Metabolic safety of laser liposuction

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Introduction

Liposuction is an invasive surgical method with a long history; a methodology has been developed for its implementation over time. This procedure is based on the method of surgically removing localized fat, which was historically described in technical publications as dermolipectomy as early as 1890. After the wide introduction and modification of the *drain curette*, liposuction as we essentially know it today started to be implemented in esthetic surgery[2]. With increasing experience and technical possibilities in this area, more simultaneously used methods and modifications were developed.

The wider expansion of laser use also found an application in esthetic surgery. Laser-assisted surgery is based on tumescent liposuction. In local tumescent anesthesia, the laser is applied through openings by flexible fiber to come into direct contact with the subcutaneous fat layer. The fiber tip emits a laser with various wavelengths, according to the device used. It directly lyses adipose tissue and adipocytes and causes leakage of adipocyte content. Due to the selective energy absorption of the laser, the surrounding tissues remain almost undamaged. This approach also lowers the occurrence of complications and adverse reactions, such as bleeding, hematomas and fat embolus. After the application of an adequate dose of laser radiation, fat is removed by standard liposuction cannula. The penetration and movement of the cannula in the correct layer is simplified by the previous decomposition of fat by laser. Some devices allow lasers to emit more wavelengths at once, enabling the simultaneous lysis of adipocytes and the stimulation of the subcutaneous tissue to fiber production, which lowers the risk of excessive laxity and the amount of loose skin after the removal of subcutaneous fat layers.

Methods and materials

The goal of our study was to describe the effects of laser-assisted liposuction on lipid metabolism parameters, which can be part of a metabolic syndrome evaluation and to simultaneously correlate the results with the clinical outcomes of improvements in the objective parameters of BMI.

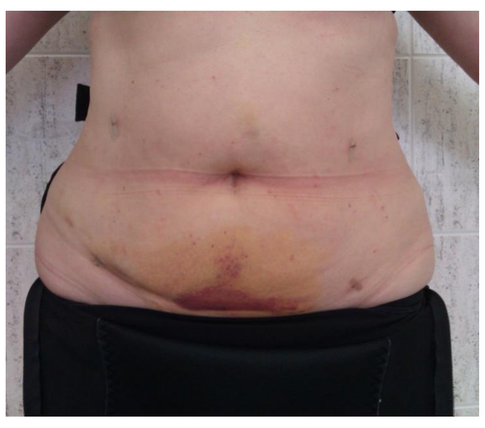
Laser-assisted liposuction was performed according to standard tumescent laser-assisted liposuction protocols. All clients were female, N=22. The procedures were carried out on the mesogastric and hypogastric areas. The patients did not consume any food 6 hours before the procedure, they drank only spring water and urinated right before the procedure. One patient underwent only one procedure and did not change any eating or movement habits during the post procedure period.

The treatment performed after the instillation of tumescent solution according to Klein; the solution consisted of the following: saline (0.9% NaCl), lidocaine (0.05%), adrenaline (ratio 1:1000000) and NaHCO3 (10% 100 mL/L saline to the treated area). The instilled amount of solution used was between 2,000 and 3,000 mL per procedure. After the tactile verification of the effectiveness of the tumescent anesthesia, the actual treatment by invasive subcutaneous optic laser fiber installation began. The SlimLipo aspire platform device by Palomar Medical Technologies, Inc., Burlington, Massachusetts, USA was used. Both 924 nm and 975 nm laser beams were applied in sequence. For 1 frontal abdominal area, the setting was at 20 W for each wave length and used 20kJ of emitted energy. Then, via the same openings, the liberalized fat was removed by mechanical aspiration cannula, with a width of 0.3 to 0.4 cm without vibrating the extension in a negative pressure of 800 to 900 mmHg. The average duration time of the procedure was 120 min. (range, 90-160 min), and the total amount of fat removed was 1593 mL (896 – 2720 mL). Clients were equipped with a compressive elastic bandage immediately after the procedure.

Both clinical and laboratory parameters were evaluated. Immediately before the procedure, immediately after, 7 days after and 28 days after, all clients were weighed; waist perimeter was measured in the transverse plane through the umbilicus, and BMI was calculated. Laboratory values were evaluated in the same time periods mentioned above and includes cholesterol, HDL, TAG and free fatty acids measured after the cooling, centrifugation and separation of the plasma. Excluded were clients with decompensated internal or metabolic diseases and/or pigmented nevus as active skin diseases in the studied area. Clinical results were evaluated by t-test and Holm´s correction, and the laboratory results were evaluated by t-test and Wilcoxon test. Significance level was set at P<0.01.

Table 1. Clinical and laboratory results in laser-assisted liposuction (N=22)

	before	after	7th day	28th day
perimeter (cm)	99,72 ± 14,90	99,67 ± 14,96	97,97 ± 14,94 (P=0.01)	93,33 ± 14,18 (P<0.001)
weight (kg)	79,58 ± 13,61	80,22 ± 13,58	79,30 ± 15,25 (P<0.001)	76,49 ± 14,00 (P<0.001)
BMI	27,61 ± 6,04	N/A	27,67 ± 7,33 (P<0.001)	26,73 ± 6,01 (P<0.001)
total chol. (mmol/L)	4,77 ± 1,11	4,82 ± 1,09	4,57 ± 0,55 (P>0.01)	4,80 ± 1,18 (P>0.01)
HDL (mmol/L)	1,11 ± 0,2	1,18 ± 0,28	1,04 ± 0,17 (P>0.01)	1,19 ± 0,18 (P>0.01)
TAG (mmol/L)	1,39 ± 0,57	1,25 ± 0,45	1,37 ± 0,54 (P>0.01)	1,59 ± 1,5 (P>0.01)
FFA (mmol/L)	0,49 ± 0,31	0,76 ± 0,34	0,40 ± 0,19 (P>0.01)	0,38 ± 0,16 (P>0.01)



Discussion and conclusion

From an overall perspective of the change in mechanical and movement risks with obesity, the changes in absolute value are not so pronounced, but from the perspective of esthetic medicine, the changes in perimeter are especially important for the resulting procedural effectiveness of plastic surgery, together with client satisfaction. The immediate post-procedural values were affected by the accumulation of tumescent solution and partial incipient edema of soft tissues: therefore it is not possible to assess the final outcome of laser-assisted liposuction immediately after the procedure. However, in long-term observation, all of the monitored parameters showed significant changes. Our study is the first to show the safety of laser-assisted liposuction regarding FFA and also proved the findings of previous studies in TAG changes and negligible changes in total cholesterol. Together, these results point to a low risk of negative changes in the metabolic lipid profile in laser-assisted surgery indicated for esthetic reasons.

Our study also confirmed significant changes in the area of clinically observed parameters (weight, BMI, perimeter of treated area), which significantly contribute not only to overall client satisfaction with the procedure but also to possibly lowering the applied load on the movement system. With the deterioration of nutritional habits, there is the increasing presumption of a further deepening of the obesity epidemic as characterized by the WHO. The obesity treatment process is multimodal and consists of changes in nutritional habits coupled with changes in exercise regimen and should be led by medical specialists. One of the puzzle pieces is also removing accumulated adiposity from areas that are not possible to shape to the clients´ satisfaction solely through a diet of pharmaceuticals.

Liposuction has undergone drastic changes over the half century that have led to significant changes, which have resulted in higher effectiveness and lower patient risks and complication rates. Laser-assisted liposuction using the sequencing of the 924 nm and 975 nm laser beam is the newest methodology, with respect to anatomical and physiological preconditions for good healing of the treated area. The change in clinical parameters is both desired and sufficient from the client’s perspective. This change is greatly contributed to by the safety of the metabolic profile of procedure. The results of our study support an increase in patient safety and procedural processes on one hand and lead to a better understanding of liposuction indications by plastic surgeons on the other.