



TO STUDY THE CORRELATION BETWEEN MINIMUM SERUM MAGNESIUM LEVELS WITH PEAK SGOT AND INFARCT SIZE ON ECG IN PATIENTS OF ACUTE MYOCARDIAL INFARCTION.

Physiology

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ABSTRACT

Myocardial infarction (MI) is one of the dangerous manifestation of coronary artery disease and is one of the most common diagnosis in hospitalized patients of western countries. The determination of location, extent of infarcted myocardium is of vital importance for the prognosis as well as management of the patients. Therefore this present study is conducted to correlate the minimum level of serum magnesium with the enzymatic estimate of infarct size i.e. by measuring peak Serum Glutamate Oxaloacetate Transaminase (SGOT) and also with Electrocardiographic estimate of infarct size. Minimum serum magnesium was measured on day 1 of admission to the ICU of 53 patients of acute myocardial infarction. Also 12 lead ECG was recorded from these patients and serum SGOT was measured on for first three days after admission. Statistical analysis for correlation between peak SGOT activity and minimum serum Magnesium was done using Pearson correlation coefficient test. We found statistically significant decrease in serum magnesium and increase in SGOT activity in patients with widespread myocardial infarction.

KEYWORDS:

myocardial infarction, SGOT, ECG, magnesium

INTRODUCTION

Cardiovascular diseases are a major cause of mortality, morbidity and disability in developed and developing countries.⁽¹⁾ In physiological study of major inorganic constituents of heart muscle cells, role of magnesium was neglected till now. There were several reasons for this neglect. Chemical analysis for magnesium was found to be very difficult for many years, the ionized magnesium (Mg⁺²) in cardiac cells could not be directly determined and the rate at which magnesium is transferred into and out of the cell is so much slower than rate of transfer of potassium, sodium, calcium and chloride that electrop physiological measurement of transport in the in-vitro preparation of heart muscle becomes difficult.

Therefore the present study was undertaken to correlate the minimum serum magnesium levels with peak SGOT (enzymatic estimate of infarct size) and ECG (electrocardiographic estimate of infarct size) in patients of acute myocardial infarction.

AIMS AND OBJECTIVES :

- To study the correlation between minimum level serum magnesium with Peak SGOT (An enzymatic index of infarct size)
- To study the correlation between serum magnesium with electrocardiogram (Electrocardiograph estimate of infarct size)

MATERIALS AND METHODS

The present study was conducted in Intensive Cardiac Care Unit (ICCU) of Sir J.J Hospital and Grant Medical College, Mumbai 8. Three ml of venous blood collected from antecubital vein with aseptic precautions. Serum magnesium and SGOT was measured in Department of Biochemistry in JJ Hospital, Mumbai 8.

Also ECG is recorded using 12 lead ECG machine with standard procedure.

Mean, standard deviation were calculated for serum magnesium, SGOT in Microsoft excel sheet.

Pearson's correlation coefficient test was used to study the correlation between peak SGOT and minimum serum magnesium levels.

The approval from Institutional Ethical Committee (IEC) was obtained before commencement of study. Also the written informed consent of the subjects were taken.

INCLUSION CRITERIA

Out of 58 cases of acute transmural myocardial infarction, 5 cases died during ICCU stay before completion of study protocol. So, remaining 53 acute myocardial infarction study cases which were finally included

for statistical analysis out of which 46 were males and 7 were females with mean age was 49.32 ± 7.41 years. Diagnosis of myocardial infarction was done using clinical history and standard guidelines laid down by WHO criteria.⁽¹⁾

Out of these 53 patients of acute myocardial infarction were divided into 3 groups.

Group A (Anterior) : This group included patients with anterior, anteroseptal, anterolateral and extensive anterior wall myocardial infarction cases.

Group B (Inferior) : This group included patients with inferior, inferolateral, inferoposterior wall infarction.

Group C (Combined) : This group included patients of fresh infarction in both anterior and inferior wall.

Table no 1 : cases in study group

SR NO	GROUP	NO OF CASES	PERCENTAGE
1	Group A (Anterior)	34	64 %
2	Group B (Inferior)	14	26%
3	Group C (Combined)	5	10%
	TOTAL	53	100 %

EXCLUSION CRITERIA

- Patients with previous history of acute myocardial infarction.
- Any other cardiac changes on electrocardiogram.
- Non cardiac causes of increase in levels of SGOT. E.g cerebrovascular accidents, intramuscular injections, hepatitis, pancreatitis, uraemia, trauma etc.
- Any illness causing reduction in serum magnesium levels like hepatic failure, renal failure, neoplasia.

Graph no 1 shows the percentage distribution of study groups.

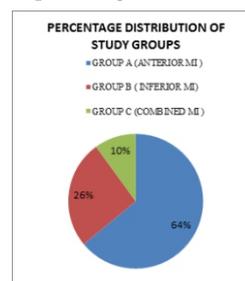


Table no 2 : shows correlation between minimum serum magnesium level with site of infarct in different groups of patients with myocardial infarction.

GROUP	MINIMUM SERUM MAGNESIUM LEVELS (mg/dl)
A (n=34)	1.31 ± 0.11
B (n=14)	1.24± 0.14
C (n=5)	1.17 ±0.11

Table no 3 : shows peak SGOT in various subgroups. (ENZYMATIC ESTIMATE OF SEVERITY OF MI)

GROUP (n=53)	Range of SGOT (IU)	Mean ±SD (IU)
A (n=34)	48 – 185	81.94 ± 26.01
B (n=14)	43 – 138	79.21 ± 25.11
C (n=5)	105 – 142	121 .88 ± 17.73

Normal range = 10 -40 IU

Table no 4: showing correlation between minimum serum magnesium and peak SGOT

Mean SGOT (IU)	Mean minimum serum magnesium	Pearsons correlation coefficient	Significance P value
84.98 ±27.50	1.275 mg/dl	r = - 0.376	0.006 highly significant

RESULT:

Table 1 and Graph 1 shows distribution of study groups depending upon the site of myocardial infarction. Group A with anterior wall MI consists of majority of study group comprising of 64 % of patients with n =34. Group B with inferior wall MI consists of 26 % of patients with n= 14 and Group C consists of combined anterior plus inferior wall MI comprising of 10 % of patients with n=5.

Table 2 shows correlation between minimum serum magnesium level with site of infarct in different groups of patients with myocardial infarction. It was found that more is the extensive area of infarction , more is the fall in serum magnesium levels. Therefore Group C with combined anterior and inferior wall myocardial infarctions shows least serum magnesium levels.

Table 3 shows correlation between site and extent of infarct with peak SGOT which is used as enzymatic index of severity of MI. It shows that SGOT levels are directly proportional to the size of infarct. We found peak SGOT in group C where combined anterior and inferior wall infarction was seen.

Table 4 shows correlation between minimum serum magnesium with peak SGOT levels using Pearsons correlation coefficient using SPSS 16 version for windows software. The value (r) worked out to be -0.376. The minus sign indicates a negative correlation i.e when one variable increases (SGOT) the other variable decreases (serum magnesium levels). This is statistically highly significant (P= 0.006).

DISCUSSION:

The present study was conducted to elucidate the role of serum magnesium and SGOT in diagnosis and prognosis of patients with acute myocardial infarction.

Normal serum magnesium levels are ranging from 2.399 mg/dl to 2.705 mg/dl with mean value of 2.44 mg/dl. There is no age and sex variations in the level of serum magnesium. (2,3,4)

The size of infarct correlates well with the levels of serum magnesium. The size of infarct was more in group C as compared with group A and group B individually and this was associated with maximum fall in serum magnesium level in group C as compared to group A and group B. From this data it was concluded that serum magnesium was very much reduced when the size of infarct was more. Similar findings were observed by Kedarnath and Prasad et al (5)

The peak SGOT was determined in 53 cases of study group, SGOT estimation was done on the day of admission and thereafter daily in the morning for 3 consecutive days to determine peak SGOT in each study groups. We found highly significant increase in peak SGOT in patients with combined anterior and inferior wall infarction in which there was

maximum fall in serum magnesium levels.

MECHANISM OF HYPOMAGNESEMIA:

The exact mechanism for hypomagnesemia is not well known but several hypothesis has been put forth.

Prasad et al (5) suggested that serum magnesium may be utilized to check the increased adhesiveness of platelets following MI in order to prevent thrombosis.

Nath et al (6) suggested that magnesium is mopped up at the site of infarction to check the hyprocoagulability of blood.

Land Mark K, Uardal P (7) stated that fall in serum magnesium can be due to increased beta 2 adrenergic receptors.

Kedarnath and Prasad et al (5) have studied correlation between serum magnesium and SGOT levels at various duration after acuteMI. They concluded that significant fall in level of serum magnesium as early as 2 hours following acute MI without significant change in SGOT in those hours can be taken as reliable diagnostic index in case of suspected myocardial infarction.

MECHANISM OF ELEVATED SGOT IN PATIENTS OF ACUTE MI.

Any cause of tissue breakdown like trauma, ischemia, infarction may result in elevated serum enzymes presumably by the release of enzymes from the damaged tissue. As these enzymes are present in sufficiently high content in myocardial tissues, sodeath of a relatively small amount of tissue results in substantial increase in measured enzyme activity in serum. (8)

CONCLUSIONS:

There is significant fall in serum magnesium levels following acute myocardial infarction. This is directly related to the size of infarct. Greater is the size of infarct, greater is the fall in serum magnesium levels. Thus this can be used as a electrocardiographic estimate of myocardial infarction.

Also, we found inverse relation between minimum serum magnesium levels with peak SGOT in patients with acute myocardial infarction. Thus this parameter can be used for enzymatic estimate of myocardial infarction.

However, currently many other reliable and rapid diagnostic criteria are available for early diagnosis and treatment of the patients like CPK-MB, troponin –t test etc.

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