**Caso clínico**

**Dermatitis and optic neuropathy due to zinc deficiency after malabsorptive bariatric surgery**

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**Abstract**

We present a patient who underwent successful classic duodenal switch and developed a marked dermatitis with a significant functional limitation. This is an unusual complication, despite the relatively moderate prevalence of nutrient deficiency after this type of bariatric surgery. We discuss possible pathogenic mechanisms and emphasize the importance of an appropriate nutritional management.


**Introduction**

Nutritional disturbances after bariatric surgery may occur due to excessive malabsorption and weight loss. Micronutrient deficiencies such as iron, folic acid, calcium, vitamin D, vitamin B12 and thiamine, may result in anemia, neurological alterations and osteopenia. However, even though insufficient levels of zinc and other micronutrients have also been described, its clinical relevance is unusual. We describe a patient who developed important clinical manifestations due to zinc deficiency early after bariatric surgery.

**Case report**

A 32-year old woman, with a long-term history of obesity and no associated comorbidities, except for irregular menses, underwent classic duodenal switch with a body weight of 143 kg and body mass index (BMI) of 50.7 kg/m², with no immediate postoperative complications. After surgery, routine vitamin and mineral oral supplements were introduced. She adequately progressed during the follow-up period and reached correct tolerance to normal solid diet by 5 months. At this moment, she weighed 106 kg (BMI 37.6 kg/m²; % weight loss (%WL) 25.9%). Occasional vomiting and increase in bowel habit did not limit her activities of daily living.

At 10 months’ follow-up, she had achieved a body weight of 85 kg (BMI 30.1 kg/m²; %WL 40.5%) and increased bowel habit and vomiting persisted. She complained because of gradual appearance of cuta-
neous lesions distributed over legs, perineal and perianal areas, and she referred increased asthenia, loss of appetite, hair loss, brittle nails, depigmentation, and slight decrease in visual acuity. Physical examination revealed skin pallor, depigmentation of hair, eyelashes and eyebrows, non-androgenic alopecia, subtle and non-painful smooth hepatomegaly and bilateral and symmetric edema in lower limbs. Additionally, erythematous desquamative patterns and eczematous plaques were remarked over abdomen, upper and lower limbs, perineal area, cutaneous folds, and feet soles, and several excoriations due to scratching were evident (fig. 1).

Laboratory data at this time were: erythrocytes 3,590,000/mm$^3$, hemoglobin 11.9 g/dL, hematocrit 34.7%, mean corpuscular volume 96.5 fL, lymphocytes 2,200/mm$^3$, prothrombin time (PT) 79%, activated partial thromboplastin time (aPTT) 32.2 s, international normalized ratio (INR) 1.1, iron 78 ug/dL (40-145), ferritin 177 ng/mL (10-155), zinc 71 ug/dL (60-150), selenium 68 ug/L (60-120), ceruloplasmin 27.8 mg/dL (22-60). The patient was discharged with daily supplements of protein, multivitamins and zinc sulfate (60 mg/day), without reappearance of lesions nor visual deficits, and remaining clinically asymptomatic.

Discussion

Bariatric surgery is an effective treatment for morbidly obese patients, which allows significant and durable weight loss, as well as resolution of several comorbidities. However, it may potentially develop a variety of nutritional and metabolic complications due to anatomical changes of the gastrointestinal tract. The most common micronutrient deficiencies are iron, vitamin B12, calcium and vitamin D, which can result in anemia, neurologic affections and osteopenia. In general, adequate oral multiple supplements may prevent them, but there are no controlled trials that establish the best type and dosage required for patients after bariatric surgery. Less frequent deficiencies include vitamins A and K, zinc and copper.

Zinc deficiency has been observed in obese patients prior to bariatric surgery, and is worsened afterwards. Levels are not always monitored, and, thus, prevalence of its postoperative deficiency is difficult to infer, but several reports have observed rates ranging from 10-74%, and differences have been observed between Roux-en-Y gastric bypass and biliopancreatic diversions. Nevertheless, most deficiencies are marginal and clinically asymptomatic, and there are only few reports that address its impact illustrating clinical manifestations such as the patient here described.
presented. Moreover, these subtle subnormal micronutrient levels are rarely specifically targeted, since they are usually associated to low intake of red meat and other proteins, and, they are, therefore, frequently resolved when diet is improved.

Because of its role in numerous biochemical pathways, insufficient zinc levels may affect several organ systems, including integumentary, immune and central nervous system, leading to mental lethargy, diarrhea, poor appetite, weight loss, immune dysfunction, alopecia, delayed wound healing and dermatitis. However, clinical manifestations are rarely relevant.

The hypothesized mechanism for the development of these alterations is that cells with a rapid turnover rate are highly sensitive to nutritional deficiencies. Skin signs include those observed in our patient, but histopathological examination is not specific, so biopsy of lesions was not deemed necessary to establish the diagnosis, since they were characteristic and micronutrient levels were found to be decreased; thus, other etiologies for dermatitis were reasonably ruled out. Rapid weight loss and malabsorption inherent to bypassing of duodenum and proximal jejunum (important sites for zinc absorption), would have been the main reasons why nutrient deficiency developed in this patient. Additionally, protein malnutrition and routine iron and calcium supplements may have contributed to insufficient zinc assimilation. Zinc absorption capacity is jeopardized even despite doubling of oral supplements, so current and empirical reference intakes that regular multivitamin tablets provide (10-15 mg/day) deem insufficient for recovery of body zinc stores, and higher intakes are required (40-60 mg/day), as it occurred in this patient.

Regarding neurological symptoms, optic neuropathies have been associated to vitamin B12 deficiency. However, except for low vitamin B12 and copper in patients with posterolateral myelopathy, and low thiamin in those with acute encephalopathy and polyradiculoneuropathy, a correlation of a specific thiamin in those with acute encephalopathy and patients with posterolateral myelopathy, and low copper cannot be disregarded. However, the latter although disturbances of other elements such as iron and calcium supplements may have contributed to insufficient zinc assimilation. Zinc absorption capacity is jeopardized even despite doubling of oral supplements, so current and empirical reference intakes that regular multivitamin tablets provide (10-15 mg/day) deem insufficient for recovery of body zinc stores, and higher intakes are required (40-60 mg/day), as it occurred in this patient.

The impressive and functionally limiting affection this patient developed due to nutrient deficiency is not frequently observed. Zinc status was evaluated according to plasma levels, which is the most widely used biochemical indicator and the only one for which reference parameters are available. However, plasma zinc represents only 0.1% of total body stores. Zinc is mainly found in skeletal muscle, bone and liver and, in blood, the majority of this element is found in erythrocytes (with plasma levels representing only 10-20%). Protein deficiency in this patient may have determined hypotrophy of both enterocytes and red cells, contributing to reduction of intestinal zinc absorption and total pool levels, respectively, even though plasma values would not be as equally affected.

We illustrate and emphasize the need for intensively supplementing zinc after bariatric surgery, especially after malabsorptive procedures, as requirements of this element are probably understated.

References