMI).

In the present study, a comparison between patients with Syntax score ≥ 33 and patients with Syntax score < 33, revealed that there was no statistically significant difference between both groups regarding demographic data, risk factors, clinical data, laboratory data p >0.05.

Yesin et al. (12) found in his study that a total of 193 patients [68 females and 125 males with a mean age of 61.5 ± 9 years were included in the study. Ninety-five patients had SS <22 and 98 had SS ≥22. Diabetes mellitus, hypertension and LMCA disease were more often present in patients with higher SS. The clinical and laboratory characteristics of the patients according to SS revealed that SS of the patients ranged from 13 to 58.5 (median 28.3). One hundred twenty-five patients had SS <32 and 68 had SS ≥32. There were significant differences between two groups in terms of gender, presence of LMCA disease, peripheral artery disease and COPD (p < 0.001 for all).

El-Den Mohamed et al. (13) revealed in his study that coronary angiography, left anterior descending artery (LAD) was (37.7%), right coronary artery (RCA) was (43.4%), and left circumflex artery (LCx) was (15.1%), while left main artery was involved in 2 patients (3.8%). When involvement of individual arteries on angiography were compared, involvement of the LAD (proximal or mid) showed higher prevalence of collaterals on PCI (p=0.05) than LCx or RCA and a lower LVEF (41.7% vs 50.0%, p= 0.015) but the presence of collaterals in these patients did not correlate with RC.

Chen et al. (4) found that angiographic characteristics of STEMI patients with reciprocal ECG changes revealed that the IRA of group I patients was mainly the right coronary artery (P 0.001); meanwhile, that of group II patients was mainly the LAD (P b .001). However, coronary artery disease severity was similar between both groups.

In disagreement with our study, **Nour, (6)** found a statistically significant higher incidence of significant RCA &LCX lesions in those patients with Acute anterior MI & inferior RSTD

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compared to those without RSTD & similarly higher incidence of significant LAD lesions in those patients with acute inferior MI & anterior RSTD compared to those without RSTD. **Hakim et al. (14)** who stated that the presence of RSTD in precordial leads during inferior STEMI was associated with more frequent left coronary artery disease.

Noriega et al. (5) concluded that only the proximal LAD occlusion in anterior STEMI patients resulted in reciprocal ST-segment depression in leads II, III, and aVF ($p < 0.001$). They concluded that proximal and mid-distal occlusion of RCA or LCX coronary artery always induce ST-segment elevation in leads II, III, and aVF and reciprocal STsegment depression in leads V2 and V3.i.e.reciprocal ST segment depression in inferior STEMI might occur with any segment occlusion in RCA or LCX.

Hwang et al. (15) showed that there was significant difference between both groups regarding infarct-related artery.

The extent of coronary artery disease was assessed in the current study using the modified Gensini score (**16)**, our data revealed that there was significant difference between both groups regarding gensini score.

This conclusion obviously revealed that the presence of RSTD was associated with increased extent of coronary artery disease & are in an agreement with **Hakim K & Co-Workers, (14)** who demonstrated a significant positive linear correlation between the presence of reciprocal ST segment depression in non-infarcted leads &gensini score ($r = 0.68$, $P < 0.05$).

Conclusion:

We concluded that patients with high syntax score with reciprocal ST segment changes had worse echocardiographic finding and high gensini score in patients undergoing primary PCI for ST elevation myocardial infarction.

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