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Common hair changes after bariatric surgery: A review

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Abstract
There are four main forms of weight reduction surgeries, involving duodenal switch with biliopancreatic diversion, laparoscopic adjustable gastric banding, Roux-en-Y gastric bypass, as well as sleeve gastrectomy. Alopecia is an acknowledged consequence of bariatric surgery (BS). A significant proportion of cases develop temporary hair loss following BS, as seen by many studies. Prior studies have shown a correlation between hair loss as well as the levels of iron and zinc. Following BS, cases often have transient alopecia, occurring as a result of the operation stress, fast weight loss, as well as inadequate nourishment.
Cases undergoing such a surgical procedure often have nutritional shortages, thus boosting the problems associated with hair. Rapid weight loss could result in insufficiencies of vital nutrients necessary for the health of hair, including vitamin D, iron, zinc, or biotin.

Keywords: Bariatric surgery, hair changes, Roux-en-Y gastric

Introduction
Bariatric surgery has become an effective option for treating severely obese cases as well as those developing metabolic syndrome, resulting in significant weight reduction. There are four main methods of weight reduction surgery: a duodenal switch with biliopancreatic diversion, laparoscopic adjustable gastric banding, Roux-en-Y gastric bypass, as well as sleeve gastrectomy [1].
An important consequence of bariatric surgery on hair health is the telogen effluvium occurrence, representing a non-cicatricial alopecia type. Such a disorder is marked by an increasing hair loss rates as well as thinning [2]. Individuals who have had bariatric surgery often have transient hair loss, which could be induced by the stress of the operation, fast weight loss, as well as nutritional inadequacies [3].
Cases who underwent such a surgical procedure often develop nutritional shortages, thus worsening hair-related issues. Rapid weight loss could result in insufficiencies of vital nutrients necessary for the health of hair, including vitamin D, iron, zinc, as well as biotin. To reduce hair-related issues after bariatric surgery, it is crucial to treat such deficiencies by using certain nutritional supplements [3].

Bariatric surgery
Bariatric surgery has emerged as an efficient choice for obese cases, providing substantial and lasting weight reduction results [4].
Eligible candidates for such a surgical procedure involve individuals whose body mass index (BMI) is 40 kg/m^2 or more, and who do not have any comorbidities. Also, those having a BMI falling between 35 and 39.9 kg/m2 may also be considered if they have one comorbidity. Such comorbidities involve DM, obstructive sleep apnea, hyperlipidemia, obstructive hypoventilation syndrome, HT, Pickwickian syndrome, NAFLD, non-alcoholic steatohepatitis, pseudotumor cerebri, gastro-esophageal reflux disorder, asthma, venous stasis disease, along with debilitating arthritis [5].

Bariatric surgeries types
Adjustable gastric band surgery
Gastric banding stands as a minimally-invasive treatment, aimed at restricting food

consumption through surrounding the stomach fundus completely with a constricting ring . Early bands lacked adjustability, but recently-introduced bands include an inflated balloon in their lining, allowing for the stoma size adjustments, thus regulating food intake. Adjustment is performed non-surgically by injecting or extracting saline through a subcutaneous port. Gastric banding represents a restrictive operation that prevents the issues related to malabsorptive procedures. Additionally, it is a reversible procedure. Like any surgical procedure, it carries the risk of possible complications that may need an urgent consultation or removal of the band [6, 7].

- **Sleeve gastrectomy:** The process starts by inserting several trocars into the abdominal cavity. There is a single primary operating trocar, a camera, as well as many retractable trocars. It starts by dissecting the gastrocolic ligament up to a location around 5 to 10 cm closer to the pylorus. The short gastric vessels are then severed up to the angle of His. Next, the anesthetist inserts a bougie with a diameter of 32 to 60 Fr into the stomach, following the path of the minor curvature. Subsequently, a vascular stapler is utilized consecutively throughout the whole bougie length to divide a portion of the stomach. The detached stomach is then extracted via an excision port [8].
- **Roux-en-Y gastric bypass:** The Roux-en-Y and resectional gastric bypass operations employ both restriction and malabsorption methods, forming a small gastric pouch along with a bypass, thus hindering the patient's absorption of ingested food. The Roux-en-Y surgical procedure involves dividing the upper stomach to form a tiny pouch, which may hold up to 50 ml, and has a narrow opening (gastroenterostomy stoma) that connects to the intestine and is connected to the pouch. Such a procedure is undertaken for preventing the occurrence of loop gastroenterostomy along with subsequent bile reflux. Reversing a gastric bypass is theoretically possible [9].
- **Biliopancreatic diversion:** This is primarily a malabsorptive procedure and involves the removal of part of the stomach to limit oral intake and thereby induce weight loss. The gastric pouch created is larger than that of gastric bypass or the restrictive procedures therefore allowing larger meals. Patients remain on less restricted diets than would be the case following gastric bypass. Part of the small intestine is bypassed (the malabsorptie component) by the fashioning of a long limb Roux-en-Y anastomosis with a short common ‘alimentary’ channel of approximately 50 cm length. Biliopancreatic diversion is only a partially reversible operation and furthermore is a technically demanding procedure associated with a high rate of perioperative morbidity and an operative mortality of 2% [10].
- **Vertical banded gastroplasty:** Vertical banded gastroplasty, which is currently hardly employed, entails the division of the stomach with staples, forming a small part or segment at the stomach's top portion. The formed segment remains largely isolated from the rest of the stomach, leaving just a small opening (stoma). Furthermore, a polypropylene band could be utilized for encircling the bottom portion of the vertical pouch in order to hinder any potential stretching. Such a technique has the benefit of being a restricted procedure without involving any malabsorption or dumping. However, it is often associated with weight regain. Complications are few, with a minimal postoperative mortality rate of 1%. The rates of revision needed postoperatively are often significant, typically about 30% [11].
- **Single anastomosis sleeve ileal bypass (SASI):** The technique stands as a variation of the Santoro method, where instead of forming a Roux-en-Y loop, a connection is made between the gastric sleeve as well as the ileum via an omega loop. SASI combines the advantages of restriction with preserving food transit via the GIT. It takes advantage of the rapid movement of undigested food to the ileum, thus trigerring the production of anorexigenic intestinal hormones. These hormones induce satiety by slowing peristalsis as well as stomach emptying [12].

Hair loss as a complication of bariatric surgery

More than 50% of individuals develop hair loss within a short period following bariatric surgery. Hair loss is linked to iron as well as zinc levels. While hair loss often is not deemed a serious condition, it could induce undue concern, impacting the patient's mental health, self-confidence, as well as overall life quality [13].

A prior research showed that 55% of those undergoing laparoscopic SG along with 40% of those who underwent laparoscopic RYGB developed hair loss during a six-month period [13]. This supports Ruiz-Tovar’s *et al*., [14] addressing a 41% rate of occurrence following laparoscopic sleeve gastrectomy in 2014. Furthermore, the occurrence was shown to reach a staggering 80% following laparoscopic gastric plication or laparoscopic sleeve gastrectomy.

Nutritional deficiency-induced hair loss following bariatric surgery

Hair loss often takes place following any weight-loss surgery type, but some may affect the way the body absorbs nutrients more than others and lead to increased hair loss, such as [15]:

- Restrictive surgical procedures, involving gastric sleeve as well as gastric bypass show no interference with the body’s nutritional absorption, however, hair loss could occur [15].
- Malabsorptive surgeries are BPD as well as BPD with duodenal switch. These can affect how the body absorbs nutrients [15].
- Mixed procedures, such as Roux-en-Y gastric bypass permanently affect the way the body absorb nutrients and could require lifelong supplementation [15].

After bariatric surgical procedure, the body could develop nutritional deficiency in specific minerals as well as nutrients that may lead to hair loss. Additionally, other nutritional deficiencies could induce hair shaft changes and hair loss [16].

- Zinc deficiency may lead to hair thinning and brittleness, which may result in increased hair loss or breakage rates.
- Protein deficiency may lead to hair thinness, brittleness, as well as dryness. This can result in increased hair loss, and breakage, along with a change in hair color.
- **Copper:** Thinning hair that could also change color.
- **Vitamins A and C:** Brittle hair that may break off.
- **Vitamin B9:** Thinning hair.

Common Nutritional Deficiencies Post-Sleeve Gastrectomy effect on health of hair [13]

- **Protein Deficiency:** Protein is vital for hair growth; a deficiency can led to hair thinning and loss. Incorporating more protein-rich foods or supplements is usually advised by the dietitian.
- **Vitamin and Mineral Deficiencies:** Deficiencies in vitamins, especially B-vitamins, vitamin D, and E, can affect hair health. Minerals: Iron, zinc, and selenium deficiencies are also linked to hair loss. Prescribing multivitamin and mineral supplements can help replenish the body's stores.
- **Fatty Acids:** Essential fatty acids contribute to skin and hair health. A deficiency can led to dry, brittle hair. Management of dietary sources like fish or supplements can mitigate this issue.

The impact of SASI on hair loss can be attributed to several factors [17]

- **Rapid Weight Loss:** After undergoing SASI bypass, patients often experience rapid weight loss, which can place the body under physiological stress. This can push more hair follicles into the resting phase, leading to a temporary telogen effluvium, characterized by increased hair shedding [17].
- **Nutritional Deficiencies:** The malabsorptive aspect of the SASI bypass can lead to reduced absorption of essential nutrients. Deficiencies in proteins, vitamins (especially B-vitamins as well as vitamin D), and minerals (like iron and zinc) can adversely affect hair health, leading to thinning and hair loss [18].
- **Protein Deficiency:** Protein is vital for hair structure and growth. Due to the reduced stomach size and bypassed portion of the ileum, protein intake and absorption can be compromised, leading to hair loss [18].
- **Hormonal Changes:** Significant weight loss can lead to hormonal shifts within the body, which could further influence the the cycle of hair growth [18].
- **Post-Surgical Stress:** Any major surgery can be a shock to the body system, causing a temporary increase in hair shedding, which usually recovers as the body adjusts to post-surgery [19].

Dynamics of hair loss post bariatric surgery

1. **Telogen Effluvium:** A temporary increase in hair shedding occurs due to the physiological stress of surgery and rapid weight loss, pushing more hairs into the resting phase. Often self-resolving but can be minimized with adequate nutritional support [20].
2. **Chronic Hair Loss:** Resulting from sustained nutritional deficiencies, leading to weakened hair structure, reduced volume, and slowed growth. Addressing ongoing nutritional gaps and optimizing the diet for hair health [20].

Conflict of Interest
Not available

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