

High Definition Liposuction Using Third Generation Ultrasound Versus Conventional Liposuction of the Lower Back and Upper Thigh Region: A Comparative Study

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ABSTRACT

Introduction: The accuracy of results of liposuction had long been related to the aspiration cannulas as much as it is related to surgeon experience. The cannulas tips, length, diameter, design, number of holes shapes and negative pressure had drawn the attention of all surgeons in order to modify their outcomes. The addition of technologies that provide energy based devices has enriched the procedure and improved patient satisfaction. Ultrasound assisted liposuction had several complications included severe burns and other problems, less energy is used in third generation ultrasound assisted liposuction than second generation liposound which make it safer with better results. A much more accurate technique was described by Hoyos to improve body contouring by using VASER assisted liposuction.

Aim of the Study: To investigate the superiority of high definition liposuction using third generation liposound in lower back and upper thigh region as regarding patient satisfaction and their need for secondary procedures.

Patients and Methods: 20 patients with age ranged from 18-40 years old and BMI=25-30 having lipodystrophy of the lower back and upper thigh and trochanteric areas with moderate skin tone, only non-smoker-non diabetic-non hypertensive were included in the study. Patients were divided into two groups; Group A included 10 patients who undergone suction assisted liposculpture and Group B: Included 10 patients who had high definition liposuction using third generation internal ultrasound machine. Both subjective and objective evaluation was done. Objective evaluation was done by measurement of both pre operative drawn line starting from mid sacral point to highest point of iliac crest and post-operative measurement at one and six month in both groups.

Results: This study involved 20 women divided into two groups. Group B patients had less blood content of the aspirate, longer time of the procedure (add ultrasound timing) more post-operative edema, more obvious skin retraction along post-operative period. While Group A patients showed overall less edema and more ecchymosis with less satisfaction and more irregularities and need for secondary procedures.

Conclusion: High definition liposuction using third generation internal ultrasound showed higher skin contraction, better body shape and contour.

Key Words: *Liposuction – Ultrasound – Conventional – Lower back – Upper thigh.*

INTRODUCTION

World wide liposuction is the top required procedure in plastic surgery. Many surgeons had

tried to modify the idea of body contouring and add to its beauty. The idea is to modify body shape without causing skin laxity and deformities not only to remove body fat, that's why liposuction the traditional technique was only indicated with cases of mild to moderate degree skin laxity. All of the modifications had aimed to minimize the scars and improve the outcomes [1,2].

Energy-based devices became to be very interesting to Surgeons, such as Ultrasonic-Assisted Lipoplasty (UAL) and power-assisted lipoplasty in order to widen the range of indication of this technique. Other technologic approaches, such as the application of laser and microwave energy for fat fragmentation and most recently fractional radiofrequency had evolved for the same purpose [3,4].

The introduction of internal ultrasound assisted lipoplasty had enabled the application of lipoplasty not only to aspirate fat but also to target skin tightening through energy emission leading to collagen remodelling and fibroblast activation. Scuderi et al., first introduced continuous ultrasound for emulsification of fat [5]. For simultaneous fragmentation and evacuation later on second generation ultrasound was introduced [5,6].

Ultrasound lipoplasty is a method for pretreating the fatty tissue to produce fragmentation/emulsification by three biologic effects. Micromechanical effect, thermal and microcavitation effects. This means damage caused by ultrasound waves on fat molecules, heat introduced by friction and ultrasound waves and gaps introduced between molecules and cell membrane [2,7].

To focus more on safety and efficacy a third generation ultrasound liposuction device was introduced. The modified technology of internal ultrasound device is to produce pulsed-lower power ultrasound and high efficacy small diameter solid titanium probe. This modification widened the scope of indication to involve male breast, double neck, trunk, back and also to be combined with

other excisional body contouring procedures such as abdominoplasty, brachioplasty and other procedures [8,9].

Several studies had aimed to compare the results of ultrasound assisted liposuction third generation to the traditional liposuction and to UAL. Some trials had done comparison on different areas of the body, others on the same patient by using different technology on each side. Some studies stated that sacral region is one of the areas of highest results of ultra sound assisted liposculpture without a real method of measurement [1,2].

Aim of the study:

To investigate the superiority of internal ultrasound assisted liposculpture (third generation) over suction assisted liposuction in trunk contouring and specifically lower back and upper thigh region regarding the results, blood loss, and skin toning as well as avoiding the need of secondary procedures as in cases undergoing traditional liposuction.

PATIENTS AND METHODS

The present study was conducted between 2014 and 2015. It included twenty patients having lipodystrophy of lower back area and upper thigh with trochanteric region, in cases with moderate skin tone. Epidural anesthesia was used for all cases after their approval. Patients were selected to be non-smoker, non-diabetic and non-hypertensive. Patients had a written consent with all information including operative plan, technique, operation time and type of anesthesia.

Patients aged above 40 years, BMI above 30 kg/m², patients having chronic illness as cardiac problems or hypertension or any history of deep venous thrombosis were excluded from the study. Amount of wetting solution ranged from 4-6 litres.

Patients were divided into two groups; Group A: Included 10 patients who undergone suction assisted liposculpture and Group B: Included 10 patients who had high definition liposuction assisted with third generation internal ultrasound machine.

Pre-operative routine investigations & hemoglobin level, patients planning and drawing of the lower back and upper thigh with trochanteric region. The lower back region planned for lipoplasty was marked by two linear line each line starts from mid sacral point till highest point of iliac crest on both sides. This line is measured by measuring meter to compare the improvement of skin retraction pre-operatively and post-operatively Fig. (1).

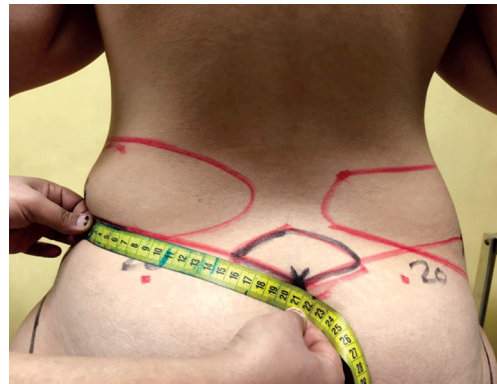


Fig. (1): Pre-operative measurement of mid sacral point to highest point of iliac crest.

Skin ports (part of the liposound system) were used to protect incision sites and points of entry from heat. Based on the entry points each skin port was placed in the stab incision and sutured in place with 4-0 silk at three anchor points. Ceramic ports may be maintained in situ by the threaded contour of the screw-type design, without suture fixation. A wet towel was used immediately around the incision to protect the skin from accidental contact with the ultra sound delivery system (probe).

Tumescent solution; liter of lactated Ringer's solution, and 2ml of 1:1000 epinephrine, was infused into the anatomical site to minimize intra-operative blood loss and provide analgesia (turgid point). The infusion was done by using a small-diameter blunt infusion cannula with a diameter of 12 gauge or smaller. The solution was infused to achieve an approximate ratio more than 1.5-2:1 for wetting solution to suction amount.

Ultrasound probe used was 3.7, amplitude setting, and pulsed versus continuous mode setting were both were used simultaneously. The ultrasound continuous mode system was applied until the targeted fat was emulsified using the guideline of 1 to 1.5 minutes of treatment time per 100cc of infused wetting solution based on system guidelines. Cross tunneling should be done. The distal 1 or 2cm of the probe, at least, must be kept in contact with tissue or fluids and inside the skin port during introduction.

Both the continuous mode and the pulse mode were used in the lower back area, continuous is for good emulsification of fat while pulse mode for tightening and skin contraction. The pulse mode was better for more delicate work, finer sculpting and softer tissues and more superficial planes. The device was adjusted in such a way that the probe moves smoothly through the tissue. 3.7 probe was used for more powerful results with severe caution during probe exit. If the probe was struggling or

dragging, the amplitude was raised with careful manipulations.

Post-operative a pressure garment applied for 6 weeks, antibiotics, anti-edematous and analgesics were recommended. The follow-up period ranged from 3 to 6 months.

Post-operative instructions were given to the patients in the form of; adequate water intake, early mobilization, constant weight control (diet maintenance), sports, vitamin C.

Evaluation:

Pre-operative and postoperative digital pictures were taken at one month after operation and at 6 month post-operative.

Comparison between high definition liposculpture and SAL was done concerning skin retraction, aspirate blood content, duration of post-operative edema, post-operative pain, and duration of the procedure. Subjective evaluation was done by patient satisfaction assessment for the final result depending on the shape and skin retraction in correlation to the pre-operative ones and both pre

and post-operative pictures. Patient satisfaction was ranked on scale of 0-3 with 0 being no improvement and 3 being highly satisfied. Objective evaluation was done by measurement of both pre operative drawn line starting from mid sacral point to highest point of iliac crest and post-operative measurement at one and six month in both groups.

RESULTS

This study involved 20 women with an average age ranged; 18-40 years old). BMI ranged from 25-30. Group B patients had less blood content of the aspirate, longer time of the procedure (added ultrasound timing) more post-operative edema, more obvious skin retraction along post-operative period. While Group A patients showed overall less edema and more ecchymosis and less time consumption.

The overall complication included scar widening in three cases (3%) of Group B in comparison to Group A. Severe ecchymosis in 5 cases of Group A. Post-operative pain was longer in Group B. Otherwise, all patients showed uneventful post-operative period.



Fig. (2): Case of Group A, pre-operative Photos 1, postero- anterior view, 2 lt side dead lateral, 3 rt side dead lateral view and post-operative Photos 4, postero- anterior view, 5 lt side dead lateral, and 6 rt side dead lateral view.



Fig. (3): Case of Group B pre-operative Photos 1, postero- anterior view, 2 rt side dead lateral, 3 Lt side dead lateral are and post-operative Photos 4, postero- anterior view, 5 rt side dead lateral, and 6 Lt side dead lateral view.

Subjective evaluation revealed overall high grade of satisfaction in 8 cases of Group B in comparison to 4 cases in Group A. Two cases of Group A were totally unsatisfied with result of liposuction as regarding size and shape and asked for revision of the procedure assisted with internal liposound (Table 1).

Table (1): Subjective evaluation by patient satisfaction scale.

	High satisfaction	Moderate satisfaction	No satisfaction	
Group B	8	2	0	No demand for secondary procedures
Group A	4	4	2	2 cases asked for high definition revision of the procedure

Objective evaluation was done by measurement of both pre-operative drawn line starting from mid sacral point to highest point of iliac crest and post-operative measurement in cms at one and six month in both groups. All measurements and ratio of improvement at 1, 6m post-operatively were recorded in both groups in (Tables 2,3).

Table (2): Pre-operative and 1, 6 month post-operative measurements in cms and percent of improvement in Group B.

	Pre cm	Early 1 month 10-15%	6 months 17-24%
Case 1	21	18.9	16.5
Case 2	21	18.5	17
Case 3	25	21.3	18.7
Case 4	25	22.5	20
Case 5	20	17.8	15.5
Case 6	20	18	16.4
Case 7	29	25.5	22.9
Case 8	25	22	21
Case 9	29	25	22
Case 10	28	25.5	22

Table (3): Pre-operative and 1, 6 month post-operative measurements in cms and percent of improvement in conventional Group A.

	Pre cm	Early 1 month 9-12%	6 months 15-16%
Case 1	24	21.8	20.4
Case 2	24	22	21
Case 3	25	22	21
Case 4	16	14.4	13.7
Case 5	24	21	20.1
Case 6	25	22.5	21.5
Case 7	23	20.4	19.5
Case 8	26	23	22.5
Case 9	28	25	24
Case 10	27	24	23

DISCUSSION

All different precautions performed in traditional liposuction including deep lipoplasty and applying wetting solutions aim to prevent superficial irregularities. The superficial fat layers preservation is important to prevent deformities and cellulitis. All of these steps were not sufficient to reach the patient expectations and required aesthetic results [10-12].

After invention of the VASER Lipo System, it offered a vital revolution in the treatment of excess fat as it was intended to advance liposuction procedures by improving safety and efficiency, reducing complications and physician fatigue, and allowing for faster patient recovery [1]. Many studies had proved its apparent clinical benefits. Hoyos and Millard, 2007 reported improved body contour and concluded that VASER-assisted high-definition liposculpture is an appropriate approach to body contouring facilitating the superficial liposculpture to define the 3-dimensional surface musculature [1,13,14].

Di Giuseppe stated that VASER is a new technology with high standards of value and safety; thus burns, seroma, skin sloughing that were grave possible complications in previously used tools; are not actually matters of questions with the recently introduced technology. Thus facilitated bloodless removal of the unwanted fat and lead to small number of complications in their study [9].

In order to improve the shape of the superficial fatty layers this requires more than the conventional liposuction as it could lead to irregularities, hyperpigmentations and wrinkles. The less energy pulsed mode of VASER produce high energy probe vibration for shorter time, also the choice of hand piece play important role together with precise pre-

operative planning of the procedure. Although being more difficult and time consuming and require high artistic view of all body layers skin, superficial and deep fatty layers. It represent a significant advance in body shape and contouring [7,15-17].

In this study, the procedure was more time-consuming compared to the conventional liposuction because the added emulsification and tightening time. This added time was accepted by patients who had adequate information about the operation steps. All cases in this study had epidural anesthesia as the targeted area lower back and upper thighs.

This study included twenty patients divided into two groups who underwent liposuction of the lower back and upper thigh region. The amount of wetting solution injection ranged from 4-6 litres and all patients BMI ranged from 25-30. All were women and were divided into two groups; Group A underwent suction assisted liposculpture while Group B underwent high definition liposculpture using third generation ultrasound.

Several studies reported that post-operative edema following VASER assisted liposuction were minimal with average pain. Jewell et al., 2002 reported that complications of UAL such as burns, seromas, skin necrosis and parasthesia were decreased using VASER assisted liposuction, and both time required is not longer and surgeons effort were less than traditional liposuction. Other reported complications were infection, seromas, induration and need of secondary procedures [8,14,15].

In this study Group B patients had longer duration of surgery also has more post-operative edema and pain persisted for longer time. Three cases had widening of entry point due to port introduction. While Group A cases had more post operative ecchymosis and lower hemoglobin level.

Subjective evaluation was done through pre and post-operative photos and patient satisfaction was ranked on scale from 0-3. In Group A 4 cases showed high satisfaction in comparison to 8 cases in Group B while 4 cases showed moderate satisfaction and required secondary intervention in relation to 2 cases in Group B. Group A had 2 cases.

Complaining of irregularities and insufficient liposuction and asked for high definition liposculpture to improve their outcomes.

Objective evaluation was done through measurement of the distance between mid-sacral point

to the highest point of iliac crest. This measurement was done immediately pre-operative and after one and six month post-operatively in order to detect the degree of skin retraction together with fat reduction. Group B showed early 10-15% shrinkage of skin after one month which improved to be 17-24% after 6 month. While Group A showed early 9-12% and 15-16% after 6 month.

Several studies evaluated blood loss, complications of VASER assisted liposuction and recorded the superior results of this technique in different areas of the body, its effect on fat and skin shrinkage [18-21]. In study by Nagy and Vanek 2012, they tried to measure the difference of skin retraction by tattooing three ultra violet dots at site of liposuction pre and post-operatively. They recorded 53% improvement in VASER group relative to suction assisted liposuction. In their study the two procedures were done in the same patient randomly blinded study [1].

This study aimed to prove the changes of skin shrinkage and size improvement between high definition liposuction and the traditional liposuction together with the low rate of irregularities which lead to more patient satisfaction.

Conclusion:

High definition liposuction using third generation internal ultrasound is an easy and simple addition that offers better results of shape of the back with high definition of the waste, better shape of trochanteric area due to skin tightening with less apparent irregularities compared to the conventional suction assisted liposuction.

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