Zinc and Copper in Serum and Urine of Children with Burns

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SUMMARY

Serum zinc and copper and urinary zinc has been estimated in 32 children with mild to moderate burns. No significant deviation from normal has been shown, and no modification of routine therapy is suggested.

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Zinc is important to normal skin[1,2] and supplements have been shown to increase the rate of its healing after surgery.[3] Its concentration decreases in the hair of burned adults,[4,5] and an increased loss in the urine has been shown after the stress of even minor surgical operations, in various diseases[2] and in protein energy malnutrition.[6]

Copper deficiency, also, can affect the skin.[7] Low serum levels have been found in patients with kwashiorkor and marasmus.[8] Local soil and water tend to be deficient in trace elements, as may be vegetables which are grown in it.[8]

PATIENTS AND METHODS

The 32 patients studied appeared typical of those admitted to this hospital, with the omission of the most severely injured. The age range was 7 months to 10,5 years (mean 3 years). Twenty were boys. Most had been scalded with water. The estimated surface area affected ranged from 0,5% to 25% (mean 9%). Six patients had not been injured recently but were returning as 'cold cases' for skin grafting. Blood was also taken from 11 healthy children.

Malnutrition may have been expected in that section of society liable to accidents, but the mean weight was only 8% less than the Boston 50th percentile and none were severely undernourished. No change was made in the usual diet, transfusion policy or treatment.[9]

Blood was collected after an overnight fast within the first 2 days of admission, and in some again before discharge a week or two later. Sterile plastic disposable syringes were used and dry glass tubes, which had been carefully rinsed with glass-distilled water. The serum was separated after a few minutes.

Urine passed during the 24 hours following venepuncture was collected by the nursing staff by means of adhesive bags which were aspirated with thoroughly rinsed syringes and catheters.

Aliquots of the serum and urine were analysed for zinc and copper by atomic absorption spectroscopy using a Perkin-Elmer 303 instrument.[10,11]

RESULTS

The average serum zinc concentration of 26 children taken the morning after admission was 0,79 ppm and of 15 before discharge one or two weeks later, 0,7 ppm. Although some individually were above those we have found in the 11 healthy children (whose mean level was 0,64 ppm), the values were within our normal range. Significant differences were not found by comparison between different age groups and varying degrees of burns. The mean of 6 children readmitted for grafting of old burns was 0,75 ppm.

Urinary zinc was measured twice in 15 children. The average total daily excretion just after admission was 201 μg, and before discharge 203 μg. There were differences if the patients were divided into groups, but the standard deviation was 10 μg, and without statistical significance. In 6 children with burns less than 5% of surface area zincuria increased from 14 on admission to 22 μg/kg body weight at discharge. In 9 children with between 5% and 20% burns there was a decrease, from 20 to 16 μg/24 h/kg. In 11 other children after admission the average was 14,7 μg, and in 4 returning for grafting it was 16 μg/24 h/kg.

For serum copper the mean of 26 sera on admission was 1,6 ppm and of 15 at discharge it was 1,4 ppm. The 6 children admitted for grafting the mean was 1,5 ppm and in the 11 controls, 1,4 ppm.

DISCUSSION

Concentrations of zinc in the serum do not necessarily reflect body stores, tissue levels or availability for the response of wounds to supplementation with the element. Nevertheless, they have been used as an index of zinc status and at least it is reassuring that no deficit has been demonstrated in these patients. Homeostatic mechanisms for maintaining serum levels are efficient,[12] and zinc excretion in the urine may be a better indicator of changes in the balance—though, also, it may be lost in exudate, sweat and stool. The urinary values obtained were slightly higher than those found in health

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in Baltimore,[14] but correspond with previous results from this Unit.[5] The results for urinary copper, though not reported here, were also normal.

Severely burned cases were not studied, but no deficiency of zinc or copper has been demonstrated in the acute phase following injury, nor in healed patients returning for grafting, in whom a chronic, slightly increased loss might have occurred. This was a small survey and perhaps the clinical effects of added zinc should be tried in spite of its unproved lack of toxicity.[15] However, one notes that low levels of both elements in protein calorie malnutrition rise in hospital without specific additional therapy.[6] These findings do not support the suggestion that there is a need for a supplement of these trace metals in mild to moderate burns.

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