Blood Zinc Levels in Patients with Arteriosclerosis Obliterans, Thromboangiitis Obliterans and Takayasu’s Disease

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SUMMARY

Serum zinc concentration was measured by atomic absorption spectrophotometry in 30 normal males, 17 normal females, 20 patients with arteriosclerosis obliterans, 26 patients with thromboangiitis obliterans, 40 patients with Takayasu’s disease.

The mean serum zinc concentration was 93.9 ± 8.4 µg/100 ml in the normal male controls, 75.1 ± 3.3 µg/100 ml in patients with arteriosclerosis obliterans without ulcers (P<0.05) and 79.2 ± 6.5 µg/100 ml in patients with thromboangiitis obliterans without ulcers. Serum zinc concentration showed to be more decreased in patients with these diseases who had ulcers. The mean serum zinc concentration was 77.9 ± 4.0 µg/100 ml in the normal female controls, 71.8 ± 5.1 µg/100 ml in patients with Takayasu’s disease who had never been treated with steroids and 59.1 ± 2.7 µg/100 ml in patients with this disease who had been treated with this drug (P<0.01).

The zinc level was significantly lower in CRP positive patients with Takayasu’s disease than in CRP negative patients (P<0.05).

Additional Indexing Words:
Zinc    Arteriosclerosis obliterans    Thromboangiitis obliterans
Takayasu’s disease

ZINC is a trace metal involved in cell and tissue growth and plays an essential role in many metalloenzymes that play the important roles in carbohydrate, lipid and protein metabolism. However, there was a lack of information concerning zinc deficiency in human beings until 1961 when Prasad and his associates suggested that this might explain failure to grow and develop sexually as metallic zinc is found in abundance in food and water and we ingest 10 to 15 mg of this metal each day and its elimination into urine and faeces is controlled.

Today, it is evident that zinc deficiency is common in man, particularly in pregnant women, and hospital patients with poor absorption or poor nutrition. An abnormally low blood zinc concentration is known to exist.

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in liver diseases, renal diseases, indolent ulcer, Down's syndrome, cystic fibrosis, arteriosclerotic diseases, pregnancy, women taking oral contraceptives, some hematological disorders, and others. Of late, beneficial results of zinc sulphate treatment have been reported in patients with leg ulcers and intermittent claudication by Husain, Greves, and Hallbóök.

In our country, peroral zinc sulphate treatment was first tried by us in 1973 and 2 cases whose clinical signs might be improved by this treatment were reported. This is a short report subjected to the serum zinc level in several vascular diseases.

**PATIENTS AND METHODS**

Serum zinc concentrations were measured by atomic absorption spectrophotometry in 30 males aged 20 to 49 years (mean 31.2), 17 normal female aged 20 to 49 years (mean 30.7), 20 patients with arteriosclerosis obliterans aged 45 to 75 years (mean 63.0), 26 patients with thromboangiitis obliterans aged 32 to 51 years (mean 42.8), and 40 patients with Takayasu's disease aged 14 to 50 years (mean 28.8).

Blood samples were taken with disposable needles, disposable plastic syringes, and placed in zinc-free tubes. After centrifugation (2,000 r.p.m., 10 min), the serum was decanted. Five-tenths ml of serum was added with 4.5 ml of diluted butyl alcohol solution. Analysis was performed against freshly prepared standards containing 0, 50, 100, 150, 200 µg zinc per 100 ml. Measurements were made on a Hitachi atomic absorption spectrophotometer (model 508). Zinc levels were determined at a wave length of 2,138Å using a zinc hollow cathode lamp.

**RESULTS**

Serum zinc concentrations in normal healthy males ranged from 54 to 138 µg/100 ml and the mean and standard error was 93.9 ± 4.0 µg/100 ml, while zinc levels in patients with arteriosclerosis obliterans ranged from 54 to 114, with a mean of 75.1 ± 3.3 µg/100 ml. In the patients with arteriosclerosis obliterans, zinc levels registered significantly (P < 0.05) lower as compared with normal individuals. Low serum zinc concentrations were seen in one patient who previously had a toe ulcer and another who presently has a toe ulcer. In patients with thromboangiitis obliterans the mean serum zinc concentration was 79.2 ± 6.5 µg/100 ml and their data showed a lower level than that of normal controls. Decreased serum zinc concentrations were also observed in 5 patients who previously had ulcers and 8 patients who now have ulcers, and their serum zinc levels were lower than the mean concentration of the healthy control group (Fig. 1).

Serum zinc concentration was 77.9 ± 4.0 µg/100 ml in the normal female
Fig. 1. Serum zinc concentration in patients with occlusive arterial disease.

Fig. 2. Serum zinc concentration in patients with Takayasu's disease.
controls. Zinc level in 12 patients with Takayasu's disease who had never been treated with steroids was $71.8 \pm 5.1 \mu g/100 \text{ml}$, and there was no statistically significant difference between these patients and the normal controls. However, the zinc level was seen to have decreased significantly, and was $59.1 \pm 2.7 \mu g/100 \text{ml}$ in patients who were undergoing steroid treatment and had previously been treated with this drug ($P<0.01$) (Fig. 2).

Serum zinc levels of patients whose C-reactive protein (CRP) reaction was positive were compared with those whose CRP reaction was negative. Although there is no tendency for serum zinc concentration to decrease as the CRP reaction becomes more intensive, the zinc level was significantly lower in CRP positive patients than in CRP negative patients (Fig. 3).

**DISCUSSION**

An abnormal low blood zinc concentration is known to exist in several diseases as previously described and furthermore, there is a striking increase of metal zinc in urine after surgery,\(^{12}\) burns,\(^{13,14}\) multiple injuries and major long bone fractures,\(^{15}\) and the same results are obtained in nephrotic syndrome,\(^{16}\) hepatic porphyria, proteinuria, hypertension, and in patients taking chothalidone.\(^{17}\) Therefore, zinc treatment may be necessary for patients whose blood zinc is abnormally low and whose urinary excretion of zinc has increased.
In our patients, serum zinc concentration showed to be decreased in patients with arteriosclerosis obliterans and thromboangiitis obliterans, and more decreased in patients who had ulcers. Serum zinc level was showed to have decreased significantly in patients with Takayasu's disease who were undergoing steroid treatment and whose CRP reaction was positive.

The cause of low serum zinc levels is thought to be partly due to aging, partly due to destructive lesion of the arterial wall and partly due to the intake of steroid hormones. As the dietary factors are not thought to contribute to the low concentration of blood zinc in our patients, it is assumed that increasing urinary output of zinc must exist in these diseases. Anyhow, supplemental zinc treatment may be necessary in these diseases, especially in patients with leg ulcers and whose CRP reaction is positive, because zinc treatment showed to promote the wound healing.

A large number of patients in our out-patient clinic are now undergoing zinc sulphate treatment on which will be reported in future.

REFERENCES