



Case Report

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Effects of the Zinc Sulphate in a Girl with Chronic Renal Failure

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Abstract

Inside of study, which was done in Lima, about effects of administration the zinc sulphate in children with renal failure (glomerular filtration rate (GFR) <25 mL/min/1.73 m in dialysis), its relationship to body size and growth velocity; we looked at the change of a girl's nutritional status after twelve months of zinc supplement.

Keywords: Zinc; Malnutrition; Renal failure; Bone

Introduction

End-stage renal disease (ESRD) is associated with numerous complications, which may partly result from excessive amounts of reactive oxygen species and/or decreased antioxidant activity [1]. In children in haemodialysis have been described hipozincemia. Given the diverse array of biologic functions of zinc, it is not surprising that multiple physiological and metabolic functions, such as physical growth, immunocompetence, reproductive function, and neurobehavioral development are all affected by zinc status [2]. When the supply of dietary zinc is insufficient to support these functions, biochemical abnormalities and clinical signs may be developed [3].

Objectives

Inside of a study of evaluation of the effect of administration of zinc sulphate on nutritional status in children with chronic renal failure, we described a girl's nutritional status.

Material and Methods

The study in 48 children with chronic renal failure was controlled, concurrent, randomized and open (not masked), conducted in two phases: Phase I: Baseline nutritional status diagnosis. Two months: monthly anthropometric assessment (10 indicators) and biochemical analysis (3 indicators). Phase II: Twelve months. For restrictive randomization were assigned to group A (sulphate 30mg Zn/day) or B (15mg Zn/day). Group B was a control group and the dose of 15 mg Zn/day as the minimum daily requirement of zinc. Were followed monthly anthropometric and biochemical analysis in the last month. We obtained serum

levels of C-reactive protein (marker of infection), albumin (visceral protein reserve) and serum zinc. Anthropometric assessments of weight (W), height (H), mid-arm circumference (MAC) and triceps skinfold thickness (TSF) were used to develop the indicators: weight for age (W/A), height for age (H/A), weight for height (W/H), nutritional index (IN), body mass index (BMI), mid-arm muscle area (MAMA) or lean mass (LM), fat mass (FM) and growth rate (GR). To diagnoses zinc deficiency we use serum zinc > 70 µg/dl. The statistics test used was the nonparametric test of Wilcoxon signed ranks [4].

Results

From the 13 indicators of nutrition, we obtained an average of 0.78% of obese, a 36.45% of normal and a 59.64% of malnourished children in the first evaluation. After oral administration of zinc remained half of 1.04% of obesity, eutrophication of a 27.06% of normal and 43.49% of malnutrition. There were 25% and 20.84% of hipozincemia in the first and second biochemical evaluation, respectively. With 30 mg/day of zinc sulphate, there was a significant change in the nutritional index ($p=0.025$), the body mass index ($p=0.009$) and in arm circumference ($p=0.041$). This increase in body mass was significant in the age group under 14 years, with doses of 30 mg/day, evidenced through the body mass index ($p=0.26$) and the arm circumference ($p=0.039$).

One girl who was 10 years old, which have renal failure by chronic interstitial nephritis with chronic malnutrition and osteodystrophy. She could not walk when she started the study,

she needed to help from her family to move around the house, hospital and other places. When she started she was W/A -3.6, H/A -4.9, W/H -2.1, BMI -1.6, MAMA -2, LM<5 percentile, FM<5 percentile and GR -3.9. Also, slow albumin, high PCR and normal serum zinc. She entered in the group A and take sulphate 30mg Zn/day pills for eleven month. Then she finished with W/A -3.6, H/A -5.8, W/H -1.7, BMI -1.4, MAMA -2.2, LM <5 percentile, FM < 5 percentile and GR -5.3, and slow albumin, normal PCR and zinc deficiency. We can see that she improve W/H, BMI and PCR. However, the best improve was in the end of the study, she can walk alone by herself.

Discussion

Zinc is an essential metal for human body and it is necessary for grow and development of children from pregnant women since adult inclusive ancient. It is possible because zinc is a dietary essential trace element, is primarily an intracellular metal involved in numerous metabolic processes, i.e., as a catalyst, structural element, or regulatory ion. With zinc deficiency, multiple nonspecific general shifts in metabolism and function occur, including reductions in growth, increased infections, and the appearance of skin lesions [5]. In low-income countries like Peru, where zinc intakes are inadequate, these functional disturbances are often associated with impaired growth, increase risk of child morbidity and mortality and preterm births.

All cells appear to have a small zinc reserve “stored” in lysosomes [6,13]. However, some tissues, possibly bone, may have labile zinc pools than can be redistributed to maintain zinc-dependent functions in other tissues [7,13]. Bone contains ~30% of total body zinc, that is, ~700mg total or 66µg/g body weight, with some differences due to sex [8, Bond]. Studies showed that bone zinc, as well as liver zinc, is mobilized when animals are fed a zinc-deficient diet [9,13]. Because the total content of zinc in bone is 3-fold higher than that of all soft tissues combined, a decrease in bone zinc concentration would indicate a major release of endogenous zinc compared with that from other tissues. Thus, bone zinc may provide a “back-up” source of zinc for other tissues with a vital zinc requirement when the dietary supply is inadequate [10, bond]. Nevertheless, there are important biological roles for zinc in bone [13].

The change of a child with renal failure in dialysis who cannot walk alone without modification her treatment with an exception of 30mg/day of sulphate zinc supply. After eleven months she can walk by herself could be, explain for the zinc function in all bone of the body via zinc’s active role in collagen formation in the epitheses, zinc ions promoters of bone remodelling by osteoblast proliferation [11,13], and they contribute to extracellular matrix calcification through the synthesis of matrix proteins in osteoblast [12,13]. Zinc deficiency finally could be explain because patients with renal failure can need supply for more time.

Conclusion

For the nutritional index, the BMI and MAC, oral administration of 30mg / day of zinc sulphate resulted in an increased significant

change in deposit mass compared with the group that received only 15mg/day. The mass increase was significant on body mass index and mid-arm circumference, in the age group under 14 who received 30mg/day of zinc sulphate. It was the same in our patient; because she improve her BMI and W/H despite that, she finished with hypozincemia.

The administration of zinc sulphate did not significantly improve the final height or serum zinc. It is recommended seeing the zinc as one of the essential micronutrient supplementation in patients with chronic renal failure and for studies of zinc deficiency in the development of other chronic diseases in which malnutrition is present. However, a biomarker of changes in bone zinc is not available at this time. Researchers are needed to better understand links between bone zinc, diet zinc, and overall zinc homeostasis [13].

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