

Characterization of the Mg Status of Elderly People by the Mg-Tolerance Test

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Zusammenfassung

Bei 20 anscheinend gesunden, unbehandelten Männern von 70–80 Jahren haben wir einen Test mit künstlich hervorgerufener Hypermagnesiämie durchgeführt. Bei 85 % dieser Patienten wurde ein unterschiedlich schwerer Magnesiummangel festgestellt. Der plausibelste Grund für diesen Mangelzustand ist eine unzureichende Magnesiumzufuhr.

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Summary

The i.v. Mg-load test was performed in twenty untreated and apparently healthy male patients, 70–80 years of age. Different degrees of Mg deficiency were demonstrated in 85 % of the patients. Poor intake was the most plausible cause of this deficiency.

Résumé

Nous avons effectué une épreuve d'hypermagnésémie provoquée par voie intraveineuse chez 20 sujets de sexe masculin, âgés de 70 à 80 ans, apparemment en bonne santé et ne recevant aucun traitement. Une carence en magnésium, à des degrés divers, a été observée chez 85 % de ces patients. La cause la plus plausible de cette carence résidait dans un apport insuffisant.

Introduction

There is a concern that Mg status cannot be determined or predicted in healthy elderly people on the basis of dietary intake nutrient density, balance studies, or blood levels alone. It may be more appropriate to look at functional indices of Mg status, load retention studies, and/or supplementation intervention studies to help characterize the Mg status of elderly people.

In the following study a parenteral Mg-tolerance test was performed on hospital admission in twenty untreated apparently healthy male patients aged 70–80 years. Ten had a probable Mg deficiency, seven had a definite Mg deficiency and three were Mg sufficient.

Patients and Methods

Twenty apparently healthy male patients, 70–80 years of age were hospitalized for prostatic surgery. The patients

were not receiving any treatment. On hospital admission an urinary catheter was inserted. Endogenous creatinine clearances corrected for body surface area were found to be within the normal range for the specific age group under study [1]. A parenteral Mg-tolerance test was performed in the following way [2, 3]:

1. Collect baseline urine for Mg and creatine (Cr) for 24 h
2. Infuse 0.2 mEq (2.4 mg) elemental Mg/kg lean body weight in 50 cm³ D₅W over 4 h
3. Collect urine (starting with infusion) for Mg and Cr for 24 h
4. Calculate percent Mg retained using following formula:

$$\frac{\% \text{ Mg retained} = \frac{\text{Postinfusion urine Mg} - (\text{Preinfusion urine Mg} / \text{Cr} \times \text{postinfusion urine Cr})}{\text{total elemental Mg infused}} \times 100$$

5. Criteria for Mg deficiency:
 > 50 % retained at 24 h = definite deficiency
 > 20 % retained at 24 h = probable deficiency

Serum and urinary Mg concentrations were determined by atomic absorption spectrophotometry. Serum and urine creatinine concentrations were determined by a Technicon SMAC-1 Autoanalyzer. After surgery, all patients were proven to have benign prostatic hypertrophy.

Results

Serum Mg concentrations were found to be within the normal range (1.5–1.9 mEq/l). Seven patients had > 50 % Mg retention at 24 h, ten patients had > 20 % Mg retention at 24 h and three patients had > 20 % Mg retention at 24 h (tab. 1). No correlation was found

Tab. 1:

% Mg retention at 24 h	
n	% retention
7	> 50 % (definite deficiency)
10	> 20 % (probable deficiency)
3	< 20 % (Mg sufficient)

n = number of patients

between Mg serum levels and the percent Mg retention at 24 h.

Discussion

Serum Mg levels have been reported as quite constant in healthy adults, regardless of age [4]. Intestinal absorption of Mg declines gradually with increasing age [5].

The RDA (recommended daily or dietary allowances or amounts) is a difficult scientific issue. The history of this concept in the last 49 years has started with the definition given in 1943 by the USA Authorities: „the RDA are to be understood as the level of intake of essential nutrients considered, in the judgement of the appropriate committee, to be adequate to meet the known nutritional needs of practically all healthy persons.“ The definition remains quite valid today and is the groundwork for today's main debatable scientific questions (definition and variability for requirements, dietary intakes, extrapolation of the study data to the whole population) [6, 7].

In the 10th edition of the RDA (USA) [7] the subcommittee concluded that insufficient data existed to establish separate RDA values for people 70 years of age and older. The committee recognized that the elderly represent such a diverse and heterogeneous group, with altered requirements for

some nutrients, that it would be difficult to establish discrete cut-off points. Therefore, as in previous editions, the RDA values for adults are divided into two categories: 25–50 years and from 51 years upward. The RDA for Mg in men 51 and older remains set at 14.4 mmol/day (350 mg/day). While the RDA for women decreased approximately 7 % from 12.3 mmol/day (300 mg/day) to 11.5 mmol/day (280 mg/day).

In the reevaluation of the 1989 RDA (USA), the subcommittee considered various kinds of data such as epidemiological, anthropometric, biochemical and clinical indices of nutritional status, as well as balance data. Since there are no reliable non-invasive techniques for determining Mg status, balance studies appear to be the only practical method for estimating Mg requirements in humans, and such studies have been faulted.

Mertz [8] has concluded that using balance studies to help to determine requirements and then adding an increment as a safety factor results in an unrealistically high recommendation that would be difficult to implement. He also stated that „a balance study does not determine the requirement for a mineral, but rather the intake required to maintain the existing pool size“. The minimal pool size consistent with health remains to be determined.

In three studies the daily Mg intake by men aged 70 years and older was investigated by different methods; it was found to be smaller than the recommended by the RDA (USA) [9].

In the present study the percent Mg retention in the i.v. Mg-load test demonstrated different degrees of Mg deficiency in 85 % of twenty male patients 70–80 years of age. These 20

patients could be categorized as apparently healthy since the only disease they had was benign prostatic hypertrophy which needed surgical intervention. Since they were not on any drugs their Mg deficiency could be due only to poor intake.

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