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To Study the Correlation of Location of Myocardial Infarction according to ECG and Echocardiography

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Abstract:
Background: *Acute myocardial infarction is one of the leading causes of death in developed as well as in developing nations. Present study was undertaken to correlate the site of infarction by ECG and 2D Echocardiography.*
Methodology: *Fifty patients of myocardial infarction fulfilling the inclusion criteria coming to OPD/Wards and Emergency ward of MGUMST, Jaipur were recruited. They were subjected to detailed history (as per the performa), clinical and diagnostic examination. Data analysis was done using SPSS software.*
Results: *Out of 50 patients, 20 patients had extensive anterior myocardial infarction (40%), 17 patients had inferior wall and inferior wall with RVMI (34%), 9 patients had anteroseptal (18%) and 4 patients had antero-inferior (8%). A definite correlation between electrocardiography and echocardiography in localizing the site of infarction was found.*
Conclusion: *The location of MI seen on ECG correlated with those seen on echocardiography.*
Keywords: *myocardial infarction, electrocardiography, echocardiography*

I. Introduction

Acute myocardial infarction is one of the most common diagnosis in hospitalized patients in the industrialized countries, which is a serious complication of atherosclerotic coronary heart disease. In most patients (80-95%) it results from thrombotic occlusion of the related vessel resulting in infarct. Myocardial infarction may occur at any age but the frequency increases progressively with age. Ischemic heart disease is thus a great killer of mankind accounting for 15% of all mortality in India (1) (2)**.** Acute myocardial infarction is characterized by chest pain, usually in retrosternal region radiating to ulnar aspect of left arm. In some patients particularly in elderly, acute myocardial infarction is not manifested clinically by chest pain but rather by symptoms of acute left ventricular failure (3).

It is observed that various risk factors such as age, male sex, smoking, obesity, hyperlipidemia, diabetes mellitus, hypertension, family history of IHD, type A personality, play a role in the occurrence of myocardial infarction (4). Various methods such as QRS scoring index by ECG & left ventricular EF and wall motion abnormality by 2D Echo help in diagnosis and prognostification of myocardial infarction. These investigations are non-invasive and can be done at less advanced centres.
Hence, this study is undertaken to correlate the site of infarction by ECG and 2D Echo.

II. Material And Methods

A total of 50 patients of myocardial infarction coming to OPD's/Wards and Emergency ward of Mahatma Gandhi Hospital, Jaipur were selected for study.
Data is collected by taking a detailed history from the patients (as per the performa) particularly keeping the following points in view.

a) Time of onset of typical chest pain, nature of pain, radiating, increasing with exertion, not relieved by rest and associated symptoms like excessive sweating, vomiting, breathlessness, diarrhoea, giddiness, fatigue and abdominal pain. A history of smoking, alcohol consumption, hypertension, diabetes mellitus, obesity according to BMI, personality type and family history of IHD.
b) A thorough clinical examination was carried out in each case with special reference to pulse, BP, CVS and respiratory examination for the presence of any cardiac enlargement, S3 gallop, rub, murmur and basal crepitations in the lungs.
c) Investigations like fasting lipid profile & enzymes like CPK-MB and SGOT were done.

d) ECG is taken at the time of admission for the ECG diagnosis of myocardial infarction, the criteria consisting of ST segment elevation of ≥ 2mm, 0.08 second from J point in ≥2 related electric fields, with typical evolutionary changes or presence of new pathological Q waves.

As soon as feasible, a 2D-Echo was performed by means of commercially available mechanical sector scanner. With the patient in left lateral decubitus position, multiple parasternal long axis views, short axis and apical views were taken to study regional wall motion abnormalities

Inclusion Criteria:
Patients above 25 years of age and WHO criteria for the diagnosis of acute MI are included
a) A history of ischemic type of chest pain
b) Evolutionary changes on serially obtained ECG tracings and
c) A rise and fall in serum cardiac markers.

Exclusion Criteria:
a) Patients above the age of 70 years were not considered for the study.
b) Patients presenting with:
i. Previous history of MI
ii. Subendocardial infarction, true posterior wall infarction.
iii. LVH, hemi-block, bundle branch blocks, intraventricular conduction
iv. defects and complete heart blocks.
v. Valvular heart disease
vi. Cardiomyopathy
vii. Pericardial diseases
viii. Congenital heart disease
ix. Previous cardiac surgeries were excluded from the study.

III. Results

Table 1: Site of infarction in ECG

Site of infarction	Total no. of cases	Percent (%)
Anterior wall MI	20	40
Inferior wall and inferior wall+RVMI	17	34
Anterior septal MI	9	18
Posterior	0	0
Antero inferior	4	8
Right ventricle	0	0
Total	50	100

It is seen that out of 50 patients, 20 patients had extensive anterior wall myocardial infarction (40%), 9 patients had anteroseptal (18%), 17 patients had inferior wall and inferior wall with RVMI (34%), 4 patients had antero – inferior (8%). No patient had posterior wall infarction or right ventricular wall infarction.

Table 2: Site of infarction on Echo in 20 patients with extensive anterior wall myocardial infarction on ECG

Site of Infarction on Echo	No. of cases	Percent (%)
Extensive anterior wall	8	40.00%
Antero – septal and apical	7	35%
Anterior & apical	3	15%
Anterior and Septal	2	10%
Global	0	0%
No regional wall motion abnormality	0	0%
Total	20	100.00%

As shown in Table 1, 20 patients, out of 50 patients had extensive anterior wall myocardial infarction on ECG. Echocardiography in these patients further elaborated that 8 patients (40%) had extensive anterior wall infarction, 7 (35%) has antero – septal and apical wall infarction, 3 (15%) had anterior and septal infarction and no patients showed global or no regional wall motion abnormality.

Table 3: Site of infarction on Echo in 17 patients with inferior wall myocardial infarction and Inferior wall with RVMI on ECG

Site of Infarction on Echo	No. of cases	Percent (%)
Inferior wall	10	58.82%
Inferior wall and right ventricle	4	23.52%
Inferior wall and anterior septal	3	17.64%
No regional wall motion abnormality	0	0.00%
Total	17	100%

As shown in Table 1, 17 patients out of 50 patients had inferior wall MI & inferior wall with RVMI on ECG. When Echo was done in these patients, 10 patients (58.80%) had inferior wall myocardial infarction, 4 patients (23.52%) had inferior wall and right ventricle infarction, 3 patients (17.64%) had inferior wall and anterior septal infarction & no patients showed no regional wall motion abnormality.

Table 4: Site of Infarction on Echo in 9 patients with antero-septal MI on ECG

Site of Infarction on Echo	No. of cases	Percent (%)
Anteroseptal	5	55.55%
Anteroseptal apical	3	33.33%
Antero septal and Interventricular septum	1	11.11%
Total	9	100%

As shown in Table 1, 9 patients out of 50 patients had anteroseptal wall myocardial infarction on ECG. On echocardiography in these patients, 5 patients (55.55%) had anteroseptal myocardial infarction, 3 patients (33.33%) had anteroseptal apical infarction, 1 patient (11.11%) had anteroseptal and interventricular septum infarction.

Table 5: Site of infarction on Echo in 4 patients with anter- inferior myocardial infarction on ECG.

Site of Infarction on Echo	No. of cases	Percent (%)
Global hypokinesia	3	75%
anterior, inferior and lateral wall hypokinesia	1	25%
Total	4	100%

As shown in Table 1, 4 patients out of 50 patients had antero inferior myocardial infarction on ECG. When Echo was done in these patients 3 patients had global hypokinesia and 1 patient had anterior, inferior and lateral wall hypokinesia respectively.

IV. Discussion

Electrocardiography has been the main tool for the diagnosis of myocardial infarction since its invention. A significant Q wave (0.04 seconds or more in width and/or more than ¼ of proceeding R-wave in depth) indicates infarction

Moreover, ECG helps to localize the site of infarction. The changes of infarction are seen in lead II, III and AVF in inferior wall infarction, in lead I, AVL and V5-6 in anterolateral infarction, in lead V1-3 anteroseptal infarction, lead V5-6 apical infarction and lead V1-6 in extensive anterior infarction.

For the last few years, echocardiography has come into use for the assessment of cardiac function. It has been used to localize the site of infarction & for calculating the left ventricular ejection fraction in this study. According to Hegar et al. (1979) echocardiography could evaluate regional asynergy associated with acute myocardial infarction (5). The location of segmental asynergy corresponded to ECG location of Q waves and pathological location of infarction.

In our data, as shown in results in table No.1, 20 patients out of 50 patients had anterior wall myocardial infarction on ECG. Echocardiography in these patients further elaborated that 8 patients had extensive anterior wall infarction, 7 patients had antero-septal and apical wall myocardial infarction, 3 had anterior & apical, 2 had anterior & septal infarction & none of the patients showed no regional wall motion abnormality, thus elaborating the extensive anterior infarction seen on electrocardiography in great details.

17 patients, out of 50 patients had inferior wall myocardial infarction and inferior wall with right ventricle infarction on ECG. When echo was done in these patients, 10 patients had inferior wall myocardial infarction, 4 patients had inferior wall and right ventricle infarction, 3 patients had inferior wall and anterior-

septal myocardial infarction and none of the patients showed no regional wall motion abnormality, again giving a more lucid interpretation.

9 patients out of 50 patients had antero-septal infarction on ECG. On echocardiographic examination in these patients, 5 patients had antero-septal myocardial infarction, 3 patients had anteroseptal apical infarction, 1 patients had antero-septal and interventricular septum infarction, thereby lending credence to the fact that echocardiography delineates ischemic changes more extensively. 4 patients out of 100 patients had antero-inferior wall myocardial infarction on ECG. When echo was done in these patients, 3 patients had global hypokinesia and one patient had anterior, inferior and lateral wall hypokinesia.

According to Penco M et al. (1996) ECG and echocardiography showed good correlation in evaluating the infarct site, but echo showed larger extension (6). Regarding the infarct site, a good correlation was found in anterior acute myocardial infarction but not in inferior acute myocardial infarction. Our study is in agreement with the above findings.

Shah et al. (1980) in his study agreed that ECG and echocardiography have good correlation to localize the site of infarction, but in echocardiography segmental wall motion abnormalities are frequently more extensive than on ECG and may occur in areas, apparently remote from the putatively infracted zone (7). In our study, this is also seen to be true.

According to Scharti et al (1984) 2D echocardiography should be regarded as a supporting method to the ECG but not as an essential one in the diagnosis of acute myocardial infarction (8).

According to Kuch (1993) ECG and 2D Echo are compatible methods but not replacable oneS (9).

Mahajan Devinder Singh concluded that localization of the site of myocardial infarction on ECG correlated broadly with that seen on Echocardiography and was able to elaborate regional wall motion abnormalities in detail i.e., Echo could detect abnormalities in those areas which could not be shown by ECG (10).

Our study is in agreement with the findings of Penco M (1996) Shah (1980), Scharti et al. (1984), Kuch (1993), Izumi et al. (1995) & Mahajan Devinder Singh (2002), and electrocardiography and echocardiography have a good correlation in localizing the site of infarction but Echo was able to elaborate the site of infarction in much greater detail (11).

V. Conclusion

The location of MI seen on ECG correlated broadly with those seen on echocardiography. Echo was able to elaborate regional wall motion abnormalities in detail than ECG.

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