

# Zinc Toxicity From Massive and Prolonged Coin Ingestion in an Adult

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**ABSTRACT:** Acquired copper deficiency anemia is rare in humans. This report describes a 38-year-old schizophrenic man with metal pica, especially coins, who presented with symptomatic anemia. Two hundred seventy-five coins were surgically removed from the gastrointestinal tract of this patient during the course of his hospitalization. Some of the post-1981 pennies, which consist primarily of zinc, showed severe corrosion because of their prolonged contact with acidic gastric

juice. The patient presented with clinical manifestations consistent with the local corrosive as well as the systemic effects of zinc intoxication. His treatment and outcome are presented. The effects of zinc intoxication on hematologic and other organ systems and on copper absorption are discussed. **KEY INDEXING TERMS:** Coin ingestion; Zinc toxicity; Copper deficiency. [Am J Med Sci 2008;336(5):430-433.]

**C**oins are the most common of foreign bodies ingested by children, but coin ingestion is a less common problem in adults. In addition to the problems of luminal obstruction, coin ingestion may result in significant gastrointestinal (GI) and systemic toxicity. We report the case of an adult male schizophrenic patient who developed symptomatic zinc toxicity from massive and chronic coin ingestion which was managed successfully.

## Case Report

A 47-year-old African-American man was seen because of epigastric pain, weight loss, and recurrent vomiting which had been ongoing for 6 weeks. There was no previous history of liver disease or GI problems. The patient had schizophrenia and HIV infection, with a CD4 count of 20 but with no AIDS-defining illness. He had been living in a residential care center and was being treated for more than a year with haloperidol, benztramine mesylate, risperadone, nelfinavir, and zidovudine/lamivudine combination. In the previous year, he was also treated for latent syphilis. Examination showed a well-developed, well-nourished male in no distress. He was 6 feet tall and weighed 158 pounds. Vital signs were normal. The conjunctivae were pink, the sclera anicteric, and the mucous membranes were moist. Heart, lung, and abdominal examinations were normal. Laboratory data showed a hemoglobin (Hgb) of 9.3 gm/dL, mean corpuscular volume (MCV) 119.4 fL, white blood cell count (WBC) 3.6 K/mm<sup>3</sup>,

and platelet count of 160,000/mm<sup>3</sup> when compared with a Hgb of 12.2 g/dL and a MCV of 112.6 fL done 7 months earlier. A chemistry profile, including liver function tests, was entirely normal. Esophagogastroduodenoscopy, performed to evaluate the symptoms, showed a large number of coins, mostly pennies, in the gastric fundus and body along with numerous ulcerations and erosions throughout the body and antrum (Figure 1). The esophagus and duodenum were normal in appearance. An abdominal X-ray immediately after the EGD showed numerous coin-like densities throughout the abdomen with the largest grouping in the left abdomen, felt to be in the descending colon (Figure 2), although, considering the endoscopic findings, it was clear that the weight of the coins caused the stomach to sag below the iliac crest. The patient acknowledged that he often swallowed pennies in order "to make his singing voice better." Because of the large number of coins, surgical gastrotomy was recommended for removal of the coins, but the patient refused.

Four days later, he was rehospitalized due to continued abdominal pain, emesis, fatigue, episodes of dizziness, and loss of consciousness. The patient denied any symptoms of overt GI bleeding. He was afebrile but his blood pressure was labile, decreasing when he stood up. Neurological examination was normal. The hemoglobin had decreased to 4.5 gm/dL with a MCV of 126.7 fL and total reticulocyte count of 11,550/mm<sup>3</sup>. WBC was 2500/mm<sup>3</sup> with 46% neutrophils, 26% lymphocytes, 18% monocytes, 4% basophils, and 5% bands. Platelets were 203,000/mm<sup>3</sup> but dropped below 100,000/mm<sup>3</sup> over the next few days. Serum electrolytes, iron studies, vitamin B12, folate levels, and liver functions tests were normal, with a total bilirubin of 1.0 mg/dL (normal range = 0.0-1.5 mg/dL). Haptoglobin was 90 mg/dL (normal range = 16-200 mg/dL), but lactate dehydrogenase was mildly elevated at 316 U/L (normal range = 100-225 U/L). CD4 count was 261 and a quantitative HIV measurement was undetectable. Despite aggressive transfusion of packed red blood cells, the hemoglobin remained extremely low. Serum zinc (Zn) was markedly elevated at 2891 µg/dL (normal range = 60-130 µg/dL); serum copper (Cu) was profoundly decreased at 6 µg/dL (normal range = 70-155 µg/dL) and serum ceruloplasmin was 2 mg/dL (normal range = 25-60 mg/dL). A bone marrow biopsy showed hypercellularity with a marked increase in stainable iron, without ringed sideroblasts. There were dysplastic changes in both the erythroid and myeloid series, with an increased number

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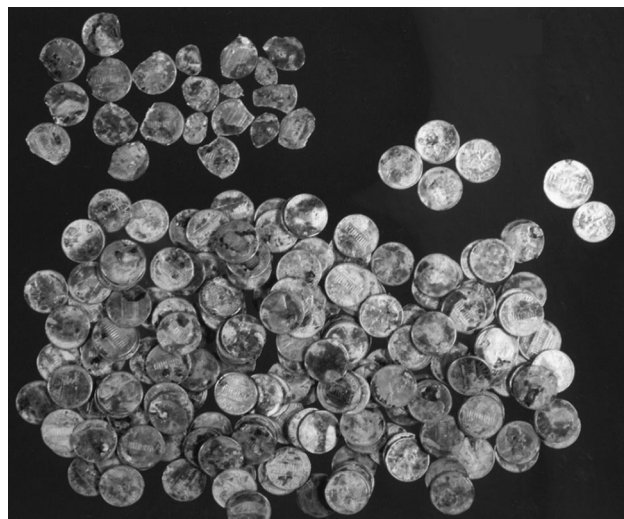


**Figure 1.** Endoscopic photograph showing ingested coins in the fundus of the stomach. Superficial ulcerations are also seen.

of megakaryocytes. Cytogenetic studies were not done. It was felt that the peripheral cytopenias were a consequence of “ineffective hematopoiesis” due to the mineral imbalance. The patient developed a right facial droop, dysphasia, dysarthria, and bilateral upper and lower extremity paresis. Computed tomography scan and magnetic resonance imaging showed multiple areas of acute and subacute ischemia, but carotid duplex studies and transtho-



**Figure 2.** Abdominal X-ray showing the stomach displaced into the pelvis by the weight of the coins.



**Figure 3.** Pennies after removal from the patient's stomach showing various stages of corrosion.

racic echography revealed no embolic source. An extensive cerebrospinal fluid examination was negative.

The patient was begun on chelation therapy with calcium ethylenediaminetetraacetic acid and infusions of copper chloride (CuCl) which resulted in an exponential decrease in serum Zn levels and rise in serum Cu and ceruloplasmin within a week. The pancytopenia resolved without further transfusion. Two weeks after admission the patient underwent a laparotomy and gastrotomy, which yielded 253 whole and 20 partially digested pennies, 1 dime, and 1 nickel (Figure 3). Some coins identified in the distal ileum were pushed beyond the ileocecal valve. Abdominal films done subsequently showed that most of the coins remaining in the bowel after surgery had been expelled. The patient was clinically much improved and was discharged about 4 weeks after admission on oral copper sulfate and psychotropic medications. One year later, WBC was 5700/mm<sup>3</sup> and hemoglobin was 12.5 gm/dL with a MCV of 120.6 fL. The high MCV could be attributed to his antiretroviral therapy.

## Discussion

Reported cases of Zn toxicity in humans suggest that Zn is potentially more toxic than was once believed.<sup>1-7</sup> The daily recommended dietary allowance of Zn for adults is 8–11 mg.<sup>8</sup> Zn supplementation is beneficial in the management of a number of conditions as diverse as acute diarrhea,<sup>9</sup> the common cold,<sup>10</sup> acne,<sup>11</sup> and progressive myoclonic epilepsy.<sup>12</sup> However, Zn ingestion may be atherogenic in man. Results of randomized controlled trials show that low-density lipoprotein (LDL) oxidation and the concentrations of LDL-cholesterol, total cholesterol, and triglycerides in plasma are unaffected by supplementation with up to 150 mg Zn/d. In contrast, plasma high-density lipoprotein-cholesterol concentrations decline when Zn supplements provide a dose >50 mg/d.<sup>13</sup> Zn lozenges used in clinical trials of cold symptoms contain 13 mg Zn and could conceivably deliver doses up to 12 times the recommended dietary allowance if taken round the clock.

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