# Zinc-Deficiency Pellagra-Like Dermatitis—A Rare Complication Following Bariatric Bypass Surgery: A Case Report

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**ABSTRACT**

**Objectives:** To highlight the risk of micronutrient deficiencies, particularly zinc deficiency, following Roux-en-Y gastric bypass (RYGB) surgery and emphasize the importance of clinical vigilance in identifying such complications. **Methods:** A case report of a 37-year-old woman who underwent RYGB in June 2014 is presented. Her postoperative progress, symptoms, clinical findings, and diagnostic process were documented and analyzed. **Results:** The patient achieved significant weight loss and BMI reduction within six months post-surgery. However, she developed symptoms including hair loss, erythematous skin lesions on her extremities, and photosensitivity. Severe diarrhea further complicated the presentation. A diagnosis of zinc-deficiency pellagra-like dermatitis was made. Symptoms resolved following intravenous zinc sulfate treatment. **Conclusion:** Zinc and other micronutrient deficiencies are common but often under-recognized complications after bariatric surgery. Laboratory findings may not always reflect clinical status. Early recognition through physical examination and prompt treatment are essential. A multidisciplinary approach is necessary to optimize postoperative care and prevent long-term sequelae.

**Keywords:** Bariatric Surgery, Complications, Micronutrients, Niacin Deficiency, Pellagra-Like Dermatitis, Zinc Deficiency

## INTRODUCTION

Bariatric surgery has emerged as a viable option for patients with morbid obesity who have failed conventional treatments. Bariatric surgery has emerged as a viable option for patients with morbid obesity who have failed conventional treatments. However, despite its clinical benefits, RYGB carries a risk of postoperative complications, including anastomotic stenosis, marginal ulcers, and cholelithiasis, and also a range of nutritional deficiencies as a result of altered absorption and digestive physiology. Micronutrient deficiencies, especially involving iron, vitamin B12, zinc, and in rare cases, niacin, are



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well documented and may lead to hematologic, neurologic, dermatologic, and immune-related complications.

## CASE REPORT

A female patient aged 37 years presented with a history of being overweight since childhood. She had experienced poorly controlled diabetes mellitus for eight years and hypertension, for which conventional treatments proved ineffective. Consequently, the patient underwent Roux-en-Y gastric bypass surgery in June 2014. Postoperatively, her body weight decreased from 99 kg to 65 kg, her BMI declined from 41.7 kg/m$^2$ to 27.4 kg/m$^2$, and her HbA1c levels normalized, dropping from 8.6% to 4.5% within six months.

Postoperatively, Vitamin B complex supplement was administered intravenously. However, in December 2014, she reported experiencing extremity itching. Physical examination revealed a skin rash over the bilateral limbs, particularly over the wrists, thighs, dorsum of the hands and feet, as well as glossitis and nail dystrophy (Figures 1, 2, 3, and 4). Additionally, the patient complained of severe diarrhea. Laboratory analysis of trace elements indicated that vitamin B12 (975 pg/mL; reference range: 160.00-970.00 pg/mL) and folic acid (12.80 ng/mL; reference range: 1.50-16.90 ng/mL) levels were within normal limits. However, deficiencies in zinc (457 µg/L; reference range: 800-1200 µg/L) and copper (327 ppb; reference range: 700-1500 ppb) were noted.

After reviewing all clinical findings, a diagnosis of zinc-deficiency pellagra-like dermatitis was determined to be the most likely explanation for the patient's symptoms. Following the administration of zinc sulfate, all symptoms were alleviated.

**Figure 1.** Fragile and thin hair.



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**Figure 2.** glossitis and lip cheilitis.

**Figure 3.** Nail dystrophy.

**Figure 4.** Skin rash over bilateral limbs.

## DISCUSSION

The rare case presented herein demonstrates clearly the value of micronutrient monitoring and early supplementation as key components of postoperative care in patients undergoing RYGB surgery.

### Zinc deficiency after bariatric surgery

Zinc is an indispensable element, serving as a cofactor for over 200 enzymes across numerous metabolic pathways [1, 2]. It is a critical factor involved in DNA synthesis, protein production, cellular proliferation, immune function, and wound healing, and is primarily absorbed in the duodenum and proximal jejunum through transporter proteins such as ZIP4 (Zrt/Irt-like Protein 4) and basolateral ZnT1 (Zinc Transporter 1), eventually binding to albumin in the portal circulation and distributed systemically [3].

Zinc deficiency is typically confined to certain at-risk groups, such as those with low food intake, intestinal malabsorption, increased depletion, or use of specific medications like penicillamine, diuretics, antimetabolites, iron, and valproate. Clinically, zinc deficiency is characterized by acrodermatitis enteropathica. The triad of typical clinical symptoms includes diarrhea, alopecia, and acral/periorificial dermatitis. The hair becomes thin and fragile and thin, and dermatitis is symmetrical. Other symptoms are significant dysgeusia, or may occur in male patients with unexplained hypogonadism or erectile dysfunction [4].

Reduced zinc serum levels after bariatric surgery is well-documented, with deficiency rates reported to be as high as 74% among women [5]. Zinc deficiency after RYGB, zinc deficiency is primarily due to impaired absorption. The procedure bypasses the duodenum and proximal jejunum, key sites of ZIP4-mediated zinc uptake. Additionally, reduced gastric acid secretion limits zinc solubilization, while impaired mixing with bile and enzymes decreases bioavailability. Accelerated intestinal transit and competition from iron and calcium supplements further hinder absorption [3].

A recent study demonstrated that micronutrient deficiencies, including zinc, are prevalent post-surgery and can lead to significant clinical consequences if not managed adequately [6]. Strategies are needed to improve the perioperative nutritional management of bariatric patients to prevent such deficiencies.

### Niacin/vitamin B3 deficiency

Biologically active forms of niacin, nicotinamide adenine dinucleotide (NAD) and NAD phosphate (NADP), function as essential coenzymes in numerous oxidation-reduction reactions, including glycolysis and the metabolism of amino acids and proteins. These reactions are vital for cellular energy production, particularly in tissues with high metabolic demand or rapid cell turnover, such as the skin, gastrointestinal mucosa, and central nervous system. As a result, pellagra, the clinical manifestation of niacin deficiency, commonly affects these systems [7]. Therefore, micronutrient monitoring and early

supplementation remain key components of postoperative care in bariatric patients.

Nicotinic acid also contains functional groups capable of forming complexes with trace metals, such as zinc, which may enhance zinc bioavailability and utilization [8].

Pellagra was first described by Gaspar Casal in 1735, and in 1926, Joseph Goldberger identified nicotinamide as the preventive nutrient. The classic clinical triad includes dermatitis, diarrhea, and dementia. Dermatologic signs typically involve symmetrical, photosensitive eruptions on sun-exposed areas, most commonly on the dorsum of the hands, neck (Casal's necklace), glossitis, and angular cheilitis [9,10].

Annual incidence of pellagra is 0.5 cases per 100 000 populations [11]. Pellagra is extremely rare in developed countries, arising from alcoholism, anorexia nervosa, food allergies, inflammatory bowel disease, carcinoid syndrome, or medications that interfere with niacin metabolism, including isoniazid, sulfonamides, anticonvulsants, antidepressants, azathioprine, and chloramphenicol.

Pellagra following gastrointestinal surgery is extremely rare. A case reported in Japan described an 80-year-old woman who developed pellagra several months as a result of poor oral intake and weight loss following gastrectomy with jejunal reconstruction [12]. She presented with characteristic dorsal hand lesions and systemic symptoms, which were resolved with oral nicotinamide therapy and comprehensive nutritional supplementation including zinc, protein, and multivitamins. A rare case of pellagra following Roux-en-Y gastric bypass was reported by Shirodkar et al. (2023), highlighting the risk of niacin deficiency postoperatively [13].

### Treatment for nutritional deficiencies

For zinc deficiency, the current guidelines vary and oral supplementation typically ranges from 15 to 30 mg/day. Recommendations from the British Obesity and Metabolic Surgery Society (BOMSS) suggest an initial dose of 15 mg/day for patients undergoing laparoscopic sleeve gastrectomy (LSG) and RYGB, and 30 mg/day for those undergoing biliopancreatic diversion with duodenal switch (BPD/DS) [14]. The American Society for Metabolic and Bariatric Surgery (ASMBS) advises supplementation ranging from 8 to 22 mg/day, with potential higher doses or intravenous administration for refractory cases [15].

For niacin deficiency, there are some recommendations that treat with nicotinamide at a dose of 300–500 mg per day, usually administered in divided doses for several weeks, depending on symptom severity and response [16-18] (Table 1).

**Table 1.** Nutrient deficiency and recommended treatment

| Nutrient | Symptoms | Supplementation dose |
|---|---|---|
| **Zinc** | Diarrhea<br>Alopecia<br>Acral /Periorificial dermatitis<br>Dermatitis | Zinc, 15 to 30 mg / day, p.o |
| **NIACIN** | Diarrhea<br>Dementia | Nicotinic acid, 300 to 500 mg / day p.o |

## CONCLUSION

Metabolic and nutritional disorders are among the main complications of bariatric surgery. These are secondary to decreased oral intake and malabsorption. Zinc deficiency may also cause pellagra-like symptoms. Continuous monitoring, appropriate supplementation, and individualized dosage adjustments for both zinc and niacin are essential to resolve pellagra-like symptoms after bariatric surgery, correcting deficiencies, and preventing recurrence. Multidisciplinary collaboration is essential in managing nutritional deficiencies.

## CONFLICTS OF INTEREST

None declare.

## ETHICS STATEMENT

This is a case report and no names or initials will be published,

protecting the patient's privacy. This case study was conducted in accordance with the ethical standards of the institutional research committees and the principles outlined in the Declaration of Helsinki. The manuscript is prepared in accord with the regulations of the HIPAA privacy regulations and IRB approval is not required.

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