ORIGINAL ARTICLE

ST- Segment Elevation on Electrocardiogram in Conditions Other Than Acute Coronary Syndrome

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ABSTRACT

Objective: Classify conditions leading to ST segment elevation on electrocardiogram in conditions other than acute myocardial infarction.
Design: Cross-sectional descriptive study.
Setting: Emergency Department of Medicine, Jinnah Hospital, Lahore. Duration: 6 months from 1-5-2006 to 31-10-2006.
Patients and Methods: Total 100 patients were included. Brief history and clinical examination was performed in emergency ward. Twelve lead electrocardiogram was recorded at a paper speed of 25 mm/s and on amplification of 10mm/mv. It was interpreted by emergency doctor. Cardiac enzyme CK-MB was done in emergency ward to exclude acute myocardial infarction.
Result: Among 100 patients 57 were male and 43 female. Mean age was 51.9±17.0. ST-segment elevation was recorded in 39 patients of left ventricular hypertrophy, 35 left bundle branch block, 20 benign early repolarization, 2 pericarditis, 1 right bundle branch block, 1 left ventricular aneurysm, 1 cerebrovascular accident and 1 hyperkalemia.
Conclusion: It was concluded that left ventricular hypertrophy, left bundle branch block and benign early repolarization are the most frequent causes of ST-segment elevation in addition to acute myocardial infarction.
Keywords: ST-Segment Elevation, Electrocardiogram, Left ventricular hypertrophy, left bundle branch block

INTRODUCTION

ST segment elevation (STE) on electrocardiogram (ECG) in the setting of acute chest pain may necessitates urgent management if Acute Myocardial Infarction is diagnosed[1].

Approximately 6 million per annum emergency department visits are for the chief complaint of chest pain in USA, but depending on the patient population surveyed, roughly 15-17% of these patients were experiencing acute coronary syndrome[2].

The occurrence of numerous other non-infarction STE syndromes only reinforces the point that ST segment elevation is a less sensitive marker of AMI. [3] Conditions like left bundle branch block (LBBB), left ventricular hypertrophy (LVH) and left ventricular aneurysm occur with increased frequency in patients with known coronary artery disease, other patterns such as benign early repolarization (BER) and acute pericardiditis, are not necessarily associated with ischemic heart disease though they may resemble acute infarction ST segment waveforms[4,5].

In Pakistan mortality of acute myocardial infarction has been studied but no study is available in our population on frequency of different conditions causing STE on ECG. ST- segment elevation is defined as greater than or equal to 1 millimeter (mm) in the limb leads or ≥ 2mm in the precordial leads.

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MATERIALS AND METHODS

It was a cross-sectional descriptive study carried out in the Emergency Department of Medicine, Jinnah Hospital, Lahore from May 2006 to November 2006. A total of 100 patients were selected through convenience sampling. All male or female patients of more than 20 years of age with St segment elevation in two contiguous ECG leads. An informed consent was obtained from patients, after explaining the purpose of study. After taking brief history and clinical examination twelve lead electrocardiogram was recorded on a paper at the speed of 25 mm/s and amplification of 10mm/mv. ECG was interpreted by emergency doctor. Cardiac enzyme CK-MB was done in emergency ward to exclude the diagnosis of acute myocardial infarction. Echocardiography was performed in cardiology ward, if needed. Data were collected on a specially designed proforma.

Computer software SPSS version 11.0 was used. The main variables in data were consisting of causes of ST elevation in conditions other than acute myocardial infarction and data was mostly in percentages of these variables. Significance of their relative frequencies being qualitative in nature was compared by Chi square test and P value of < 0.05 was taken as significant.

RESULTS

A total of one hundred cases were included in this study presented in emergency department with chest pain having ST segment elevation non-acute myocardial infarction.In a total of 100 patients mean age was 51.9± 17.0 with a majority of cases between 51 to 60 years of age. Among 100 patients, sex distribution was 57 male and 43 female patients (p> 0.05). (Figure-1)

Among the causes left ventricular hypertrophy was most frequent, followed by left bundle branch block, benign early repolarization, right bundle branch block, left ventricular hypertrophy, pericardtitis, ceberovascular accident and hyperkalemia. (Table-1).

Fig. 1

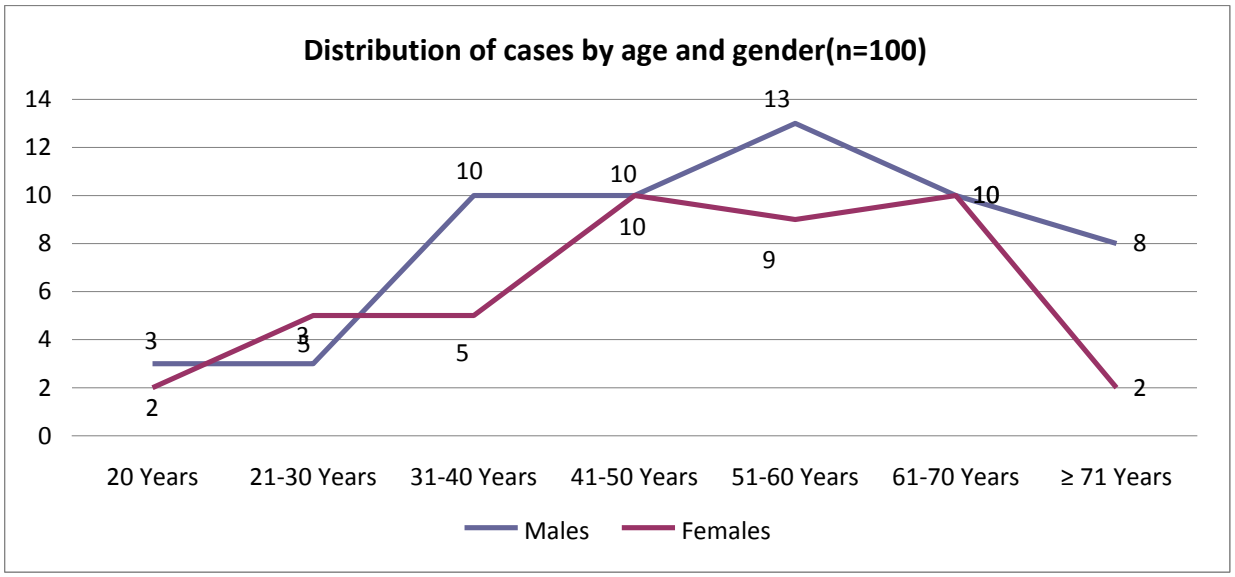

Table 1: Distribution of causes among 100 patients

Causes	%	P- value
Left Ventricular Hypertrophy	39	0.02
Left Bundle Branch Block	35	0.003
Right Bundle Branch Block	01	<0.001
Left Ventricular Aneurysm	01	<0.001
Benign Early Depolarization	20	0.001
Pericarditis	02	0.001
Cerbrovascular Accident	01	0.001
Hyperkalemia	01	0.001

DISCUSSION

In the chest pain patient, the rapid and accurate diagnosis of transmural (ST segment elevation) AMI is a formidable challenge for emergency physician. This diagnosis is accomplished using the 12-lead ECG in conjunction with the history and physical examination, the ECG in this setting also assists the physician in the selection of the proper therapy, in particular the application of treatment aimed at coronary reperfusion of patients with chest pain and ST segment elevation, 171 of 202 patients (85%) in one study[6] and 63 of 123 (51%) in another study[7] had diagnosis other than infarction. In two studies of consecutive patients treated with thrombolytic agents, 10 of 93 patients (11%) in one study[8] and 35 of 609 (5.7%) in another study[9] did not have infarction. In our study which is conducted in emergency department, we found left ventricular hypertrophy, left bundle branch block, benign early repolarization, acute pericarditis, left ventricular aneurysm, right bundle branch block, hyperkalemia and cerebrovascular accident as causes having ST segment elevation and frequently encountered in emergency department in addition to acute myocardial infarction. The existing literature also support these ST segment elevation non-acute myocardial infarction causes.[10]

ECG is an important tool to detect left ventricular hypertrophy but age, race, sex, built,

proximity to surface and composition of intervening tissues etc. are affecting, so a different voltage is recorded at surface on ECG. These all factors decrease diagnostic value of ECG but as it is easily available, cheap and quick way for detection, it is an important test. There are many ECG criteria for detection of left ventricular hypertrophy like Gubner ungerleider criterion with 8-12% sensitivity, Sokolow lyon limb lead RAVL > 11mm criterion with 7% to 22% sensitivity and 96% to 100% specificity, Sokolow lyon precordial leads SV_1 and RV_5 or RV_6, with 32% sensitivity and 100% specificity, Romhilt Estes point score criterion with 54% sensitivity and 97% specificity, Cornell voltage criterion with 41% sensitivity and 98% specificity[11-13]

We have used these criteria for detection of left ventricular hypertrophy. The left ventricular hypertrophy is primary cause of ST elevation of ECG chest pain patient in our study and existing literature support it as number one important cause[8,10,14]. In the current study it is 39%. Sharkey et al found 30% cases of LVH with ST segment elevation in his study[8]. Brady et al found 25% cases of LVH in his study and also mentioned that agreement between emergency physicians (EPs) and cardiologists on ECG interpretation regarding cause of ST elevation on LVH was 96%.[14]

Left bundle branch block is the next important cause of ST elevation on ECG in non AMI cases in our study. Existing literature accept it as most important cause after left ventricular hypertrophy.[14] Sagarbossa et al devised criteria to distinguish left bundle branch block from acute myocardial infarction and found it 44% to 79% sensitive and 93% to 100% specific for diagnosis of acute myocardial infarction.[15] In our study we have applied same criteria to distinguish left bundle branch block stroke.[16-8] In our study cerebrovascular accident accounts for 1% of total cases of non AMI ST elevation.

Right bundle branch block with ST segment elevation in right precordial leads on ECG known as Brugada syndrome is predominantly documented in Asian and white persons.[19] It is also documented that fluctuations between diagnostic and non-diagnostic ECG in patients with Brugada syndrome is high.[20] In our study frequency of right bundle branch block with ST elevation is one percent. Brady et al described its frequency 5%[14].

CONCLUSION

ST segment elevation less often results from acute myocardial infarction among adult chest pain patients in emergency department. Left ventricular hypertrophy, left bundle branch block and benign early repolarization are the most frequent causes of ST segment elevation in addition to acute myocardial infarction. Emergency physicians must consider the various causes of ST elevation in the chest pain patients, realizing that not all such instances of elevation represent myocardial infarction.

Educational efforts should be directed towards the correct recognition of the various causes of ST elevation – both acute myocardial infarction and non acute myocardial infarction origins – so that correct therapies may be delivered in appropriate fashion.

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