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Original Research Article

STUDY ON SERUM MAGNESIUM LEVEL IN ACUTE MYOCARDIAL INFARCTION

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Abstract

Coronary artery disease is the most common cause of premature deaths. It is characterized pathologically by atheromatous plaque which may stenose the coronary arterial system sufficiently to cause exertional myocardial ischemia. There are reports in the literature over patients with acute myocardial infraction have lower magnesium levels. The present study was undertaken to determine whether changes occur in the serum magnesium level in acute myocardial infarction. The present study was conducted on 30 patients of acute myocardial infarction admitted to ICCU who fulfilled the inclusion criteria. Patients presenting with chest pain suggestive of myocardial infarction, who showed E.C.G evidence of acute infarction changes were assessed by detailed history and physical examination as outlined in the proforma. The infarction was confirmed by elevated CPK/SGOT levels. Serum magnesium is estimated within first 24 hours of chest pain 1st day and on 5 th day as well. . The results shows patients with low serum magnesium developed arrhythmia. There was an increase in serum magnesium from Day-1 to Day-5 in both those with arrhythmias and those without arrhythmias

Key words: Myocardial Infarction, Serum Magnesium, Arrhythmias.

INTRODUCTION

Coronary artery disease is the most common cause of premature deaths. Its cause is unknown. But a number of risk factors have been identified including diabetes, hypertension, hypercholesterolemia, cigarette smoking, correlation of which may protect the development and progression of disease. It is characterized pathologically by atheromatous plaque which may stenose the coronary arterial system sufficiently to cause exertional myocardial ischemia, experienced by the patient as angina. Plaque rupture provides a focus for platelet deposition and thrombosis which my result in unstable angina or myocardial infarction depending on whether the thrombus is subocclusive or occlusing the coronary lumen completely. There are reports in the literature over patients with acute myocardial infraction have lower magnesium. Magnesium has been known to have an influence in the causation of acute myocardial infarction and also its sequelae like arrhythmias. It plays a major role in the pathogenesis of other cardiovascular diseases as well. Magnesium ions are found to be essential for the maintenance of the normal functional integrity of the myocardium[1]. supplementation of magnesium salts may reduce the incidence of fatal and on fatal arrhythmias after an infarct and thereby decreased the mortality in AMI. In patients with sudden death because of ischemic heart disease, magnesium concentration in the cardiac muscle was found to be decreased [2].

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 1, 2024

A fall in serum magnesium following acute myocardial infarction has been observed by many workers [3, 4] Hypomagnesemia is an electrolyte disturbance in which there is low level of magnesium in blood [5]. Experimental studies showed that magnesium suppresses the early after-depolarsation and the triggered activity responsible for arrhythmias.

This indicates that a fall in serum magnesium in AMI may be associated with ventricular arrhythmias in patients with acute myocardial infarction [6].Hypomagnesemia is an important risk factor for post AMI complication. It has been reported in various international studies that the serum Mg level is not only low at admission in cases of AMI but also continues to fall even for days after the onset of AMI [7-9]. It is unknown however, if the low cardiac content precedes the myocardial infarction or is result of it. Hypomagnessemia is present in acute myocardial infarction (AMI) as shift of magnesium from extra cellular to intracellular compartments occur [10]. A number of clinical studies have shown a fall in the serum magnesium concentration within first 24 to 48 hours after myocardial infarction [11]. The present study was undertaken to determine whether changes occur in the serum magnesium level in acute myocardial infarction.

Material and methods

Selection of Patients: The present study was conducted on 30 patients of acute myocardial infarction admitted to ICCU who fulfilled the following criteria, included in the present study.

1. Patients presenting within 24 hours after the onset chest pain.
2. Patients showing evidence of infarction of either anterior or inferior wall were included.
3. Patients with history of previous infarction, chronic alcohotism and patients on diuretics were excluded.
4. Patients with evidence of serious diseases involving other system were also excluded.
5. Continuous bed ECG monitoring

Patients presenting with chest pain suggestive of myocardial infarction, who showed E.C.G evidence of acute infarction changes were assessed by detailed history and physical examination as outlined in the proforma. Subjects having hypertension, diabetes, history of smoking was noted. Type of infarction was also noted. The infarction was confirmed by elevated CPK/SGOT levels. Serum magnesium is estimated within first 24 hours of chest pain 1st day and on 5 th day as well. In the present study, serum magnesium is estimated by colorimetric method using calmagite. statistical analysis was done.

Results

Table 1: Age distribution of patients

Age groups (years)	Males n=18	Percentage	Females n=12	Percentage
31-40	1	5.55 %	0	0 %
41-50	3	16.66 %	2	16.66 %
51-60	5	27.77 %	3	25 %
61-70	6	33.33 %	5	41.66 %
>70	3	16.66 %	2	16.66 %

Table 2: Risk Factors

Risk factors	Cases n=30	Percentage
Hypertension	20	66.66 %
Diabetes	13	43.33 %

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 1, 2024

Alcohol consumption	12	40 %
Obesity	08	26.66 %
Smoking	06	20 %
Family history	07	23.33 %

Table 3: Distribution of patients with arrhythmia in acute myocardial Infarction (n=30)

Myocardial Infarction	Number of Patients n=30	Percentage
With arrhythmia	16	53.33 %
Without arrhythmia	14	46.66 %

Table 4: Serum magnesium levels in patients with arrhythmias (n=16)

Serum magnesium mg/dl	Day 1 n=16	Percentage	Day 5 n=16	Percentage
<1.6	6	37.5 %	2	12.5 %
1.6-2.4	9	56.25 %	8	50 %
>2.4	1	6.25 %	4	25 %

Table 5: Serum magnesium levels in patients without arrhythmias (n=14)

Serum magnesium mg/dl	Day 1 n=14	Percentage	Day 5 n=14	Percentage
<1.6	2	14.28 %	0	0 %
1.6-2.4	11	78.57 %	7	50 %
>2.4	1	7.14 %	4	28.57 %

Table 6: Mean serum magnesium level in Day 1 and Day 5 (n=30)

Serum magnesium	Day 1	Day 5
Mean serum magnesium in 30 cases mg/dl	1.76±0.34	2.24±048
Mean serum magnesium level in patients with arrhythmia mg/dl	1.58±0.24	1.84±0.24

Discussion

Few studies have demonstrated that Serum Magnesium concentration decreases significantly during A.M.I. The cause of hypomagnesemia during the early phase of infarction is related to the increased stress induced catecholmine release, which induce enhanced lipolysis and sequestration of magnesium with free fatty acids (FFA) and adipocytes. It has been shown that magnesium depletion modifies coronary blood flow, blood clotting, and atherogenesis [12]. Magnesium cofactor in more than 300 enzymes system of the body in human cell. Its possible site of action includes vascular smooth muscle, platelets, and myocardial cells [13]. Magnesium depletion can induce hyperlipidemia and subsequently atherogenic deposits in coronary arteries leading to atherosclerosis[14].Routine use of IV magnesium is recommended within first few hours of acute myocardial infarction to reduce mortality, arrhythmias and pump failure.[15,16].Magnesium treatment reduces ventricular tachycardia and ventricular fibrillation[17]. Magnesium ion has emerged as a premier cardiovascular cation during the decade. It has been implicated in the pathogenesis of acute myocardial infarction and complication like arrhythmias. Magnesium is essential for activation of ATP, which maintains the sodium-potassium pump and also because of calcium blocking action magnesium has been implicated in relation to arrhythmias after acute myocardial infarction.

ISSN: 0975-3583, 0976-2833 VOL 15, ISSUE 1, 2024

Singh A et al[18] checked serum magnesium levels of twenty patients of acute myocardial infarction on the 1st , 7th and 12th day of admission. In all the cases, there was a significant fall of serum magnesium on the first day. Dimtruk [19] in his series of 67 patients of ischemic heart disease showed a distinct reduction of plasma magnesium during the first 3 days following onset of disease, the level normalized by 15-25 days from onset of the disease. Sachdev et al [20] (1978) in 30 patients of myocardial infarction determine the magnesium levels within 24 hours, 5th and 8th day and reported as 1.83±0.087 mgm%, 1.91±0.149 and 1.97±0.089 as against control of 2.44±0.162mgm%.

In our study maximum patients of MI were in 50- 70 age groups. Hypertension, diabetes, alcohol consumption was risk factors in majority of MI cases. 53.33 % patients of MI developed arrhythmia. Mean serum magnesium in 30 cases on Day 1 and Day 5 was 1.76±0.34 and 2.24±048 mg/dl . Mean serum magnesium level in patients with arrhythmia on Day 1 and Day 5 was 1.58±0.24 and 1.84±0.24 . This shows patients with low serum magnesium developed arrhythmia. There was an increase in serum magnesium from Day-1 to Day-5 in both those with arrhythmias and those without arrhythmias .The incidence of serious ventricular premature beats, ventricular tachycardia and ventricular fibrillation on admission was significantly higher in the hypomagnesemic patients with acute myocardial infarction .

Conclusion

Magnesium is an underestimated cation and has been implicated in the pathogenesis of AMI and its complications. Measurement of serum magnesium levels is simple and cost effective, and thereby should be done in MI patients along with routine hematological analysis. In the present study, patients of AMI with low serum magnesium levels are found to be more prone to develop arrhythmias. Hence, it can be concluded that measurement of serum magnesium level is of prognostic significance in AMI. Supplementation of magnesium salts may reduce the incidence of fatal and on fatal arrhythmias after an infarct and thereby decreased the mortality in AMI.

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