



Investigating Alterations in Blood Parameters Pre-lipolysis and Post-lipolysis Surgical Intervention

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Abstract

Background: Laser lipolysis is one of the most prevalent liposuction techniques and is widely preferred in cosmetic surgical procedures globally. Compared to traditional liposuction, some investigations have demonstrated a reduction in complications when using the laser lipolysis technique. However, the amount of research in this area remains limited.

Objectives: This study aims to investigate changes in pre- and post-operative blood parameters, including hemoglobin level, hematocrit, WBC count, and platelet level. Additionally, the research explores potential complications following laser lipolysis.

Methods: This retrospective study, conducted at the Isfahan Clinical Center (Najaf Abad Branch), included 100 patients (without previous hematological disorders) who underwent laser lipolysis. Demographic information about the patients was collected. Blood parameters (hemoglobin, hematocrit, WBC, and platelets) were measured before and 24 hours after the operation. Laser liposuction was performed using a 1064-nm Nd laser. Postoperative care instructions were provided. Statistical analysis included *t*-tests and mixed linear regression using SPSS 20 software for data analysis, with a significance level of $P < 0.005$.

Results: Significant alterations were observed in hemoglobin, WBC, and platelet levels. Hemoglobin and platelet levels showed a notable reduction of 16.9% and 7.9%, respectively. Conversely, the WBC count increased by 100.5%.

Conclusions: Our study found a significant decrease in hemoglobin levels following laser lipolysis surgery, likely due to intraoperative bleeding. Further research is recommended to compare hemoglobin level changes using different laser types.

Keywords: Laser-Assistant Liposuction, Laser Lipolysis, CBC Alternation, Complication of Laser Lipolysis, Post-operative Complication

1. Background

Liposuction is one of the most popular cosmetic surgery procedures globally, accounting for 15% to 20% of all cosmetic surgeries according to worldwide statistics (1-3). Liposuction is used to reduce localized fat tissue in specific areas of the body, and can be performed using various methods, such as laser-assisted liposuction (also known as laser lipolysis) (4) and ultrasound-assisted liposuction (1, 5).

While liposuction offers significant aesthetic benefits, it is also associated with various complications, including necrotizing fasciitis, toxic shock syndrome, hemorrhage, pulmonary embolism (6), skin irregularities, prolonged edema, ecchymosis,

hyperpigmentation, changes in skin sensitivity, seromas, hematomas, ulcers, skin necrosis, visceral perforations, systemic infections, fat embolism, sepsis, and potentially fatal outcomes (7). However, some studies have reported a reduction in complications when using the laser lipolysis technique (8). In addition to improved skin tightening and enhanced results, laser lipolysis has shown a reduction in blood loss and a shorter post-operative recovery time (9).

Despite the widespread use of laser lipolysis, there are limited studies exploring complications related to this technique, including changes in pre- and post-operative blood parameters.

2. Objectives

In the present study, we investigated blood indices such as hemoglobin level, WBC count, and platelet levels before and after laser lipolysis surgery.

3. Methods

This retrospective study was conducted at the Isfahan Clinical Center's Najaf Abad branch, including 100 patients who underwent laser lipolysis surgery between March 2015 and February 2018 (response 1.4). Patients with preexisting hematological disorders were excluded from the study. The study protocol was approved by the ethics committee at the Islamic Azad University of Isfahan.

3.1. Data Collection and Measurement

We collected demographic and clinical data, including gender, age, preoperative BMI, smoking status, amount of fat extracted, surgery location, and patient history (including prior surgeries and certain diseases). Blood parameters [hemoglobin, white blood cell (WBC) count, and platelet levels] were measured one week before the operation and 24 hours postoperatively.

3.2. Surgical Technique

Laser lipolysis was performed using a 1064 nm Nd laser with a maximum power of 10 W (Smartlipo-Laser; DEKA M.E.L.A. SRL, Firenze, Italy). The laser was operated at a pulse energy range of 800 to 4500 J, following the protocols established by Goldman (10) and Kim (11). The laser was delivered through a 1 mm diameter stainless steel microcannula. After the laser-induced cell lysate was generated, it was removed via negative pressure (0.8 - 0.9 kPa) using 4 - 5 mm cannulas. All patients received tumescent local anesthesia (12) as the sole anesthesia method.

3.3. Post-operative Patient Care

Patients were instructed to wear a compression garment for one month post-surgery. They received three doses of intravenous antibiotics (one dose every 12 hours), starting at the onset of surgery. Additionally, analgesics and anti-edema medications were prescribed for the first week after surgery.

3.4. Statistical Analysis

Quantitative variables were represented by mean and standard deviation, while qualitative variables were shown using frequency and percentage. A paired, two-sided Student's *t*-test was employed for statistical analysis, with a mixed linear regression model used to

compare pre-operative and post-operative means, adjusting for confounding variables. Data analysis was performed using SPSS 20 software, with a significance level of $P < 0.05$ (response.3.2).

4. Results

4.1. Patients' Information

A total of 119 participants were included in this study, of whom 5 were men and 114 were women. The mean age of the participants was 35.71 ± 8.92 years, and the pre-operative BMI was 28.81 ± 5.41 . Among the participants, 10% were smokers. Details of the baseline information are shown in Table 1.

Table 1. Basic Descriptive Information of Patients^a

Characteristic	Values
Gender	
Female	114 (95.8)
Male	5 (4.2)
Smoking	10 (8.7)
Age (y)	35.71 ± 8.92
BMI	28.81 ± 5.41

^a Values are expressed as No. (%) or mean \pm SD.

4.2. Pre-operation and Post-operation Hemoglobin (HG), WBC, and Platelet (PLT) Alterations

We measured blood parameters before and after the laser lipolysis surgical intervention (Table 2). The pre-operative hemoglobin level was 12.59, which significantly decreased to 10.08 post-operatively, reflecting a 16.9% reduction ($P < 0.001$). Similarly, platelet counts decreased by 7.9%, with pre-operative and post-operative means of 275.04 and 250.23, respectively.

However, after adjusting for variables such as age, sex, BMI, and smoking, this alteration was not statistically significant ($P = 0.068$). In contrast, WBC counts showed a significant increase. The mean WBC count pre-operatively was 7,665.79, which rose to 14,885.09 post-operatively ($P < 0.001$).

4.3. Subgroup Analysis of Pre-operation and Post-operation Hemoglobin Level Changes

Table 3 presents summary data from subgroup analyses based on menstruation status, BMI, and smoking. No statistically significant differences were observed in HG changes based on menstruation status

Table 2. Average Hemoglobin, WBC and Platelet Before and After the Operation and Their Percentage Changes ^{a, b, c}

Variables	Pre-operation	Post-operation		Change (%)	P-Value ^a	Adjusted P-Value ^b
HG ^c	12.59 ± 1.63	10.08 ± 1.81	2.51 ± 1.97	16.9 ± 38.1	< 0.001	< 0.001
WBC	7,665.79 ± 2,008.65	14,885.09 ± 4,396.46	7,219.30 ± 3,936.80	100.5 ± 56.0	< 0.001	< 0.001
PLT	275.04 ± 67.06	250.23 ± 71.42	24.81 ± 55.89	7.9 ± 20.3	< 0.001	0.068

^a Based on paired t-test.

^b Based on adjusted mixed regression model for BMI, sex, smoking, and age.

^c Mean ± SD.

Table 3. Subgroup Analysis of Hemoglobin Changes

Variables	N	Hemoglobin		Difference	P-Value ^a
		Pre-operation	Post-operation		
Menstruation					
Yes	11	12.97 ± 1.53	10.42 ± 2.23	2.55 ± 2.06	0.847
No	100	12.45 ± 1.53	9.96 ± 1.65	2.48 ± 2.03	
BMI					
< 30	35	12.76 ± 1.51	10.00 ± 2.05	2.76 ± 2.41	0.526
≥ 30	76	12.52 ± 1.67	10.10 ± 1.43	2.41 ± 1.82	
Smoking					
Yes	10	13.38 ± 2.27	11.54 ± 1.93	2.03 ± 0.95	0.353
No	105	12.64 ± 1.17	12.64 ± 1.76	2.62 ± 1.79	

^a Based on mixed model linear regression.

or BMI categories ($P > 0.05$). Smokers had a higher pre-operative HG level compared to non-smokers (13.38 vs. 12.64), but post-operatively, smokers had a lower HG level (11.54 vs. 12.64), though this difference was not statistically significant ($P = 0.353$). Therefore, patient characteristics did not significantly influence HG levels following surgery.

4.4. Variation in Hemoglobin Decline Rates Based on Surgical Site

Table 4 shows HG level changes based on different surgical sites. No significant differences were observed in HG levels across surgical locations ($P > 0.05$). The maximum HG level reductions were observed in the buttocks, breast, and legs, with reductions of 36%, 25%, and 23%, respectively. The arm showed the smallest HG change, with a 0.49% reduction.

5. Discussion

This study investigated the changes in CBC parameters, including HG, WBC, and PLT levels, and identified significant pre- and post-operative associations. Our findings contribute to the

understanding of complications related to the laser lipolysis procedure. In this study, 95.8% of participants were female, with 9.9% in their menstrual period and 8.7% being smokers. The mean age and BMI were 35.71 and 28.81, respectively. Hemoglobin levels decreased from a pre-operative mean of 12.59 ± 1.63 to 10.08 ± 1.81 , representing a 16.9% reduction. Similarly, PLT levels decreased by 7.9%, while WBC counts increased by 100.5%.

In our study, the adjustment of variables (age, sex, BMI, and smoking) influenced PLT levels but did not affect HG levels across different surgical sites. These findings align with previous studies. Campos et al. (13) reported a decrease in HG with an average reduction of 3.1 g/dL, alongside a 44.87 g/dL reduction in iron levels, noting that blood loss is a significant complication of liposuction techniques (14). Therefore, identifying a safe and effective technique is crucial. Abdelal and Abouelatta (15) compared blood loss between traditional and laser-assisted liposuction, finding a 54% reduction in blood loss with laser-assisted liposuction, particularly in areas like gynecomastia, the back, limbs, and abdomen. However, our study did not demonstrate significant differences in HG reduction across different

Table 4. Hemoglobin Changes (Mean and Standard Deviation) Before and After Surgery to Separate the Surgical Site ^{a,b,c}

Surgical Site and Features	Yes (Surgery Has Been Done)	(No) No Surgery Was Done	P-Value ^b
Abdomen			
Number	112	1	-
The difference before and after surgery	2.50 ± 1.99	2.80	NA ^c
Percentage of changes	16.77 ± 38.44	19.31	NA ^c
Lumbar			
Number	79	34	-
The difference before and after surgery	2.53 ± 1.64	2.43 ± 2.62	0.849
Percentage of changes	19.51 ± 11.84	10.45 ± 67.68	0.848
Thigh			
Number	31	82	-
The difference before and after surgery	2.61 ± 1.21	2.46 ± 2.21	0.123
Percentage of changes	20.46 ± 8.89	15.40 ± 44.60	0.182
Abdominoplasty			
Number	51	62	-
The difference before and after surgery	2.24 ± 1.02	2.71 ± 2.50	0.476
Percentage of changes	17.73 ± 8.23	16.02 ± 51.31	0.363
Flunk			
Number	39	74	-
The difference before and after surgery	2.47 ± 2.45	2.51 ± 1.70	0.811
Percentage of changes	11.57 ± 63.08	19.54 ± 12.41	0.818
Arm			
Number	24	89	-
The difference before and after surgery	1.70 ± 2.32	2.71 ± 1.83	0.102
Percentage of changes	0.49 ± 77.66	21.18 ± 14.00	0.106
Breast			
Number	1	112	-
The difference before and after surgery	3.4	2.49 ± 1.99	NA ^c
Percentage of changes	25.37	16.71 ± 38.44	NA ^c
Crus			
Number	2	111	-
The difference before and after surgery	3.05 ± 2.33	2.49 ± 1.98	0.79
Percentage of changes	23.84 ± 16.64	16.66 ± 38.57	0.802
Buttock			
Number	1	112	-
The difference before and after surgery	3.80	2.49 ± 1.98	NA ^c
Percentage of changes	36.19	16.62 ± 38.40	NA ^c

^a Values are expressed as mean ± SD.

^b Mann-Whitney test.

^c NA, Unavailable due to sample size < 2 in each group.

surgical sites. Peterson et al. (16) also reported a reduction in HG, hematocrit, and erythrocyte levels, alongside a significant increase in WBC counts following laser lipolysis, with pre-operative WBC counts increasing from 6.64 to 14.92 thousand per microliter.

5.1. Limitations

Our study faced several limitations. First, the research could not be conducted in multiple hospitals for result comparisons. A larger, multicenter study is necessary for more comprehensive conclusions. Additionally, challenges in collaborating with laser manufacturers, due to potential financial implications, may have impacted the study. Future research should focus on multicenter, long-term studies with larger

sample sizes, comparisons between centers, and results from interventions using various laser types.

5.2. Conclusions

In conclusion, this study measured blood parameters before and after laser lipolysis surgery. A key finding was the significant decrease in HG levels post-surgery, likely due to intraoperative bleeding. While this method may be safer than traditional liposuction, further research is necessary to compare HG level changes using different laser types in laser lipolysis procedures.

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Footnotes

Authors' Contribution: Each author contributed significantly to the conception and design of the study. N. Z., B. S. K., and M. B. conceived and developed the research idea; K. T., B. S. K., and N. Z. reviewed the manuscript. The final manuscript will be approved and read by all the authors

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval: This study was approved by the Research Ethics Committee of Islamic Azad University, Najaf Abad Branch with code of [IR.IAU.NAJAFABAD.REC.1398.128](https://doi.org/10.1007/s00105-012-2487-8). The study protocol was in accordance with the Declaration of Helsinki (1975) and its amendments in 2008.

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