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CARDIODYNAMICS AFTER MYOCARDIAL INFARCTION

DR. TEHSEEN IQBAL, M. Phil.
Assistant Professor of Physiology
Nishtar Medical College, Multan.

DR. AKBAR KHOJA, M. Phil.
Head, Department Of Physiology
Basic Medical Sciences Institute, JPMC, Karachi.

DR. EJAZ AHMAD, FCPS.
Assistant Professor of Cardiology
Allama Iqbal Medical College, Lahore.

Prof. Hamid Javaid Qureshi, M. Phil.
Head & Professor of Physiology
Nishtar Medical College, Multan.

Correspondence:
Dr. Tehseen Iqbal,
Assistant Professor of Physiology
Nishtar Medical College, Multan.

ABSTRACT ... mailmirza@yahoo.com Various aspects of cardiodynamics have prognostic value after myocardial infarction (MI). These aspects were studied non-invasively by echocardiography, in one hundred MI patients. Fifty were having anterior wall MI and 50 were of Inferior wall MI. Thirty control subjects were also included. End diastolic volume (EDV), End systolic volume (ESV) and ejection fraction (EF%) were estimated by defining endocardial border and applying 'cubed' formula. Results showed that in anterior wall MI group, EDV and ESV were highly significantly ($P<0.001$) increased (149.72 ± 37.36 and 81.14 ± 22.25 respectively) as compared with the control group (108.70 ± 21.00 and 39.30 ± 4.30 respectively). EF% was highly significantly decreased (44.98 ± 6.41) as compared with the control group (64.70 ± 3.9). In Inferior wall MI group, EDV and ESV were highly significantly increased to 123.64 ± 17.19 and 57.66 ± 9.58 respectively as compared with the control group; EF% was decreased highly significantly to 53.86 ± 5.99 as compared with the control group. EDV and ESV were increased and EF% was decreased to a greater extent in anterior wall MI group as compared with the inferior wall MI group. We conclude that anterior wall MI affects the cardiodynamics more adversely as compared with the inferior wall MI.
Key words: Cardiodynamics, EDV, ESV, EF%, myocardial infarction.

INTRODUCTION

The term cardiodynamics refers to the mechanical events that are associated with the contraction of the heart.[1] Myocardial infarction (MI) produces an area of myocardial necrosis which depresses the overall pumping ability of the heart.[2]

MI principally involves the left ventricle[3] partly because blood vessels in the left ventricle are intensely compressed by systolic contraction of the heart.[2] Many studies show that MI is one of the commonest causes of mortality in Pakistan and it is occurring at an earlier age than in Europeans.[4-7] This study was carried out to see the effects of MI on various aspects of cardiodynamics. Echocardiography provides us opportunity to visualize and record the cardiodynamic events and

cardiac function non-invasively and in real time.[8]

SUBJECTS & METHODS

This study was carried out in the Department of Physiology, Basic Medical Sciences Institute, JPMC, Karachi in collaboration with National Institute of Cardiovascular Diseases (NICVD) Karachi during December, 1999 to May, 2000. A total number of one hundred patients after a first myocardial infarction were included in this study.

On the basis of ECG findings, half of them were labeled as anterior wall MI patients and half as inferior wall MI patients. Thirty normal, apparently healthy subjects were also taken as controls. All the patients in this study did not receive any reperfusion therapy because of one or the other reason e.g., contraindication or late arrival. Patients with extensive MI (i.e., primary changes in more than three ECG leads) and those with involvement of right ventricle were excluded.

After proper registration and general physical examination, echocardiography was done by using Toshiba Core-vision, Color Doppler (140-A) machine. Transducers of 2.5 or 3.5 MHz were used. For optimal endocardial border tracing, the subject was kept in left lateral decubitus position and was asked to suspend his respiration where quality of image was optimal.

Gain, gray-scale and hormonic imaging settings of the instrument were properly adjusted. By using the highest optimal frequency of the transducer, its position was adjusted while maintaining the correct tomographic plane. Cine-loop function was used to define the endocardial border at end-systole and at end-diastole. Endocardial border tracings were taken from at least two tomographic planes. Measurements of left ventricular end diastolic volume (EDV), end systolic volume (ESV) and ejection fraction (EF%) were made by using the "cubed method." Results of the study were statistically analyzed by utilizing the student t test.

RESULTS

Table-I showed a comparison of baseline characteristics of various groups. The comparison of various parameters showed a non-significant ($p>0.05$) difference among these groups.

Table-I. Baseline Characteristics of Various Groups

Parameter	Control (n=30)	Ant. Wall MI Group (n=50)	Inf. Wall MI Group (n=50)
Age (years)	49.96±6.40	51.96±5.22	54.34±5.60
Sex M	56.70%	74.00%	82.00%
Sex			
Sex F	43.30%	26.00%	18.00%
Weight (kg)	67.40±3.40	72.20±3.07	73.12±3.16
Height (cm)	165.50±7.20	165.38±4.59	166.18±4.25
BMI (kg/m^2)	24.70±1.70	26.26±1.36	26.24±1.40

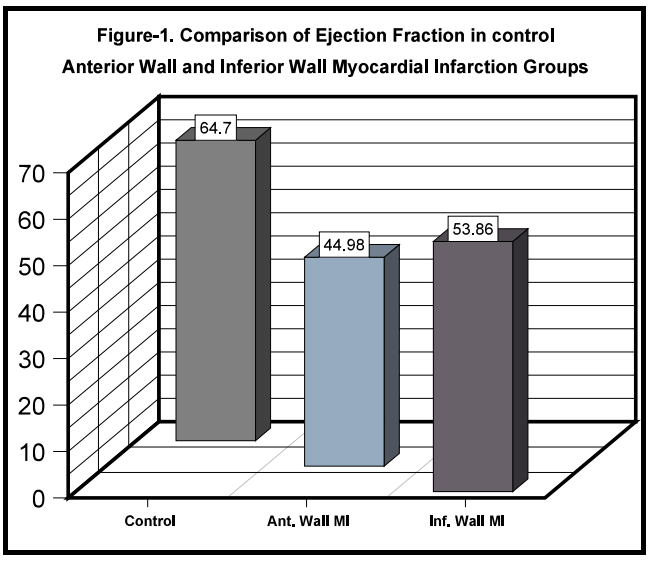
Values expressed as mean ± SD. All comparisons between groups non-significant (P>0.05)

Table-II. Comparison of left Ventricular EDV, ESV and EF% in various Groups.

Parameter	Control	Ant. Wall MI Group	Inf. Wall MI Group
EDV	108.70±21.00	149.72±37.36**	123.64±17.19**
ESV	39.30±4.30	81.14±22.25**	57.66±9.58**
EF%	64.70±3.90	44.98±6.41**	53.86±5.99**

Values expressed as mean ± SD.
*EDV = End Diastolic Volume, ESV = End Systolic Volume, EF% = Ejection Fraction (in percentage), ** = P-value = <0.001 (highly significant) Comparison among groups.*

Table-II showed comparison of EDV, ESV and EF% among various groups. End systolic volume (ESV) and End diastolic volume (EDV) were increased highly significantly ($p<0.001$) in both myocardial infarction groups as compared with the control group.



Ejection fraction (EF%) was highly significantly ($p<0.001$) depressed in both anterior wall as well as inferior wall MI groups as compared with the control group. In anterior wall MI group EDV and ESV were increased and EF% was decreased highly significantly ($p<0.001$) as compared with the Inferior wall MI group.

DISCUSSION

Left ventricular enlargement and functions after MI are major predictors of outcome after MI.[9] We found that left ventricular EDV and ESV were significantly increased ($p<0.001$) in patients of MI as compared with the control subjects. Our findings are in total conformity with the findings of Golia et al (1997), Mor-Avi et al (1998), Bosimini et al (2000). Other workers[10,11,12,13] also reported the increase in volumes of left ventricle after myocardial infarction. Following infarction 'remodeling' of the left ventricle occurs involving expansion and thinning of the infarct zone. This infarct expansion causes an increase in ventricular volume.[14] We found that EDV and ESV were enlarged to a greater extent (denoting more adverse effects on cardiodynamics) in Anterior wall MI group as compared with the inferior wall MI group. Galderisi (1995)[15] also noted that the most pronounced left ventricular dysfunctions occurred in anterior myocardial infarctions.

We found that the ejection fraction (EF%) was lower in patients of MI as compared with the controls. Many workers[10,16] showed a decreased EF% after myocardial infarction. We also noted that the EF% was decreased to a greater extent in anterior wall MI group (44.98±0.90) as compared with the Inferior wall MI group (53.86±0.84).

Taylor et al (1980)[17] reported that a low EF% was more common in anterior wall MI patients. Otto (2000)[18] described that EF% was moderately depressed (41±11%) in unperfused anterior wall MI patients while EF% was only mildly depressed (53±10%) in unperfused inferior wall MI patients. Our findings are in total conformity with the findings of Otto and other workers.

While using 'cubed' formula in myocardial infarction patients, estimation of EF% may be either over-estimated or under-estimated, depending upon whether normal or abnormal ventricular regions are sampled by the echo beam.[19] So in myocardial infarction patients, approaches that incorporate endocardial border tracings from at least two tomographic planes are most appropriate.[20]

This is concluded from this study that anterior wall myocardial infarction affects the cardiodynamics more adversely as compared with the inferior wall myocardial infarction.

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