

# Best Cases In Biological Medicine

## Series #15

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G.H. is a 43 year old female who presented with a nine month history of increasing lower extremity numbness and tingling, palpitations, and dyspnea on exertion. She had a history of extreme obesity since childhood and when her weight had reached 400 pounds her doctor had recommended she undergo Roux-en-Y gastric bypass surgery. This is the most commonly done Bariatric surgery. This procedure reconnects the stomach and upper small intestines and reduces the usable portion of a patient's stomach to around a 2-ounce capacity – down from one liter. This was performed 5 years prior to her presentation. After surgery her weight gradually reduced to 180 pounds. Initially she had felt relatively well, and was on no medication or supplements except a monthly B12 shot.

She did not smoke and had no occupational or environmental exposure to heavy metals, pesticides, or chemicals.

On presentation her blood pressure was 124/56. temperature 99 F, R 18, HR 100. Initial neurological exam showed reduced sensation to light touch, pin prick and proprioception in both lower extremities.

Rhomberg was positive and Babinski's were positive bilaterally. Ankle, brachioradialis, and patellar reflexes were hyperreflexic bilaterally. Cranial nerves were intact. Motor strength was normal. Exam was otherwise negative. Dentition was normal with no amalgams.

Laboratory results showed Hemoglobin 9 grams. WBC 2000 (4400-11,000) with 45% neutrophils. Serum, B12 level was 749 (200-950), folate 24 (>0.9), methylmalonic acid 0.77 (>0.4), homocysteine 6 (4-9), retic count 3.2% (0.5-1.5)

Serum iron, ferritin, TIBC were normal. ANA negative, serum lead normal. CSF was normal, brain and C spine MRI normal. CT chest, abdomen were negative. ION panel showed a very low copper level and no elevations of heavy metals. Serum copper level was 35 ug/dL (80-155). Serum zinc 88 (65-256).

A diagnosis of copper deficiency, as a consequence of her gastric bypass surgery, was made.

Copper deficiency is very rare.

The normal diet contains between 0.6-1.6 mg of copper per day. Shellfish and organ meats have the highest concentration, and good amounts are also found in nuts and whole grains. Refined grains, without the bran and germ, are very low in copper. Insignificant amounts of copper are absorbed from copper pipes, but absorption from copper bracelets can be significant.

Absorption is through the stomach and upper duodenum. Disruptions in either can lead to copper malabsorption. Other known factors that may inhibit copper absorption and lead to low copper levels are high dietary intakes of zinc or iron. Another known cause is Menke's syndrome, where there is a hereditary defect in the transfer of copper from the intestinal mucosa to the blood.

Once absorbed, copper is transported via albumin and transcuprein (a copper transfer protein in the serum) to the liver where most of it is deposited. The liver may incorporate copper into a variety of copper containing enzymes and proteins or transfer needed amounts to other organs.

The role of copper is as a specific cofactor for certain enzymes, electron transport proteins, and anti oxidant functions. Some examples are:

1. Ceruloplasmin- an acute phase reactant and transport protein
2. Cytochrome oxidase, the terminal enzyme in respiration
3. Superoxide dismutase (SOD) an enzyme that defends against oxygen radicals.
4. Metallothionein which stores copper and has superoxide capabilities
5. Dopamine Beta hydroxylase, the enzyme for conversion of dopamine to norepinephrine.
6. Copper is a ligand to the enzyme, ferroxidase, which oxidizes iron so that it can be mobilized from liver stores to the bone marrow to make hemoglobin.

Copper deficiency has been reported after Bariatric surgery. This is most likely from malabsorption. It has also occurred after extensive hyperalimentation when copper has not been supplemented.

With copper deficiency, deficits can occur in at least the five areas listed above which can lead to neurological deficits, including myelopathy, demyelination, ataxia, optic neuritis, weakness, fatigue and others.

Hematopoietic pathology can also occur including anemia and leucopenia with sideroblastic and nuclear maturation defects.

Hypochromic microcytic forms are often seen on peripheral smear. Sometimes, however, macrocytic forms are seen, and when combined with the neuropathy can fool one into thinking that this is a B12 or folate deficiency.

This patient had classic neurological and hematopoietic signs and symptoms.

This patient was treated with 5 mg of copper chloride IV daily (equivalent to 2 mg copper). By 14 days of treatment her serum levels rose from 35 to 78 ug/dl (80-155). She was maintained on parenteral copper for 4 months with gradual improvement in her symptoms, anemia and leucopenia.

The differential diagnosis of this patient included B12 and folate deficiency, CNS infection, autoimmune disease, malignancy (leukemia, myeloma), heavy metal poisoning, multiple sclerosis, and copper deficiency.

We find that an ION panel from Metamatrix Labs on all patients to be very helpful in picking up occult deficiencies of trace minerals, fatty acids, amino acids and vitamins.

This case is just another side of modern iatrogenic illness. The new gold mine for hospital incomes is Bariatric surgery. In the U.S. it is estimated that 64% of adults are overweight and more than 30% are obese. According to the American Society for Bariatric Surgery, there will be 150,000 operations this year for obesity. That's 10 times more than in 1998. Generally these people are 100 pounds or more overweight and suffer from many complications such as diabetes, hypertension, sleep apnea, DJD, and ASVD. However, a study published in JAMA last year showed that in 35-44 year olds who underwent Bariatric surgery between 1997 and 2002, more than 5% of men and 3% of women were dead within a year. As age increased so did the death rate. Added to this are the deficiencies that can occur, as illustrated by this case, as well as a myriad of other complications.

In our experience all obese patients have a genetic susceptibility, but additionally are always malnourished and toxic. To a great extent, their food cravings are driven by these two later factors. Their key to successful weight loss must begin with approaches that identify and correct deficiencies and detoxification. This is the purview of Biological Medicine.

Biological Medicine is the science of working with the laws of nature and life to heal the body. When these principles are followed, and the patient is compliant, and providing we are not too late, we can be successful. ☸

*Biological medicine practitioners are effective because they understand and work with the natural laws of living organisms. The purpose of this series is to present illustrative cases from different practitioners in order to demonstrate the highly effective principles and practice of Biologic Medicine. If you have cases that have educational value for others using Biological Medicine in practice, please email them in Word format to Dr. David I. Minkoff M.D. at [drnminkoff@bodyhealth.com](mailto:drnminkoff@bodyhealth.com). They will be presented each month as part of the Best Cases in Biological Medicine series.*

For a good reference on Copper Metabolism:  
<http://www.ajcn.org/cgi/reprint/63/5/797S>

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