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A STUDY IN MI PATIENTS TO CORELATE THE SITE INFARCTION BY ECG AND ESTIMATE LEFT VENTRICULAR EJECTION FRACTION BY ECG AND 2DECHO IN INDEX MEDICAL COLLEGE, HOSPITAL AND RESEARCH CENTER INDORE (M.P.)

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Abstract

BACKGROUND: CHF is very common feature of ST elevation MI and at times need urgent management but without echocardiography ,clinical assessment may be incomplete hence some knowledge regarding CHF can be obtained from this equation in areas where echocardiography cannot be done at the time

DURATION: This Study Was conducted in IMCHRC from September 2020 to august 2021

METHODS: 500 patients of age groups of 25-70 yrs of both genders with ST elevation MI of any region of single episode,the site of infarction left ventricular ejection fraction were estimated in 'Q' wave infarction, Using the QRS scoring system of Palmeri and then correlated to the same by Echocardiography for localization of wall motion abnormalities and ejection fraction by standard method.

INCLUSION CRITERIA: Patients above 25 years of age and WHO criteria for diagnosis of acute MI are included

a) A History of ischemic type of chest pain
b) Evolutionary changes as obtained on serial ecg
c) A rise followed by subsequent fall in serum cardiac markers.

EXCLUSION CRITERIA : Non ST elevation MI ,Angina and angina equivalent, previous /old MI, History of MI ,Who refused consent , patient suffering from valvular heart disease ,congenital heart diseases.,pericardial disease, LVH, hemiblock, bundle branch blocks,complete heart block,previous cardiac surgeries

CONCLUSION :-

The location of MI was better elaborated on 2D Echo rather than ECG

Bedside calculation of LVEF (pump function) can be done from ECG in Q wave infarction, which fairly correlates with 2 D - Echo findings.

Anterior wall MI and Global MI patients had lower EF than inferior wall MI and should be managed aggressively .

KEY WORDS:1.electocardiogram 2.echocardiography 3.ejection fraction percentage 4.myocardial infarction

Introduction

An attack of myocardial infarction, the ischemia will lead to necrosis within the hour. This process of necrosis which started in sub endocardial region, will progress to sub epicardialregion within a span of 6 hours in form of wave front.

An early intervention undertaken within the window period can be lifesaving and will improve the quality of the patient's life. Early intervention reduces both morbidity and mortality. In resource poor countries, immediate availability of cardiovascular investigationsare not in reach everyone. In such case if the facility able to perform ECG and predict the location of the event then it can be life saving as stated above.The purpose of this study to co-relate the site of infarction by ECG and 2D Echo, estimation of left ventricular ejection fraction in Q wave infarction from ECG by QRS scoring method of Palmeri & Wagner and its echocardiographic co-relation & comparison of left ventricular ejection fraction in sub groups of acute myocardial infarction to assess the severity and prognosis of Myocardial Infarction.

AIM

To study the correlation of electrocardiography and 2D echocardiography for localizing the site of infarction and leftventricular ejection fraction in myocardial infarction

OBJECTIVE

Cardiovascular diseases are at present the leading causes of death in the developed & also developing countries. Ischemic heart disease is agreat killer accounting for 15% of all mortality in India.

The objective of this study is:

1. To correlate the location of MI according to ECG & 2D-Echo.
2. Estimation of LVEF in 'Q' infarction from ECG by QRS scoring method of Palmeri & Wagner and its echocardiographic correlation.
3. Comparison of LVEF in sub-groups of acute myocardial infarction.

OBSERVATION AND RESULT
DURATION OF STUDY:- 01/09/2020 TO 31/08/2021:-

	MEAN +_ SD.	P VALUE
EF BY ECG =	48.38 +_ 6.45	P> 0.05
EF BY 2D- ECHO =	48.64+_9.53	

Correlation Co-efficient r=0.83, p value = 0.821
LVEF was dichotomized at 40% (>40% & < 40%). It has been demonstrated by studies that this EF level is critical and has shownclinical prognostic value. (136)

SUBGROUP OFMI	MEAN EJECTION FRACTION BY ECG (QRS SCORING)	MEAN EF BY 2D ECHO	P - VALUE
ANTERIOR WALLMI (n = 340)	46.40+_5.35*	46.88+_8.14	P> 0.05 (0.68)
INFERIOR WALLMI (n = 130)	54.13+_4.09	57.48+_7.03	P> 0.05 (0.66)
GLOBAL MI(n = 15)	37.00+_7.55	38.33+_5.13	P> 0.05 (0.81)
RV MI (n = 15)	55.00+_4.58	60.00+_12.28	P> 0.05 (0.54)

LVEF by QRS scoring system showed EF <40% in 60/500 patients.While LVEF by 2D-Echo showed EF <40% in 90/500 patient.

ECG &Echocardiography correlation for site of MI:
Electrocardiography has been a sensitive 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 % of proceeding R-wave indepth or > 2mm in depth) indicates infarction.
Moreover, ECG helps to localize the site of infarction. The changes of infarction are seen in lead II, I and avf in inferior wall infarction. The leads I, avl and V1 correspond to anterolateral infarction. Leads V13 V1
V1 depict anteroseptal, apical infarction and extensive anteriorinfarction respectively.
Nowadays echocardiography is being used for the assessment ofcardiac function. It is used to localize the site of infarction & for calculating the left ventricular ejection fraction.
Evaluation of regional asynergy associated with acute myocardial Infarction is aptly documented on echocardiography, Echocardiogram has an enhanced advantage of demonstrating segmental asynergy in the Infarcted regions where as in ECG it appears normal. In patients with acute chest pain syndrome without diagnostic ECG findings of acute myocardial infarction, echocardiography is helpful in the establishment of correct diagnosis.
A study by Reddy et al stated that the role of echocardiographyl in identifying the infarct related artery in comparison to ECG in whichangiography was used for confirmation. The study revealed that echocardiography was more helpful in identifying the infarctrelated artery (90%) rather than ECG.
130 patients, out of 500 patients had inferior wall myocardial infarctionand inferior wall with right ventricle infarction on electrocardiography.When echo was done in these patients, 15 patients (57.7%) had inferior wall myocardial infarction, 7 (26.9%) patients had inferior wall and right ventricle infarction, 3 patients had inferior wall and anterior- septal myocardial infarction and patient showed no regional wall motion abnormality,
165 patients out of 500 patients had antero-septal infarction on ECG. On echocardiographic examination in these patients, 20 patients (60.6%) had antero-septal myocardial infarction, 7 (21.2%) patients had anteroseptal and apical infarction, 4 patients had antero-septal and interventricular septum infarction & 2 patient showed no regional wall motion abnormality.
15 patients each out of 500 showed the evidence of global and right ventricular infarction on ECG which was subsequently confirmed on2D ECHO
Infarction and perforation of interventricular septum were accompanied by asynergy of medial segment on echocardiography, but ECG showed no evidence of septal infarction. ECG showed inferior infarction but echo showed inferior infarction which extended into the interventricular septum.

Our study is in agreement with the findings of Penco M (1996) Shah (1980), Scharti et al., (1984) & 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 ofinfarction in much greater detail. In some cases ECG proved to be greater than echocardiography.

The QRS scoring system evaluated in this study was developed by Sylvester et al., and then subsequently modified by Palmeri and Wagner et al. Although It encompasses many of the principles of duration, amplitude and ratios of Q and R waves principle, independently derived and reported by several investigators.

The scoring system was simplified to include the only aspects of commonly employed clinical symptoms to identification an infarct andit was modified to meet the requirements for sensitivity & specificity.

The point score was then calculated from the QRS complexes in 10 ofthe 12 standard leads.

The degree of ventricular dysfunction following acute myocardial infarction is variable. The most profound levels of dysfunction are found in patients with shock following acute myocardial infarction. The mortality in such patients remains substantial. Thus, ventricular performance is a major factor affecting patient's prognosis.

After acute myocardial infarction, various methods are utilized to evaluate the global left ventricular performance, the extent and the location of regional wall motion abnormalities and the presence and extent of right ventricular involvement.

As a result, it provides prognostic information since the left ventricularejection fraction is predictor of early mortality and development of congestive heart failure or sudden death. Ventricular function can also be used to assess patient's recovery.

Global and regional ventricular performances will improve gradually over the first two weeks after infarction but will show significant improvement by 2-4 months, if uninterrupted by complication such as re-infarction.

The present study was undertaken to evaluate the left ventricular Ejection fraction by electrocardiography using the QRS scoring system and to show whether this correlates well or not with the left ventricular Ejection fraction estimated through echocardiography after MI preferably on the same day or earliest possible day.

The study also attempts to assess whether ECG is an effective tool forestimating ejection fraction in post MI patients and thus predicting prognosis in these patients. The degree of left ventricular dysfunction following acute myocardial infarction is variable. The most profound degree of left ventricular dysfunction is found in patients with shock following acute myocardial infarction.

Rigo et al. (120) showed that the ejection fraction of those presenting with shock was more depressed when compared to those who did nothave shock.

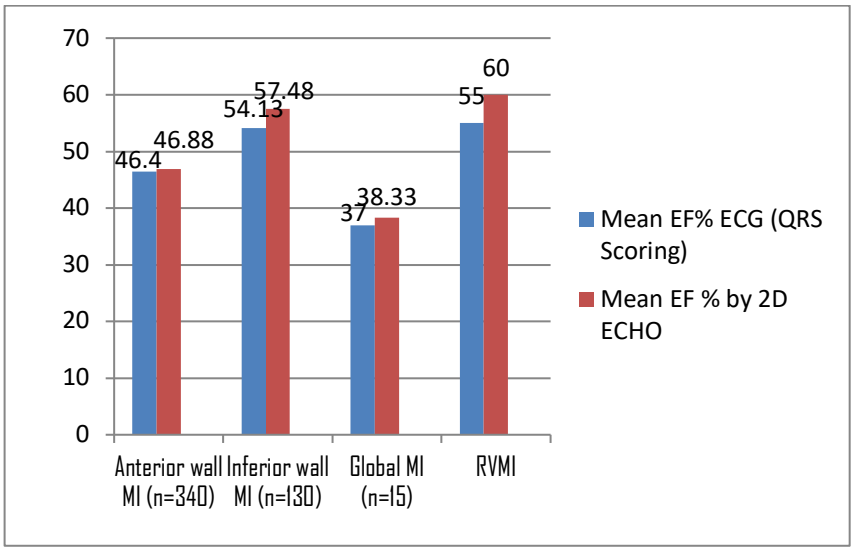
INFERIOR MI:-

Numbers in our study have shown that the ejection fraction in inferiorwall infarction was better than anterior wall MI. EF through ECG was
54.13 +_ 4.09 . The EF through echocardiography was 57.48 +_ 7.03

This correlates well with the study of Hafiz Mughees Ather who foundthat left ventricular ejection fraction was better in inferior wall infarction than anterior wall infarction.

In our study out of 340 patients of anterior wall MI 20 patients expired of which 10 patients had low EF & out of 15 cases of global MI all the 15 cases had low EF in which 5 case expired due to cardiogenic shock.

This correlates well with the study of Brezinov, Klempfner et a ^ (124)who examined 8983 AMI patients.



Mean ejection fraction by ECG (QRS scoring) & Echocardiography in subgroups of MI

They have quoted in their study that mortality was highest among patients with severe LV dysfunction (36%) intermediate among patients with mild to moderate dysfunction at 10% and lowest amongthose with preserved ejection fraction (4%)

The statistical analysis done on the basis of linear regression curve reveals a fair degree of correlation between ejection fraction as obtained by echocardiography with r-0.83 and p > 0.05 . However, better correlative values could not be obtained possibly because ofcertain limitation.

Ideally the ECG used for scoring should have been performed on the same day or nearest possible day as ejection fractions obtain the best correlation.

SUMMARY:-

The present study undertaken at IMCHRC, Indore revealed male to female ratio of 3.3/1 in the study population. This ratio of the study population suggests that males are more prone to MI when compared to females. There was no difference in between the genders in regardsto the age of incidence (MI) occurred. Smoking was the major risk factor for causing MI in this study population.

Our study also noticed that the most common type of MI is the anteriorwall infarction, which were picked up more clearly along with the site oflesion using ECHO rather than with ECG. Using ECG we were able to calculate LVEF (pump function) in Q wave infarction, thus getting a fair idea on pump function during the course of ICCU and at discharge.

Reduction in LVEF was more common in anterior wall and global MI than in inferior wall MI, mortality rate from MI was 7\% during the study. Using linear regression scale we found out that there is a fair correlation (r = 0.83p > 0.05) between EF calculated from ECG to ECHO.

QRS SCORING SYSTEM:-

LVEF (%) = 60 – (3 X QRS SCORE)

LEAD	DURATION (msec)		AMPLITUDE RATIOS		MAX POINTS
I	q>_30	1	R/Q<_1	1	2
II	Q>_40	2			2
	Q>_30	1			
aVL	Q>_30	1	R/Q<_1	1	2
aVF	Q>_50	3	R/Q<_1	2	5
	Q>_40	2	R/Q<_2	1	
	Q>_30	1			
VI	ANY Q	1	R/S<_1	1	4
	R>_50	2			
	R>_40	1			
V2	ANY Q OR R<_20	1	R/S<_1.5	1	4
	R>_60	2			
	R>_50	1			
V3	ANY Q OR R <_30	1			1
V4	Q>_20	1	R/Q OR	2	3
			R/S<_0.5	1	
			R/Q OR R/S		
			<_1		
V5	Q>_30	1	R/Q OR R/S	2	3
			<_1	1	
			R/Q OR R/S		
			<_2		
V6	Q>_30	1	R/Q OR R/S	2	3
			<_1	1	
			R/Q OR R/S		
			<_3		

Our study revealed that there is a fair correlation between EF obtained by QRS scoring system from ECG and ECHO. Hence, this method can be used additionally on bedside and in scenarios with limited availability of Echo in cases of Q wave infarction. Future researches are required on this subject to develop a better understand

CONCLUSION :-

The location of MI was better elaborated on Echo rather thanECG. Bedside calculation of LVEF (pump function) can be done fromECG in Q wave infarction, which fairly correlates with 2D - Echo findings.

Anterior wall MI and Global MI should be managed aggressivelyas they have a lower EF than inferior wall MI

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