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ORIGINAL ARTICLE

Serum lipid changes following laser lipolysis

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Abstract

Background: Laser lipolysis allows the removal of small volumes of fat with concurrent sub-dermal tissue contraction. However, the physiologic consequences of this procedure are not well documented. The possible effects on serum lipids are not well established. *Objective:* This study was undertaken to determine what changes, if any, occurred in serum lipid profiles at different intervals (1 day, 7 days, 2 weeks and 1 month) after the procedure. *Methods:* Four consecutive patients were included in the study. In all patients, the right and left hips were treated with a 980-nm diode laser (Osyris Medical, Hellemmes, France). Power was tuned at 18W. Cumulative energies varied from 22 000 J to 50 150 J. Fasting blood samples were obtained before the procedure and 1 day, 3 days, 2 weeks and 1 month after. A standard lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides) was done using the same laboratory facility for all tests. *Results:* Serum cholesterol and triglyceride levels remained in the normal range after laser lipolysis. *Conclusion:* Two hypotheses can be proposed: (i) fat elimination is so gradual that an increase in circulating lipid levels is not measurable; (ii) the damaged adipocytes are undergoing apoptosis and being removed by phagocytosis, presumably via activated macrophages.

Key Words: *Cholesterol, HDL, laser lipolysis, LDL, serum, triglyceride*

Introduction

Widely used in Europe and Latin America, laser lipolysis (also called laser lipoplasty) was introduced in North America in 1994 (1,2). Laser lipolysis with a pulsed 1064-nm Nd:YAG laser and more recently with a continuous wave (CW) 980-nm diode laser has proven to be a safe and effective method (3–5). After adequate infiltration of an anesthetic solution, a flexible fiber optic delivered through a small caliber cannula is inserted inside fat tissue. Trans-illumination from a red aiming beam makes the 1-mm cannula easily visible. Laser energy is transmitted to and absorbed by the adipocytes, leading to volume expansion and rupture (6). Histologic analyses of the effects of lasers on human fat tissue have shown areas of reversible cellular damage (tumefaction), irreversible tissue damage (lysis) and a reduction in bleeding when compared to conventional liposuction (7–9).

The safety of the procedure has been addressed regarding patient selection, complications and results (3–5). Little is known about the impact of laser lipolysis on lipid metabolism during and immediately after the procedure.

This study aims to evaluate, in patients operated on for large-volume laser lipolysis, the levels of total cholesterol, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol and triglycerides at different intervals after the procedure (1 day, 7 days, 14 days and 30 days).

Methods

A consecutive series of four patients undergoing laser lipolysis in a private clinical practice consented to participate in the study. After marking the treatment site with a surgical marker, patients were prepped and draped in a sterile fashion. Local anesthesia was

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Table I. Treatment parameters.

Patient	Area treated	Tumescent volume	Laser power	Energy (J)	Cumulative energy/patient (J)
1	Right hip	250 cc	18 W	25 000	46 500
	Left hip	250 cc	18 W	21 500	
2	Right hip	250 cc	18 W	11 000	22 000
	Left hip	250 cc	18 W	11 000	
3	Right hip	200 cc	18 W	16 000	28 300
	Left hip	200 cc	18 W	12 300	
4	Right hip	350 cc	18 W	27 750	50 150
	Left hip	350 cc	18 W	22 400	

performed using the wet infiltration technique with adrenaline 1:500 000. After infiltration of the tumescent fluid, a small incision of 1–2 mm was made with an 18-gauge needle. A 1-mm-micro-canulla was then inserted through the incision into the subcutaneous fat. A 980-nm diode laser (Pharaon, Osyris, France) was used in continuous emission. Since jodhpurs were treated, the power was tuned at 18W. The laser light was conveyed into the fat layer using a 1-mm micro-cannula which incorporated a 600-μm optical fiber. Transcutaneous illumination of the aiming beam ensured precise visualization of the region where the energy was delivered. During the procedure, liquified fat was not aspirated. Only massage was performed immediately after the procedure. Micropore™ adhesive was affixed to skin to better compress and remodel the external thigh. The tape remained in place for 1 week, and the patients were asked to wear compression garments for 1 month. There were no restrictions to activity – except sun exposure, which had to be avoided for a month.

On the morning of laser procedure a fasting blood sample was obtained. Patients returned after 1 day, 3 days, 2 weeks and 1 month to provide another fasting morning blood sample. Results of the original serum lipid tests were not revealed until the post-operative samples had been obtained. A standard lipid profile (total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides) was done using the same laboratory facility for all tests (BioQu@lys, Lille, France). Patients were instructed to maintain their usual diet and lifestyle during the study period.

Results

Four consecutive patients were included in the study. All of the patients were women. In all four patients the right and left jodhpurs were treated. Injected tumescent volume and laser parameters are reported in Table I. Cumulative energy was, respectively, 46 500 J, 22 000 J, 28 300 J and 50 150 J. No peri-operative complications occurred and all patients were satisfied with the aesthetic outcome. Lipid profile measurements are displayed in Figure 1 (total cholesterol: normal level between 1.55 and 2.4 g/l), Figure 2 (HDL cholesterol: normal level between 0.4 and 0.8 g/l), Figure 3 (LDL cholesterol: normal level between 0.6 and 1.4 g/l) and Figure 4 (triglycerides: normal level between 0.35 and 1.4 g/l).

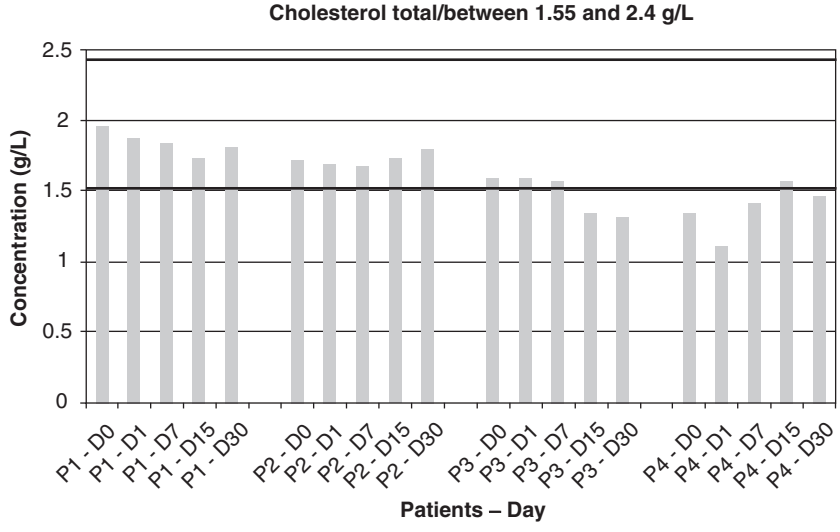

Figure 1. Preoperative (D0) and postoperative (D1, D7, D15, D30) serum cholesterol levels (four patients).

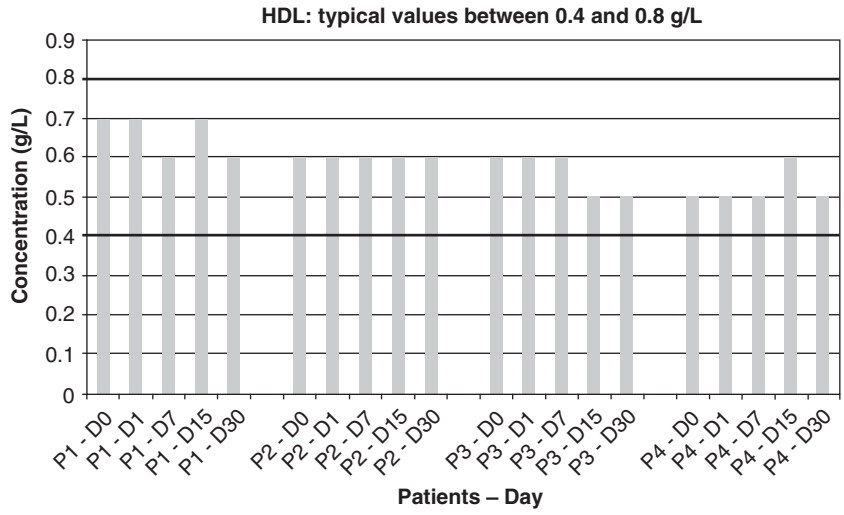

Figure 2. Preoperative (D0) and postoperative (D1, D7, D15, D30) serum HDL levels (four patients).

For all patients, whatever the interval, both total cholesterol, HDL, LDL and triglycerides remained within normal values.

Discussion

This limited study was undertaken to evaluate the impact of laser lipolysis on lipid metabolism at different intervals after the procedure. Since lipid metabolism could be affected by the laser damaged volume, medium to high energy levels were used in this study. As stated by Kim and Geronemus, the higher the energy delivery, the greater the volume reduction (4). Using the calibration curve determined by these authors and confirmed by Mordon et al. (10), for 46 500 J, 22 000 J, 28 300 J and 50 150 J the volume reduction should be, respectively, $80 \pm 10\,cm^3$ for patient #1, $38 \pm 5\,cm^3$ for patient #2, $49 \pm 6\,cm^3$ for patient #3, and $87 \pm 11\,cm^3$ for patient #4. When compared with other laser lipolysis clinical studies, the cumulative energy used on these four patients is important. For example, Kim and Geronemus used a maximum cumulative energy of 12 000 J (4).

However, even with these high cumulative energies, and without any liquefied fat aspiration, total cholesterol, HDL cholesterol, LDL cholesterol and triglyceride levels were not modified during the 1-month follow-up period among these four patients. These results are in agreement with the observation of Goldman et al. who also found no significant change in triglycerides and lipid profiles at 1 day, 1 week and 1 month after the procedure (11).

These two studies confirm that the absence of fat aspiration during laser lipolysis does not lead to

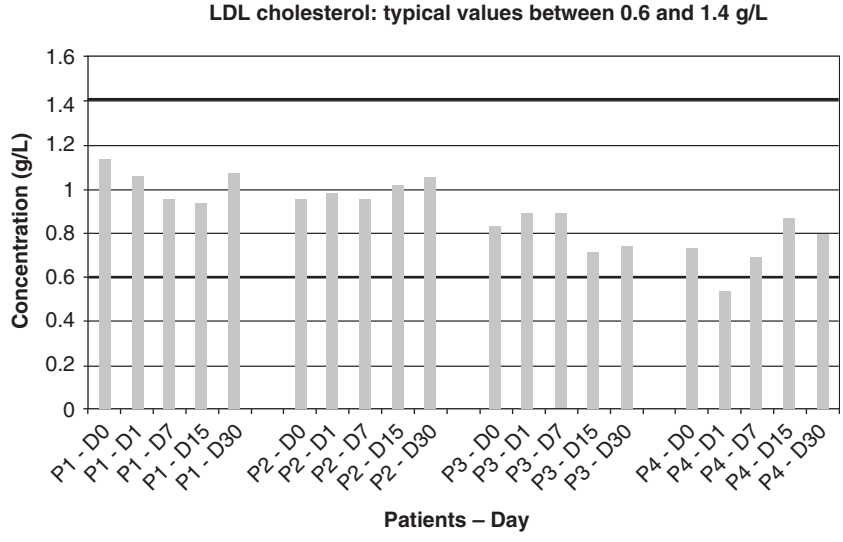

Figure 3. Preoperative (D0) and postoperative (D1, D7, D15, D30) serum LDL levels (four patients).

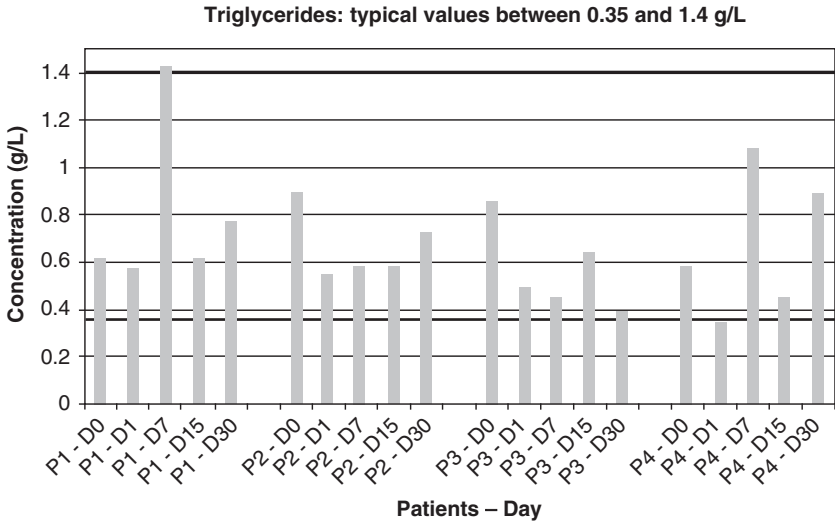

Figure 4. Preoperative (D0) and postoperative (D1, D7, D15, D30) serum triglyceride levels (four patients).

higher concentrations of free-fatty acids. Consequently, there is no potential risk of a possible hepatic and renal toxicity, as speculated by Prado et al. (12).

Since there was no significant rise in serum lipids after the procedure in these two studies, there is the question of where does the fat go? Two hypothesis can be proposed: (i) fat elimination is so gradual that an increase in circulating lipid levels is not measurable; and (ii) the damaged adipocytes are undergoing apoptosis and being removed by phagocytosis, presumably via activated macrophages. This process has been suggested by Mainstein et al. when studying cryolysis (13). This cellular transport process would not be expected to cause any increase in serum lipids. This process is likely to follow usual pathways for adipose tissue turnover. Each year, about 10% of body fat is recycled through adipocyte apoptosis (14).

In conclusion, this study confirms that fat reduction by laser lipolysis does not affect serum cholesterol and triglyceride levels.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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