Original Research Article

Prediction of reciprocal ST segment changes in determining the extent of coronary artery disease in ST segment elevation myocardial infarction: An angiographic correlation

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Abstract

Background: In patient with history suggestive of myocardial infarction, ST segment elevation in ECG is supportive of MI. Mechanism of reciprocal changes is still a debate. The reason for ST segment depression has been extensively investigated, with conflicting results. Possible hypothesis for the mechanism of reciprocal changes are concomitant stenosis of other vessels or merely a benign electrical activity.

Objectives: To identify reciprocal ST Segment depression in ST segment elevation acute myocardial infarction and predict the extent of coronary artery disease by correlating with coronary angiography, to assess left ventricular dysfunction in patient with and without reciprocal ST Segment changes.

Materials and methods: The study was conducted over 18 months among 80 patients who were admitted to FMMCH with STEMI. They were analyzed in two groups with 40 patients with anterior wall MI and 40 patients with Inferior wall MI with reciprocal changes and those without reciprocal changes.

Results: Among the 80 patients, 57% belonged to age 45-65 years, with male was to female ratio was 4:1. Reciprocal changes seen in multi vessel disease were statistically significant (p value 0.000).

Cases with reciprocal changes 42.5% had severe LV dysfunction (p value 0.03) which was statistically significant. Reciprocal changes seen in multi vessel disease were statistically significant (p value 0.0).

Conclusion: This study showed statistical significant positive correlation between reciprocal ST segment changes, multi vessel coronary artery disease and severity of left ventricular dysfunction. Emphasizing the need for urgent evaluation and treatment patients with reciprocal ST segment changes among the patient with ST elevation myocardial infarction.

Key words

Reciprocal ST changes, Left ventricular dysfunction, Mulitvessel disease.

Introduction

Myocardial infarction has become one of the major health problems in terms of morbidity and mortality. Early diagnosis and intervention is necessary in preventing the complications following myocardial infarction (MI) and is lifesaving. In patient with history suggestive of myocardial infarction, ST segment elevation in ECG is supportive of MI. However, little attention is given on reciprocal changes, etiology and mechanism causing it is still a debate. The reason for ST segment depression in precordial leads in acute inferior wall myocardial infarction has been extensively investigated, with conflicting results [1]. Reciprocal S T segment changes for anterior wall myocardial ischemia have not been investigated thoroughly. In this study, acute myocardial infarction involving the anterior and inferior wall was considered. Possible hypothesis for the mechanism of reciprocal changes are:

- Concomitant stenosis of other vessels
- Merely a benign electrical activity [2].

Identifying the reciprocal changes would be of significance in predicting the extent of the disease. Thereby high risk and poor outcome among these patients can be predicted. This study is based on the hypothesis that reciprocal ST segment changes have concomitant multivessel stenosis and LV dysfunction.

Materials and methods

Source of data: Patients who were admitted in Father Muller Medical College Hospital with the diagnosis of ST segment elevation acute myocardial infarction.

Method of collection of data: A semistructured proforma where details about age, sex, coronary risk factors (Hypertension, Diabetes, Dyslipdemia, history of ischemic heart disease (IHD), positive family history of IHD was be administered. They were divided into 2 groups, Group A: Anterior STEMI and Group B: Inferior STEMI. Each group subdivided into two subgroups according to presence of reciprocal ST segment depression (RSTD): A1 and B1, Absence of RSTD: A2 and B2.

Method of collection of data
Study design: Cross sectional Study.
Study Population: Patients who were admitted in Father Muller Medical College Hospital and diagnosed to have ST segment elevation acute myocardial infarction and undergone coronary angiography were selected. Informed and written consent was taken.
Inclusion criteria
- Patients above 18 years
- Patients with the diagnosis of STEMI

Exclusion criteria
- Patients with old myocardial infarction
- Patients whose ECG shows ventricular paced beats
- Patients with arrthymias

Statistical analysis: All statistical data was analyzed using Statistical Package for Social Sciences, Version 20 (SPSS 20) First descriptive statistics were computed with frequency and percentages calculation for categorical variables. Then inferential statistics were computed using Chi-square test.

Results

In this study, out of 80 patients, 57% belonged to age group of 45-65 years, 18% belonged to less than 45 years. Among the cases with reciprocal changes 55% (22/40 cases) belonged to age group of 45-65years. Male to female ratio was 4:1. Among the patient with reciprocal changes 75% (30/40) were men and 25% (10/40) were females.

Duration of diabetes more than 10 years was seen in 32% of the subjects. Hypertension of duration more than 10 years and sedentary lifestyle was seen in 40% of the subjects. Hypertension and sedentary life style were most common risk factors noted.

In 66% of patient total count was elevated. Neutrophilia was seen in 65% of them, which statistically significant (p value=0.02). In subjects with diabetes of more than 10 years, 16/40 cases had reciprocal changes, which was found to be statistically significant (p value=0.028). Among patients with duration of more than 10 years of diabetes; 32% had MI. A significant association between diabetes of more than 10 years duration and reciprocal changes on ECG was noted (p value= 0.02). Dyslipidaemia was seen in 33.8% of the patients. About 28.8% gave history of alcohol consumption in hazardous levels. Smoking more than 10 pack years was present in 32.5% and was more common among patients without reciprocal changes, which was not statistically significant. Smoking of more than 10 pack years did not show statistically significant results in relation to multivessel disease as compared to single vessel disease. In 66% of patient total count was elevated. Among them, 50% of the patient had reciprocal changes. Neutrophilia: Among the subjects with leucocytosis, 65% of the patient with elevated count had neutrophilia, Presence of neutrophilia was statistically significant (p value=0.02).Among the cases with anterior wall MI without reciprocal changes, 75% (15/20) had a neutrophilic response.

Among reciprocal changes in STEMI, 14/40 patients had glyco Hb of >8. Multivessel disease was significantly associated with poorly controlled diabetes (p value= 0.039).

In cases of anterior wall STEMI with reciprocal changes, 30% had (6/20) had severe LV dysfunction. In cases of inferior wall STEMI with reciprocal changes, severe LV dysfunction was seen in 55% (11/20). Severe LV dysfunction was found in inferior wall MI with/without reciprocal changes with no significant difference between them. Among the cases, 42.5% with reciprocal changes had severe LV dysfunction, which was statistically significant (p value= 0.03).

All cases of inferior wall STEMI without reciprocal changes (20/20) had single vessel disease and with reciprocal changes (20/20) had multi vessel disease. Among them 5/20 cases of inferior wall with reciprocal changes had triple vessel disease. In cases with anterior wall STEMI without reciprocal changes, 50% (10/20) had multi vessel disease and with reciprocal changes all had multivessel among them 60% (12/20) had triple vessel disease.

Relation between reciprocal changes and multivessel disease

Reciprocal changes seen in multi vessel diseased patients were statistically significant (p value= 0). In cases of anterior wall MI with reciprocal changes, 30% (12 /20) had triple vessel disease. In cases, inferior wall MI with reciprocal changes, 25% (5/20) had triple vessel disease.

Discussion

Out of 80 patients with STEMI, 57.5% belonged to age group of 45-65 years, about 18% belonged to age group of 18-45years which is consistent with a study done in South India in 2014, with Mean age of presentation which was 54.71 ± 19.90 years [3].

Male to female ratio was 4:1, consistent with the findings of the study done in South India in

2014, where Among 1562 ACS patients majority were male 1242 (79.5%) and 320 (20.5%) were female. In this study, most common risk factor was hypertension, where 40% had h/o hypertension for more than 10yrs. Duration of diabetes more than 10 years was seen in 32% of the cases, consistent with that done in the study where, diabetes was risk factor in 37%, hypertension in 40%. In this study, among reciprocal changes in STEMI, 14/40 patients had glyco Hb of >8%.Multivessel disease was significantly associated with poorly controlled diabetes (p value=0.039). 17/50 (34%) cases had glycol Hb of >8%.

In this study 28.8% of the cases had history of alcohol consumption above recommended units, while the prevalence was 49% in a previous study. History of smoking was present in 32.5% of the cases, similar to a previous study which had 30%.

In this study, 66% of patient had elevated total count. Presence of neutrophilia among the subjects with STEMI was statistically significant (p value 0.02). Among them, 37.5% (30/80) had severe LV dysfuction, however it was not statistically significant. Higher leukocyte and neutrophil counts were predictors of failure in one of the study [4].

Correlation between reciprocal changes ad left ventricular dysfunction
In this study, 42.5% with reciprocal changes had severe LV dysfunction LVEF<30% (p value 0.03). A study published by JAPI in 2014 showed higher incidence of LV dysfunction i.e. LVEF < 40% in patients with reciprocal changes (72.05%) compared to patients without such changes (27.94%) [5]. This was contradicting to the study done in 2003, which showed no significant difference between patients with reciprocal ST depression with severity of left ventricular dysfunction [6]. Another showed that ejection fraction was lower in group with reciprocal changes than in group without reciprocal but was not statistical significant difference noted (*P*-value 0.257) [2]. In this

study, 30% (6/20) of anterior wall STEMI with reciprocal changes and 55% (11/20) of inferior wall STEMI with reciprocal changes had severe LV dysfunction. Here, severe LV dysfunction was found to be more common among inferior wall STEMI, probably because more number of patients with inferior wall MI had with multi vessel disease.

Relation between reciprocal changes and multivessel disease
Reciprocal changes seen in multi vessel disease was statistically significant (p value 0.0) which is consistent with study done in 2003, implying that this changes may not be always due to an electrical phenomenon [7]. A study published in international journal of cardiology in 2014 showed contradicting results of no difference in incidence of multivessel disease with and without reciprocal ST segment changes [8]. A study done in Europe showed, Multi vessel disease was significantly more commonly in patient with reciprocal changes. 50% of patients with reciprocal changes had three -vessel disease and only 5% with no reciprocal changes had three- vessel disease with statistical significant *p* value 0.001 [2]. In this study, all cases of Inferior wall STEMI without reciprocal changes (20/20) had single vessel disease. Cases with anterior wall STEMI with no reciprocal changes 50% (10/20) had multi vessel disease. Among them 30% (6/20) had triple vessel disease. All cases of inferior wall STEMI with reciprocal changes (20/20) had multi vessel disease. Among them 5/20 cases of inferior wall with reciprocal changes had triple vessel disease accounting for 25% of the cases. Anterior wall STEMI with reciprocal changes 60% (12/20) had triple vessel disease.

Conclusion
This study showed a statistical significant positive correlation between reciprocal ST segment changes, multi vessel coronary artery disease and severity of left ventricular dysfunction. Emphasizing the need for urgent evaluation and treatment patients with reciprocal

ST segment changes among the patient with ST elevation myocardial infarction.

Limitations

- Small sample size
- Complication and mortality rates is not included

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