Comparison between Two Energy Based Liposuction Assisted Methods

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ABSTRACT

There is much debate about the safety of energy based liposuction methods as well as the efficacy and benefit ratio of these newer devices used in this procedure. Most of the studies compare traditional liposuction with one method of liposuction either laser or VASER diminutive studies compare laser to VASER.

Objective: To determine if there are any benefits in terms of safety and efficacy of laser assisted liposuction compared to VASER assisted liposuction.

Methods: Forty Patients enrolled in this study 20 patient treated by VASER assisted liposuction compared with 20 patients treated with laser assisted liposuction.

Results: Both methods significantly reduced procedure times, postoperative pain, and increased the amount of fat aspirated. There were no significant differences between the two groups regarding decreased postoperative pain, ecchymoses, and edema, as well as cosmetic results scores.

Conclusion: Laser liposuction in this study in not significantly different from VASER assisted liposuction.


INTRODUCTION

Traditional suction assisted lipoplasty has today become the most commonly performed aesthetic surgical procedure when this suction-assisted lipoplasty is performed after competent training; it has low rates of complications, predictable recovery periods, and high patient satisfaction [1,2]. The advertising and media introduced the blend of “laser and liposuction as an extraordinary innovative operation”, our cosmetic patients are overwhelmed by this marketing made in favor of this specific laser liposuction [3]. The use of any machine in humans should follow the principle of research before commerce although marketing made in favor of this technique has promoted many unproven benefits over the traditional method [4].

Laser-assisted liposuction by liquefying the adipose tissue enables larger volumes of fat to be removed more easily. There is less mechanical destruction of subcutaneous tissues in a laser assisted procedure due to the small cannula size and the laser mediated lipolysis effect. This results in faster recovery times and diminished ecchymosis but although laser assisted lipolysis minimizes trauma it cannot eliminate it. There is coagulation of small blood vessels by the laser light, resulting in less blood loss during the procedure and the most positive attribute is skin tightening [5]. Coagulation of collagen can lead to the creation of a new, thicker and more organized reticular dermis, the end clinical result being tightened skin. This attribute makes laser lipolysis particularly attractive for areas of localized adiposity or localized laxity following liposuction. The skin tightens over a period of time that may last up to 8 months, with tightening becoming progressively more evident over time due to collagen regrowth [6].

Ultrasonic-assisted lipoplasty (UAL) was based on the emission of continuous ultrasound energy that aimed the selective fragmentation / emulsification of fat before its aspiration. This technology introduced the first-generation UAL device, which delivered continuous ultrasound through blunt, solid, thick probes (4-6mm diameter) to pre treat fat before its aspiration. The second-generation ultrasonic machines featured hollow cannula was developed but from both generations of ultrasound cannulas several complications arose, especially related to the inadvertent excessive exposure of the treated tissues to ultrasound energy. The VASER device was developed as an answer to the search for an enhanced ultrasonic device that might overcome the limitations of the first and second-generation UAL machines [7,8].
Both of the above mentioned technologies (laser and VASER) produce fat lipolysis prior to liposuction, the advantages over conventional surgical interventions is their minor trauma and the thermal effect produced by laser or VASER prevents extra redundant skin combined with a skin retraction, resulting in a quick surgical recovery and greater satisfaction of the patients.

Of all the advantages mentioned, retraction of the skin, closely related to the thermal energy deposited by on the tissue is one of the most important, since it makes unnecessary the removal of any excess skin, thus avoiding unsightly scars and their associated risks, such as keloid formation. In this prospective study, we sought to verify whether the laser-assisted liposuction reaches meaningful results in comparison.

PATIENTS AND METHODS

This clinical study protocol was reviewed and approved by our local Ethics Committee. Forty women who were complaining of lipodystrophy were included in our study, then were randomly divided into two groups 20 patient each, the first group treated with laser assisted liposuction, the second group treated with VASER assisted liposuction the study conducted between October 2013 and January 2015.

All patients were subjected to full medical history and clinical examinations we also determine the weight and body mass index (BMI) of each patient. Exclusion criteria were the following: Pregnancy, history of coagulation disorders or anticoagulants, BMI greater than 35, and history of sensitivity to laser treatments.

Surgical procedure:

All surgeries were performed under general or spinal anesthesia. Tumescent solution was administered via blunt cannula 20cm in length and 2mm in diameter, with multiple holes; the solution consists of an isotonic solution (500ml NaCl 0.9% ± 1mg adrenalin). In all other aspects, the two groups were treated in an identical manner concerning intraoperative and postoperative care, including the volume of wetting solution and the technique of infiltration performed using approximately 1cc of wetting solution per cc of estimated aspirate. Wetting solution and aspirate volumes were recorded in the data sheet. The end point for suctioning was subjectively determined by the surgeon using usual aesthetic criteria.

Laser liposuction:

The laser used was 980nm Diode laser device (Quanta C D-Plus 980 diode laser, Solbiate Olona, Italy) the laser system offers a choice of continuous or pulsating irradiation. In the present study, the laser irradiation is made in continuous transmission, adjusting the speed of movement of the cannula back and forth without stopping, to avoid damaging the skin. Continuous mode emission laser generates significant heat deposition in the tissue leading to adipocyte rupture, coagulation of the collagen fibers and the closure of the small vessels. Repeated passes of the laser in necessary to achieve progressive accumulation of thermal energy, and effective heat buildup, but avoids the risk of burns.

Laser irradiation started 20 minutes after administration of tumescent solution performing two 2mm incisions with a scalpel blade 11 to introduce a cannula of 20cm in length and 1mm in diameter to tunnel the treatment area. Tunneling maneuvers completed and through the same cannula, optical fiber had a diameter of 600 microns at its distal end connected to the 980nm Diode laser aperture. The other free end of the fiber was set to 3mm peeped out of the cannula.

Irradiation was variable depending on the size of the area with a total energy accumulated between 4000 and 10000 joules (J). The cannula with laser fiber incorporated first into the deep subcutaneous tissue plane after passing a more superficial level. We were careful that the movement of the cannula was faster at this level for the contact of the tip of the fiber skin was soft, so as not to cause burns. Although these maneuvers posing a potential risk, it is important enough laser energy deposited in the subdermal plane to produce effective skin retraction. In the place where the tip of the cannula, which is visible by the laser light guide through the skin is provided, pointing at the same time we used an infrared thermometer (CEM DT –880, Everest Shenzhen Machinery Industry Co. Ltd., China), to detect the external skin temperature in real time to avoid exceeding 42ºC. If this occurs, the cannula is quickly shifted to another area to prevent burning. After the end of laser irradiation we proceeded to liposuction cannula using a 3mm diameter connected to a suction of negative pressure of 1 bar. While liposuction performed, the contralateral hand controls so there are no irregularities in the treated areas. After the liposuction incisions were closed then application of an elastic compression bandage on the surgical site.
VASER Liposuction:

The Infiltration fluid is necessary to ensure the effective transmission of ultrasound energy, infusing adequate amounts of solution at the superficial and deep levels and ensuring even distribution is a key to effective emulsification. The VASER system (Solta Medical, Inc. 11818 Northcreek Pkwy North, Bothell, WA. 98011 USA), offers a choice of continuous or pulsating ultrasound energy delivery, allowing the surgeon to tailor the approach according to every case. Continuous mode is appropriate for general use, for more fibrous tissue, and for higher-speed fragmentation. The pulsating “VASER” mode is appropriate for softer tissue and applications in which finer sculpting in sub-dermal plane is required and after completion of liposuction aiming for skin tightening. Continuous mode is used at the beginning with a 4.6mm or 3.7mm 2-groove probe. Using a fanning technique and gentle, smooth, long strokes to cover the entire region currently being treated; while the dominant hand moves the VASER probe, the palm of the non-dominant hand should be placed flat on the skin surface to monitor probe position and depth.

The VASER pulsating mode often utilizes the 5.1-mm solid titanium probe where the grooves on the lateral part of the tip of the solid probes increase the efficacy of the system. When utilizing the pulsating mode for sculpture the power sets at 70% of the total power. After the application of ultrasound energy, the emulsion that flows away during aspiration is clear, yellow, with really small blood content. At the end of surgery, manual remodeling of the region is required to check symmetry; in this step, we use the VASER mode in the device to stretch the redundant skin usually for 30 minutes. Aspiration was performed using ventilated cannulas, beginning in the deep layers and continuing to the mid-lamellar layer no Closure is done for the wounds.

Postoperative protocol:

We prescribe all patients antibiotic and anti-inflammatory. We conducted the first review of the next day of surgery. Then kept the elastic garments for 6 weeks, removing it only for daily hygiene. After this time 4 more weeks remained alone at night.

Subjective assessment:

The first three follow-up examinations were conducted in specific chronologic windows on postoperative times; one week to 10 days then at 1 to 3 months and the final monitoring of results was done 6 months after surgery (as much as this was practically feasible). Results were evaluated with photography and with subjective ratings performed independently by the operating surgeon and by the patient. At the time of the evaluations patient’s postoperative pain and ecchymosis and discomfort was rated on a score of 1 to 5, with 5 representing the most edema and ecchymosis. Postoperative pain was assessed by surgeon, separately for each patient, 24 hours after the operation and then at days 7 to 10, using a visual analogue scale (VAS) ranging from 0 to 10 (where 0 = no pain at all and 10 = maximum imaginable pain).

Patient’s satisfaction was also rated on a 1 to 5 score, with 5 being completely satisfied. The operating surgeon independently evaluated each patient using the same scores, we correlated the average rating of the results with the scores as follows: Excellent, 5; Very good, 4; Good, 3; Poor, 2; Very poor, 1. For evaluation, patients were accompanied by a doctor who was not involved in the surgery. During the exam, the doctor reminded patients only the details that should be taken into account when issuing a rating. To this end, we provide the patients before surgery photos and photos taken 6 months after and were asked to rate the response to therapy.

Objective assessment:

As part of the assessment, anthropometric data (weight and height) of each patient to determine BMI, waist circumference were noted. These measurements were performed with the patient standing comparison with those taken before surgery.

Statistical analysis:

We use the SPSS v program 20 for Windows. As a test of statistical testing we used t-test for independent samples, with \( p<0.05 \) as significance point.

RESULTS

All 40 patients were evaluated for safety, efficacy, and satisfaction with both the liposuction assisted methods. None of the patients had undergone any previous treatments for fat reduction; all the patients received treatment for at least in one region. For all patients the median age was 35.4 years; the youngest 29 and the oldest 52 where the median age for laser group was 32.8 years and for the VASER group 33.2 years the difference was statistically insignificant. In laser group 14 patients were female, with six males whereas in VASER group 15 were female with five males. Different
locations were treated in all groups: hips and (n=19) inner thighs (n=8), abdomen (n=11), flanks (n=5), buttocks (n=8), and back (n=4).

Surgical time was longer for the V ASER group (median, 60 minutes; range, 45 to 80 minutes) per area when compared with the laser group (median, 45 minutes; range, 40 to 84 minutes) (p=0.0005).

The outcome of patients' symptoms and discomforts showed no scarring, infection, skin burns, hypopigmentation, or impaired healing in all the treated patients in both groups but ecchymoses were observed in almost all patients but were resolved in less than 1 week in 11 patients within the laser group versus 9 patients in VASER group. Only three patients reported ecchymoses lasting more than 3 weeks in laser group and only two patients reported ecchymoses lasting more than 3 weeks in VASER group. According to the score ecchymosis showed a mean 2.94±1.22; range (1 to 4) in laser group versus a mean, 2.1±1.75; range (1 to 4) in VASER group.

Postoperative pain according to (VAS) was higher in the laser group versus the in VASER group side in the first week after surgery as the mean ± SD (6.4±1.1 versus 5.8±0.72, p=0.0001) but there was no different three weeks after (3.8±0.8 versus 2.7±0.9, p=0.0014); Overall, there was less pain in the in VASER group when compared with the laser group.

None of the laser group patients showed accumulation of seroma whereas three patients in the in VASER group showed mild to moderate seroma accumulation that was treated by multiple aspirations only occurred in abdomen.

Recovery Periods after the surgery was 23.46±2.53 days on the laser group with no significant difference from the in VASER group 21.32±3.22 days (p=0.3563).

BMI presented as a Mean ± SD was 29.73±6.62 preoperative then becomes 28.18±7.04 kg/m² postoperative for the laser group with significant difference p≤0.0001 and for the VASER group, preoperative BMI was 30.36±7.42 becomes 27.4±2.5 kg/m² postoperative with significant difference p≤0.0001.

Cosmetic results were assessed by an objective grading system according to the method described before this score has five items grades, the final assessment done at 6 months after operation hence showed that the group with laser treatment had statistically significant reduction of scores (p-values was ≤0.05). Of the VASER treated group, there was statistically significant reduction of scores (p-values was ≤0.05) the difference between the two treatments had a trend toward statistical insignificance (p-values ≥0.05).

All patients in both groups showed "good" to "excellent" results as 8 of 20 cases were evaluated as "excellent" 7 cases as very good and the other 5 cases as "good" in the laser group whereas 7 of 20 cases were evaluated as "excellent" 8 cases as very good and the other 5 cases as "good". No cases were regarded as "poor" or "very poor".

Skin contraction:

No skin irregularities were observed in any of the patients in both groups patient had no complain of “loose” skin after treatment in both groups and the difference between the groups regarding skin contraction was difficult to assess objectively, despite taking close-up photographs for the purpose.

The addition of score items showed a final result did not differ between groups and showed no changes in the first and second postoperative follow-up visits.

![Fig. (1): Cosmetic results score difference between two groups.](image-url)
Fig. (2): Male patient 30 years old done with VASER assisted liposuction (A, C, E, PreOp.) (B, D, F, PostOp.).
Fig. (3): Male patient 35 years done by LASER assisted liposuction (A, C, PreOp.) (B, D, F, PostOp.).
**DISCUSSION**

Liposuction is performed more than any other procedure in plastic surgery; generally it gives good results, but it does have some concerns in particular, surgical discomfort, recovery time, and the problem of loose skin some patients experience after liposuction these concerns drive constant innovation in liposuction techniques [9,10]. In simple terms, the traditional method involves judicious use of wetting solutions, a blunt tip cannula, and a vacuum source. The subcutaneous fat is mechanically disrupted by the back-and-forth movement of the cannula prior to its aspiration [11]. Powered liposuction devices that use reciprocating cannulas, which facilitates the fat removal and decreases the work of the surgeon cannulas are designed to be attached to a motor electrically or air-driven which moves the cannula in a to-and-fro motion from 2 to 7 mm forward and backward this motion increase rate of fat harvesting and useful for difficult fibrofatty areas [12]. Ways to emulsify the fat prior to extraction were also proposed. Laser-assisted liposuction was investigated as a technologic advance.
However, an ultrasound-assisted liposuction has been advocated as a technologic advance in liposuction [13].

The degree to which a new technology is considered a major advance for any particular surgical treatment is often measured by the extent to which it increases efficacy and safety. Also Debate continues whether the benefits (real or perceived) of this approach justify the additional costs and training [14].

Although the first mid ninetieth multicenter FDA-approved study of laser-assisted liposuction failed to show any advantage over the traditional method, the technological development of laser systems has achieved new wavelengths that interact more selectively with fatty tissue are used [15]. The wavelength of 980nm diode laser we use in this study, in the near infrared spectrum characterized by its high absorption by fat and water, rapid heating subcutaneous tissue other important factor is dose of energy per unit of treated area in order to reach optimal heating of tissue for liquefying the fat [16]. For the patients in this study, we use total energy accumulated in each area between 4000 to 6500J.

In this work we highlight the advantages associated with the surgical laser assisted liposuction, which achieved remarkable effects on skin retraction.

Conventional techniques or ultrasonic assisted liposuction not produce thermal reservoir in the tissue as the laser energy getting. The heat caused by the laser product stimulates collagen formation during the repair of surgical lesions, obtaining the effective retraction of the skin [17].

Treatment of the superficial layers is necessary to achieve optimal aesthetic results. Conventional superficial liposuction produced contour irregularities, hyperpigmentation, and waviness when used in the superficial layer. Early generations of ultrasound assisted liposuction (UAL) has been associated with severe burns and other complications when used on the surface. VASER had a less heat release to the tissues as it uses less energy than earlier generation of UAL also VASER does not remove the protective wetting solution, these technical advances reduce the risk of complications, such as burns and skin necrosis. When used for superficial work [18,19].

In our study both the laser treated and the VASER treated group showed a less painful recovery with no significant difference between them. This was also observed in several studies that compared laser assisted liposuction to traditional liposuction. Also the same pervious information could be concluded from VASER assisted liposuction compared to traditional liposuction [20,21].

This study demonstrates a greater level of skin retraction for both techniques with no significant difference between VASER-assisted liposuction compared with laser-assisted liposuction. In contrast to the studies compared traditional liposuction method with laser or VASER assisted liposuction showed great skin contraction in these energy based assisted liposuction that may reach 53% in VASER liposuction [21] and 54% in laser liposuction [22] this little or no difference in skin contraction between these studies could become in accordance to the insignificant difference found in our study between the two methods.

Our explanation of that is energy based method by the end produce heat within the tissues this energy could be calculated in Joules then it converted to raise of temperature by the end it seems the raise of temperature is end result with difference from method of its production this heating produce collagen contraction that results in tissue tightening.

Further studies are needed to determine the exact amount of energy needed to produce skin contraction and to what limit so selection of cases would be easier to which method would be better than the other.

REFERENCES


