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Correspondence

Dr. Jay Narayan Shah
Department of Surgery
Patan Hospital, Patan Academy
of Health Sciences, Lalitpur,
Nepal
Email: drjaywufei@hotmail.com
drjaywufei@gmail.com

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Self-prescribed nutrition supplements for hair loss following laparoscopic sleeve gastrectomy bariatric surgery: extent of the problem in a cohort of Chinese patients

Sachin Bhagat,¹ Haijun Guo,² Radheshyam Gupta,¹ Jiangfan Zhu,³ Jay Narayan Shah⁴

¹PG Fellow, ³Prof. Dept. of General Surgery, Bariatric and Metabolic Surgery, East Hospital, Tongji University School of Medicine, Shanghai, China; ²Dept. of Emergency Surgery, Zhoupu Hospital, Shanghai, China; ⁴Prof. Dept. of Surgery, Patan Hospital, PAHS, Nepal, Visiting Prof. School of Medicine, Jiaotong University, Shanghai, China

Abstract

Introductions: Hair loss is common after bariatric surgery. This study analyzes the extent and risk factors of hair loss following laparoscopic sleeve gastrectomy (LSG), and satisfaction of self-prescribed supplements.

Methods: All patients of LSG bariatric surgery during June 2013 to August 2016 at Shanghai East Hospital affiliated to Tongji University, Shanghai, China were included in the study. Study variables were- age, gender, preoperative body mass index, hemoglobin, albumin, total cholesterol, iron, zinc, copper, folic acid, vitamin B12, vitamin D, and postoperative excess weight loss (% EWL), time and degree of hair loss, satisfaction of using supplements. Logistic regression was used to analyze risk factors for hair loss.

Results: Total of 86 patients underwent LSG. After exclusion data on 54 patients (M=11, F=43) were analyzed. Hair loss was reported by 42/54 (77.8%, M=6, F=36), starting at 3.43±1.36 months and ending at 8.59±3.38. All of 11 severe hair losses were in female. The female gender, preoperative serum folic acid, and %EWL were significant risk factors for hair loss. Hair regrowth was reported by 39/42 (92.86%). The 15 patients who used various self-prescribed iron and zinc supplements reported no satisfactory benefit.

Conclusions: Hair loss was seen in 3/4th of patents after LSG bariatric surgery. Self-prescribed nutrition supplements were used by 1/3 of patients without satisfaction. Female gender, preoperative serum folic acid, and %EWL were significant risk factors for hair loss.

Keywords: bariatric surgery, hair loss, laparoscopic sleeve gastrectomy LSG, obesity, nutrition supplements

Introductions

Obesity has increased and so is the comorbidities like type 2 diabetes, hypertension, obstructive sleep apnea, polycystic ovary syndrome, hyperlipidemia and coronary heart diseases.¹⁻³ Patients suffering from obesity requires persisting changes to healthy lifestyle to reduce weight, otherwise rebound occurs in up to 90% after six months.⁴ In year 2011, over 340,000 bariatric procedures were performed worldwide.⁵ The curative effect of bariatric surgery for patients suffering from obesity is nearly 100%.⁶

Laparoscopic sleeve gastrectomy (LSG) has become a standalone bariatric surgery procedure of choice for obesity and is preferred because of its technical efficiency, less operation time, minimal blood loss, and excellent weight reduction. However, in common to other bariatric procedures, LSG share the frustrating psychological distress and quality of life issue due to hair loss after surgery.⁷⁻⁹ Various nutritional interventions have failed to solve this problem.

The aim of this study was to analyze the risk factors for hair loss after LSG so as patient can be counseled and appropriate measures implemented.

Methods

The cohort obese patients who underwent primary LSG during June 2013 to August 2016 at Shanghai East Hospital, Tongji University, Shanghai, formed the study cohort. All patients were informed about the study and gave signed consent to participate. The study was approved from the ethical committee of the university. Patients with revision LSG, hair conditions such as bald, significant preoperative hair loss, obvious scalp infections and incomplete follow up data after surgery were excluded from final analysis, (Figure 1).

Patients were assessed during out-patient department (OPD) visits at one month after surgery. Further OPD visits were not mandatory and only on voluntary basis if the patients felt the need to visit the hospital. They were provided with the structured follow up chart and advised to complete the documentation at 3, 6, 9 and 12 months for weight loss, starting (start of hair fall) and ending (stoppage of hair fall and regrowth of new hair) times of hair loss, degree of hair loss (as per the provided pictorial images of mild, moderate and severe hair loss, (Figure 2a and 2b). We used Ludwig grading for severity of hair loss because most of our patients were female.^{10,11} We used WeChat (free messaging and calling electronic social media platform common in China), text messages and email to collect patient self-reported data. Uses of nutritional supplements by patients were recorded as well as satisfaction of patients to prevent hair loss or enhance hair growth (determined by patients themselves).

Logistic regression model and regression equation were used to predict the risk factors for hair loss. Thirteen variables were taken as covariates and divided into $X_1 \sim X_{13}$ respectively. The severity of hair loss was taken as variable (no or mild hair loss group and moderate to severe hair loss group) and set to Y. The gender and the degree of hair loss were classified as qualitative data. The quantitative methods used were: gender (X_2) = 0 for male and 1 for female; postoperative hair loss severity (Y) = 1 for moderate to severe hair loss, and 0 for no hair loss or mild hair loss. The other 12 variables- age (X_1), preoperative BMI (X_3), total cholesterol (X_4), albumin (X_5), hemoglobin (X_6), iron (X_7), zinc (X_8), copper (X_9), folic acid (X_{10}), vitamin B12 (X_{11}), vitamin D (X_{12}), %EWL (X_{13}) itself were the quantitative data.

Statistical software SPSS 20.0 was used to analyze the data and expressed as mean \pm standard deviation ($X \pm SD$). The χ^2 test was used for comparative analysis and P values <0.05 were considered statistically significant.

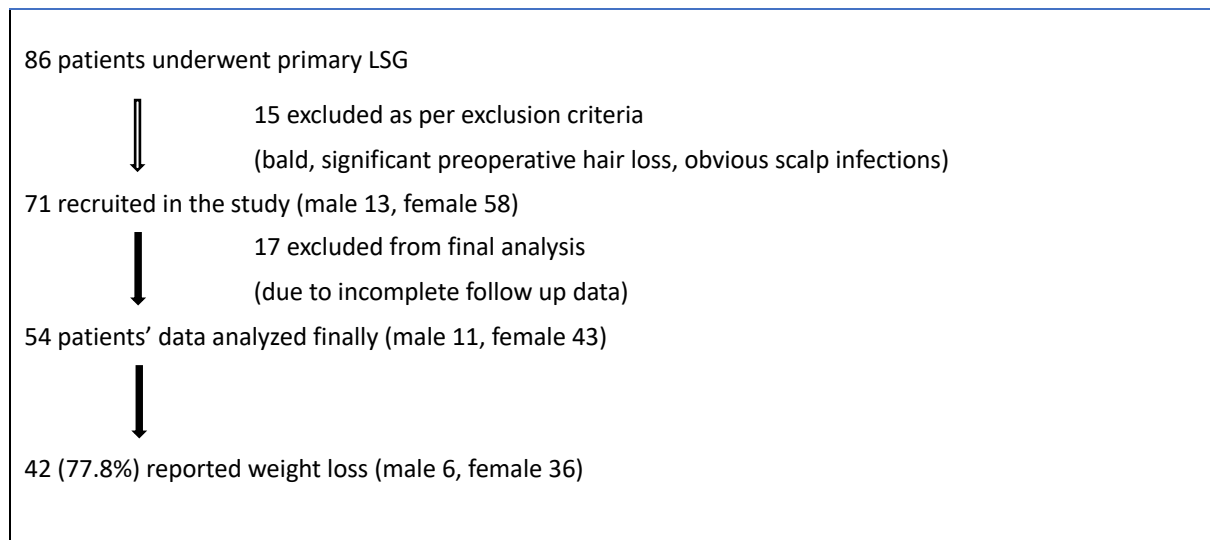
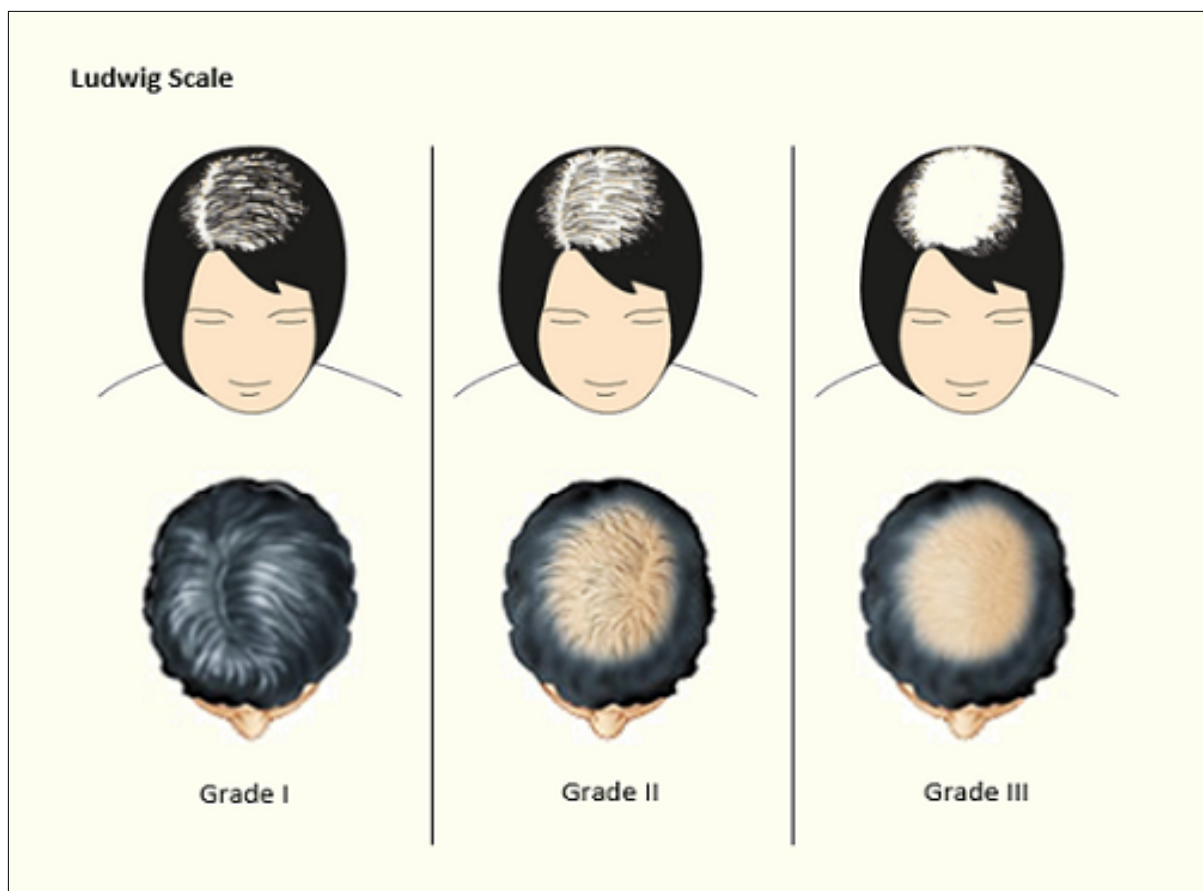
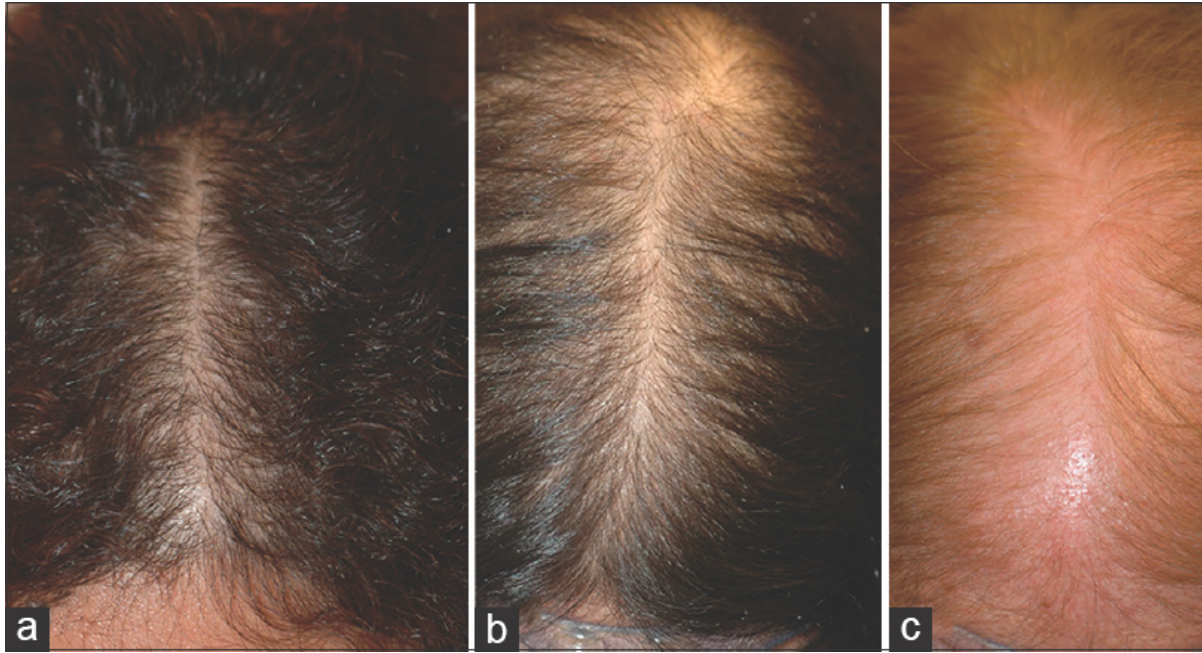


Figure 1. Study flow chart



Source:
http://www.dreamplasticsurgery.com/images/Hair_Transplant/Ludwig_Female_Hair_Loss_Pattern-web.png

Figure 2a. Schematic pictorial image provided to patients to report grading of hair loss mild (Grade I), moderate (Grade II), severe (Grade III);



Source: http://www.ijtrichology.com/articles/2016/8/2/images/IntJTrichol_2016_8_2_57_188033_f1.jpg

Figure 2b. Pictorial image provided to comprehend easily and compare with the classical Ludwig grade of mild (a), moderate (b) and severe (c) hair loss.

Results

There were 86 patients who had LSG. Fifteen were excluded as per initial recruitment criteria and from remaining 71 obese patients (M=13, F=58) formed the study cohort. Their mean age was 30.5 ± 7.49 years, BMI $35.3 \pm 7.1 \text{ Kg/m}^2$, comorbidities- type-2 diabetes 13 (18.3%), polycystic ovary syndromes 10 (14.1%), sleep apnea 8 (11.2%) and hypertension in 7 (9.9%). There was no postoperative bleeding, gastric leakage, obstruction and mortality. Among 71 patients, 17 had incomplete follow-up data and were excluded from final analysis.

Finally, data on 54 patients (M=11, F=43) were eligible for analysis. Hair loss was

reported by 42/54 (77.8%), male 6/42 (14.3%), female 36/42 (85.7%). Mild grade hair loss in 21/42 (50%), 10 (23.8%), moderate and 11 (26.2%) severe, (Table 1). All severe hair losses were reported by female patients.

The average starting time of start of hair loss was 3.43 ± 1.36 months and ending time 8.59 ± 3.38 months, (Table 2). Total of 15/42 (35.7%) patients used self-prescribed nutrition supplements available in the market without prescription (6 used zinc supplement, 4 iron, 3 iron plus zinc and 2 had zinc and vitamin B12 supplements) and they no significant improvement after use of these remedies. Out of 42 patients with hair loss, 39 reported growth of new hair

Table 1. Degree of hair loss reported by 42 patients (77.8% of 54) following laparoscopic sleeve gastrectomy (LSG) bariatric surgery

Degree of Hair loss	Male		Female		Total	
	N	%	N	%	N	%
No Loss	5	45.5	7	16.3	12	22.2
Mild	5	45.5	16	37.2	21	38.9
Moderate	1	9.0	9	21.0	10	18.5
Severe	0	0	11	25.5	11	20.4
Total	11	100.0	43	100.0	54	100.0

Table 2. Outcome of hair loss in 42 patients (77.8% of 54) after LSG bariatric surgery

Hair Loss	Results
Starting time (months, mean \pm SD)	3.43 \pm 1.36
Ending time (months, mean \pm SD)	8.59 \pm 3.38
Nutrition supplement for hair loss	15 patients took nutrition supplements (6 had zinc, 4 iron, 3 iron plus zinc and 2 zinc plus vitamin B12), and none of them reported satisfactory improvement
Outcome of hair loss	39 patients reported stop of hair loss and growth new hair 3 patients continued to have hair loss during follow up period

Table 3. Omnibus tests of Model Coefficients for hair loss in 42 patients (out of 54) after laparoscopic LSG bariatric surgery

Items	χ^2	Degree of freedom (df)	P value
Model	35.265	13	0.001
Block	35.265	13	0.001
Step	35.265	13	0.001

Table 4. The equation of covariate regression coefficients, standard errors and P value for hair loss in 42 patients (out of 54) after LSG bariatric surgery

Covariates	B	SE	Wald Test	df	Sig
Age	0.070	0.103	0.469	1	0.493
Gender	4.850	2.279	4.528	1	0.033
BMI	-0.010	0.243	0.002	1	0.967
Total Cholesterol	-1.366	1.547	0.780	1	0.377
Albumin	-0.013	0.167	0.006	1	0.938
Hemoglobin	0.090	0.045	4.052	1	0.544
Iron	0.830	1.096	0.573	1	0.449
Zinc	-0.113	0.061	3.471	1	0.062
Copper	0.123	0.143	0.750	1	0.386
Folic Acid	-0.644	0.272	5.586	1	0.018
Vitamin B12	-0.006	0.004	2.618	1	0.106
Vitamin D	0.013	0.141	0.008	1	0.928
%EWL	2.808	1.267	4.908	1	0.027
Constant	-10.783	13.428	0.645	1	0.422

*BMI= Body Mass Index, %EWL= Postoperative Excess Weight Loss, B=correlation coefficient, SE= standard error, df= degree of freedom, Sig=significance

The one step single variate analysis showed that the χ^2 values among the Model, Block and Step were same, (Table 3). The P value was 0.001<0.05. The coefficients of the covariant were not all 0, which showed significant differences of the model.

On multivariate regression analysis of 13 covariates, the gender (correlation coefficient B = 4.850, P = 0.033), preoperative folic acid (B = -0.644, P = 0.018) and %EWL (B = 2.808, P = 0.027) had a significant effect on moderate to severe hair loss (strain Y), and rest of the variables had no significant effect on hair loss, (Table 4).

The regression equation of the factors of hair loss was established by the regression coefficient of each variable. We set the risk rate of moderate to severe hair loss at P, $\text{logit}(p) = -9.756 + 0.060 X_1 + 4.280 X_2 - 0.020 X_3 - 1.499 X_4 - 0.023 X_5 + 0.070 X_6 + 0.849 X_7 - 0.131 X_8 + 0.349 X_9 - 0.680 X_{10} - 0.007 X_{11} + 0.011 X_{12} + 2.504 X_{13}$. Then we randomly selected 5 cases with moderate to severe hair loss. The predicating results were same as the follow-up results, indicating that the model was satisfactory.

Discussions

In our study hair loss was reported by 3/4th of patients (77.8% i.e. 42 of 54) following LSG for obesity. Female patients reported hair loss more commonly (36 out of 42), and with high severity as all 11 severe hair losses were seen in female.

Different grades of hair loss have been reported after bariatric surgery. It occurs usually after 3 months following bariatric procedures.¹²⁻¹⁵ Hair loss is reported in up to 74.2%.¹⁶ Diffuse type of hair loss known as telogen effluvium is common. Stress due to surgery and enforced dietary regimen causes the hair cycle shift to the telogen phase or resting phase with continued hair loss.^{17,18} Some studies have also shown that excessive weight loss causes damage in some components of the cutaneous extracellular matrix of the hair causing hair loss.^{19,20}

Various micronutrients have been associated with the hair loss. Study reports hair loss in 16 (38% in 42) obese patients undergoing LSG and were significantly associated with low plasma zinc levels ($P=0.021$).⁸ Reduction of gastric acid following sleeve gastrectomy reduces zinc absorption. Reports shows that the patients taking higher supplements of iron and zinc had milder hair loss than the patients taking lower supplements.¹⁴ However, in a study conducted on 130 patients undergoing bariatric surgery showed that 47 patients still had hair loss despite the iron and vitamin supplement.⁷ In our study we didn't find significant correlation between hair loss and preoperative levels of zinc or iron. We did not monitor post-operative levels of these minerals and thus cannot conclude with certainty whether the postoperative levels of these minerals were significant low and played a role in hair fall. However, 15 patients who did use self-prescribed various nutrition supplements (6 had zinc, 4 iron, 3 iron plus zinc and 2 zinc plus vitamin B12) available in the market without prescription (Table 2) did not report satisfactory benefits. The use of various supplements and results were all self-reported by patients, and the accurate dose

and their effect could not be analyzed in detail, one of the possible limitations of our study. Iron supplements were not required for at least one year after surgery in patients undergoing LSG.²¹

In our study, the mean starting time of hair loss was 3.43 ± 1.36 months after surgery. This is the period of rapid decline in the body weight after surgery. The highest weight loss occurs in the first six months of the surgery.²² The greater the %EWL, faster the weight loss and more serious is the hair loss. Possible explanation of this early hair loss could be rapid subcutaneous adipose tissue decrease after LSG, making scalp structure thinner, reducing the strength needed to support hair and resulting in hair loss. The thinning of the scalp tissue may also decrease blood supply and nutrient to the hair follicle which could further weaken the hair causing the hair to advance into the 'telogen phase'. These are the areas of further research. Women with longer hair require more strength of scalp to support the hair. This may be the reason of higher and severe hair loss in female. A few months after the LSG, the body adapts to the changing environment, the scalp structure gradually stabilizes and so the hair loss stops. At this time, the 'telogen phase' re-enters the hair growth phase. Folic acid as a carbon unit carrying molecules plays important role in protein synthesis^{23,24} The folic acid deficiency may affect synthesis of kerato-proteins, leading to hair loss.

The small sample size and patient self-reported follow up may have biased reporting for the severity of hair loss. Similarly, the use of self-prescribed supplements, lack of details about the dose and duration and objective measure of satisfaction are some of the limitations of our study. Majority of our patients with hair loss were females, (F:M=36:6), and so the Ludwig grading system we used may not justify for the male patients. All patients in this study had LSG, and resulting hair loss may not be generalized to other bariatric procedures. This was the beginning of LSG bariatric procedure at our center, and

the number of procedures has increased significantly thereafter.

This study highlights the extent of problem of hair loss after LSG in majority (77.8%, 42 of 54 patients had hair loss) and there were more than 1/3 patients (35.7%, 15 of 42 with hair loss) who experienced stress due to hair loss and were desperate to try various self-prescribed supplements. Our study points out the significance of preoperative serum folic acid, and %EWL and certain risk factors like female gender for hair loss following LSG. These findings may be useful to counsel female patients and prepare them for this self-limiting stressful postoperative situation, and also the fact that there is no proven benefit of self-medication of supplements available in the market. Taking into consideration the limitation of our study, and findings of no benefit of self-prescribed iron and zinc supplements, there is need of prospective comparative study design to further consolidate these issues.

Current study shows that there was no reported satisfactory benefit of self-prescribed nutritional supplements containing iron, and zinc. Hair loss was a self-limiting common phenomenon after LSG bariatric surgery, seen in 3/4th (77.8%, 42 of 54) of patients starting at 3.43±1.36 months and ending at 8.59±3.38 months (in 39 out of 42). Multivariate regression analysis showed female gender, preoperative serum folic acid, and %EWL (3 out of 13 covariates) as risk factors for hair loss.

Conclusions

Hair loss was seen in up to 3/4th of patients after Laparoscopic sleeve gastrectomy bariatric surgery. Postoperatively 1/3 of patients used self-prescribed nutrition supplements for hair loss with no satisfactory results. Female gender, preoperative serum folic acid, and postoperative excess weight loss (%EWL) were significant risk factors for hair loss.

Conflict of Interest

All authors declare no conflict of interest.

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