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Chapter 75

Erythrocyte and mononuclear cell magnesium content in non-cardiac intensive care patients

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Introduction

Several studies have examined serum magnesium concentration (S-Mg) in an intensive care unit; two studies measured muscle magnesium content, two erythrocyte magnesium (E-Mg) and one, carried out in an intensive cardiac care unit, mononuclear magnesium (M-Mg) content. The latter was found to be significantly lowered[5].

We were interested in screening non-cardiac intensive care patients. Consequently, we examined patients admitted to a non-cardiac intensive care unit for S-Mg, E-Mg, M-Mg and 24 h urinary magnesium (U-Mg).

Methods

Patient population

The patient population consisted of 34 cases, 10 males and 24 females, aged 65 ± 21 years, consecutively admitted to the non-cardiac intensive care unit of Ichilov Hospital, Tel-Aviv.

Seventeen patients were surgical emergency cases and 17 were medical emergencies.

Controls

Twenty carefully screened, apparently healthy Israelis, mean age 36.7 ± 12.6, (nine males and 11 females) served as controls.

The criteria for screening controls were as follows: no past history of chronic diseases, no concomitant diseases (not even a cold), no concurrent medication, no alcohol abuse, no drug abuse, smoking no more than 10 cigarettes daily. All the conditions which were excluded in the controls are known to cause lowering of magnesium. It should be emphasized that this stringent screening of the controls caused the reference group to be younger than the patient group. It would have been easy enough to take an age-matched sample, but this would no longer have been an apparently healthy control group with non-compromised magnesium status.

Statistics

Since by virtue of the screening criteria for the apparently healthy controls, the age of the controls was lower than that of the patients, a logistic regression analysis was carried out in order to correct the age difference before the statistical comparisons.

Laboratory assays

The blood was sampled between 8.00–10.00 a.m. using brief stasis. Erythrocytes were separated by the method of Henrotte[4].

Mononuclear cells were separated by a modified method of Elin & Husseini[3]. S-Mg, E-Mg, M-Mg and U-Mg were estimated by atomic absorption spectroscopy using strontium chloride as a diluent[7].

Results

S-Mg and E-Mg were slightly but not statisticaly significantly lowered and the M-Mg was highly significantly raised, compared with the controls (261.9 ± 124.0 fg/cell and 164.8 ± 28.3 fg/cell (mean ± SD) respectively; $P < 0.001$, independent Student's t test). U-Mg values did not differ.

Discussion

In the non-cardiac medical and surgical emergency cases the mean M-Mg was highly significantly higher than that of the controls, in contrast to the lowered values reported in intensive cardiac care patients[5]. To our knowledge, there is no prior report of raised M-Mg in intensive care patients in the literature.

The patients screened by us consisted of 17 surgical postoperative and 17 medical, non-cardiac cases, with a wide variety of diagnoses.

The only feature in common in the examined patients was that 32/34 received antibiotics. Of these, 18 (nine surgical and 10 medical emergency cases) received antibiotics before admission and 14 immediately on admission, that is, before the laboratory sampling. Extensive literature reports show that there is a lowering of S-Mg during antibiotic treatment, for example the aminoglycoside gentamicin lowers extracellular magnesium[1] and the interaction between tetracycline and Mg^{2+} is well known. Based on earlier studies of magnesium in infection[6], we speculate that antibiotic treatment facilitates an increase of magnesium content in the mononuclear cells, thereby enhancing the immune response.

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