Body Contouring by Liposculpture

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Introduction

Body contouring by liposculpture is everyone's dream of a slimmer figure with minimally invasive approach. The fact is that the number of fat cells in our body is regulated by our genetic predisposition that may deviate only in cases of morbid obesity. This translates to the possibility of permanent fat cell reduction by cell destruction or removal. The fat removed, will not regenerate. However, drastic body weight loss can only be achieved by dietary control, regular exercise and perhaps short-term medications. More drastic surgical treatment may include mechanical regulation of food intake or creation of a malabsorption state. In other words, beauty can be related to a combination of favourable genetic code, appropriate dieting and lifestyle and a certain lucky probability.

The common misconceptions that body fat cells migrate are also untrue. Should we indulge in gastronomic over consumption after liposculpture, the entire body may expand due to increase of size of individual fat cells, and the non-treated areas do not grow significantly out of proportion.

Whether the patient is a candidate for liposculpture depends on the distribution of white fat. Extraperitoneal or subcutaneous fat can be treated whereas intraperitoneal cannot.

Obesity

Obesity is defined as over development of fat in comparison to total body mass. It is not strictly equated to "overweight", since fat is only a possible component of such. Overweight in particular, increases the individual's risk of death and heart disease. This particularly applies to patients with central or "android" obesity rather than peripheral or "gynoid" type of fat distribution. The Body Mass Index (BMI), a measurement of the square of height and weight (in metres and kilogram units) can be helpful in determining whether one is obese or overweight.

- BMI = 20-25 normal weight
- BMI = 25-30 overweight
- BMI > 30 obese

Complications of obesity may include cardiovascular, hepatobiliary, gynaecological, metabolic and, mechanical problems.

Secondary Fat

Before contemplating in treatment, one must distinguish and rule out the possibility of treatable medical causes of Secondary fat.

Conditions may include the followings: hypothyroid, Cushing's syndrome, insulinoma, hypogonadism and a few rare congenital syndromes such as Stein-Leventhal syndrome, Frolich syndrome.

Cellulitis/"Cellulite"

To distinguish from the general term to describe infection or inflammation, "cellulite" can best be described by fat cells caught within fibrous septi connection between skin and muscle fascia. The aetiology is not known except it is more likely to occur in females with thin skin. Various treatment methods have been described and mentioned below but the results are often unpredictable.

Possible Methods of Fat Cells Reduction

A. Fat melting injections-Mesotherapy

Being the least invasive treatment, injection lipolysis is gaining momentum. The first report was for correction of xanthelasmas around the eyes by Dr. Maggiory in 1988 by injecting phosphatidylcholine. At present, full scientific evidence of the mechanism is still missing and research is ongoing. A variation of the chemical with a solvent and benzylalcohol is often used. Tiny fat particles are produced which is then turned into monoglycerides and transported to the liver for final breakdown and excretion.

It is noted that the subcutaneous use of phosphatidylcholine is still "off-label" and not approved by the FDA in the US. Injections to the wrong tissue such as muscle or connective tissue lead to irritation and inflammation. On the other hand, it is reported to be effective in treating fat embolism after multiple injuries and collapsed alveoli of newborn. The effect on treatment of cellulite reduction and spot fat reduction is often promoted. However, an experimental study by the department of dermatology at University of Southern California failed to show any clinical proof of such improvement.

Even in appropriate application, mesotherapy has reported to cause allergic reactions, necrosis, infection, and panniculitis. Other reports have shown soft tissue...
infection due to non-tuberculous mycobacteria following mesotherapy, systemic lupus erythematosus after acetyl-L-carnitine injections.

The American Society for Aesthetics Plastic Surgery cautioned its use in an advisory message last year. To sum up, Dr. Rod Rohrich, chief of plastic surgery at the University of Texas, Southwest Medical Center, indicated injection lipolysis is "scientifically unproven, lacking objective data on safety and efficacy."

**B. Laser Lipolysis**

Nd:Yag laser was recently introduced to Japan and USA after wide acceptance in Europe and Latin America. A Japanese study compared the 1,064 nm lasers at 40Hz and 150mJ and 100 microseconds-long pulses and compared histological study with control group of regular liposuction without irradiation. The tissue was scanned by EM and showed laser "SmartLipo" to be effective in destruction of human fat tissues. However, another report from University of Chile compared randomised double blind clinical trial comparing laser-assisted lipoplasty with regular suction. Analysis of patient and surgeon satisfaction, postoperative recovery evaluation, procedure time, free fatty acids, and DNA proteins was performed. More damage to adiposities was seen in laser-assisted cases. The conclusion was that there were no major clinical differences between the two techniques. Also of note was higher concentration of free fatty acids after laser lipoplasty alert to potential hepatic and renal toxicity.

"SmartLipo" is generally promoted as minimally invasive since surgery can be performed under local anaesthetics via small incisions. However, due to the size of canula used in fat removal is smaller in comparison (1-2mm), comprehensive fat extraction is more difficult compared to regular liposuction. As a result, seroma, haematoma and wound infection in large-scale lipolysis is more likely. Skin puckering and sagging is also reported. On the positive side, the heat generated can result in skin tightening. Although less invasive than traditional liposuction, it is still considered as regular surgery, and carries the same risks. Another report showed complications included bruising, infection, haematoma and scarring. Less common risks are burns of skin, although rare.

SmartLipo is reported to be effective in removal of small pockets of fat collection such as knees, chin, face or neck. It is not intended to replace traditional liposuction

Another report on "low-level laser" by 635-nm diode laser is reported to generate no heat and causes less tissue damage. Combined with tumescent injections of local anaesthetics, it can be performed without general anaesthetics. It is currently used, as "off label" in the U.S. Further evaluation is still ongoing. Another report from Columbia showed similar results with the 635 lasers.

Another report compared the efficacy of 980 nm diode lasers with 1064 nm Nd: Yag. Histological studies were similar between the two wavelengths at equivalent energy settings. Higher total energy is more effective in removing larger volume of fat, high power 980 nm diode can be an alternative to the 1064 nm laser. Other laser technologies include the 1320 nm "CoolLipo" and 1319 nm "Prolipo", using similar applications.

**C. Liposuction**

In the mid 1980s, liposuction was performed with dry suction technique with aspirators alone. This has resulted in high percentage of blood loss in proportion of fat aspiration. Large volume liposuction was not possible without significant anaemia and risks of hypovolaemia.

The introduction of tumescent injections by Klein greatly reduced the above risks. This involved infiltration of subcutaneous fat prior to liposuction with a ratio of more than 1:1 of infiltrate to aspirate. Although the formula varies, the components usually contain a dilute volume of lidocaine, adrenaline and bicarbonate. The volume introduced often creates a firm soft tissue swelling for better precision liposculpture, while providing local anaesthetics and the adrenaline reduces bleeding.

The introduction of subdermic liposuction by gasperoni using smaller cannula in the superficial plane in addition provides better contouring of the body, by causing more skin retraction.

In 1987, Scuderi and D’Andrea introduced the technique of ultrasonic liquefaction of fat prior to liposuction. This was the introduction of modern liposculpture, which has since evolved into the “third generation”. The ultrasound generated at the tip of the canula can break down fat easily since 90% of fat mass volume is made up of liquid. Ultrasound waves generate expansion and compression cycles. Micro bubbles are generated on expansion cycle. Compression cycle, on the other hand, exerts negative pressure. Very thick tissues such as bone and muscle, the cohesion is so high that very high energy is needed to cause tissue destruction. The principle of modern ultrasonic generators are designed for lower energy application only, therefore, more selective to fat cells destruction.

The biological effect of ultrasound can be divided as follows

1. Cavitations phenomenon: as described
2. Micro mechanical effect: direct effect of ultrasound on chromosomes break down and disruption of acro-molecules
3. Thermal effect: electric heat energy, in addition to frictional heat and absorptive acoustic heat

A closer look at the arrangement suggests that compared to fat, denser materials such as muscle can transmit the sound wave faster but due to the intrinsic lower impedances, the energy is passed on with much less damaging effect.

This method not only enables more comprehensive fat destruction and removal, but also reduces the risks of unevenness in traditional liposuction. Also, very fibrous fatty tissues such as the buttocks and back areas and gynaecomastia can be removed with minimal effort. In certain cases, the fibrous septa that contains the fat lobules can be divided and hence reducing the...
appearance of "cellulite" skin dimpling.

However, the procedure is much complex and the ultrasound liposuction is divided into three parts:

1. Tumescent infiltration: Larger quantity is needed to reduce heat build up and the maximum safe duration of ultrasound application is dependent in a close ratio to the total volume of infiltrate used.

2. Ultrasound treatment: The introduction of "VASER" (vibration amplification of sound energy at resonance), also known as third generation ultrasound, enables the use of ultrasound to superficial fat. This is possible due to the wider choice of size of canula, the different number of rings at the tip and the choice of pulsed versus continuous mode. The rings are designed to distribute the ultrasound wave sideways, allowing better skin tightening without burning through the skin in appropriate use of the energy. Pulsed mode allows tissue better thermal recovery. Hoyos and Milled described the technique as "high-definition liposculpture", giving better definition of abdominal wall muscle profile in patients. No skin necrosis was reported but the procedure was time consuming and a high learning curve for the technique.

Richards warned the use of VASER for superficial sculpturing is unforgiving and the result is more operators dependent than previous devices. However, if used appropriately, the results are far superior in body lifts, breast reductions and abdominoplasties. The operating time, however, is twice as long as "power assisted liposuction".

Pinto described the VASER as more tissue selective, preserving more blood vessels and nerves, causing less haematoma and pain, better fat emulsification and more tunnelling was possible. The combination of using smaller canula, reduction of ultrasound energy and better logistics is the reason behind.

Jewell and Fodor reported 77 cases of VASER liposuction with no major complications, compared to 4.9% with 1st and 2nd generation ultrasound liposuction. Meticulous attention is recommended in "superwet" tumescent, skin protection and correct choice of mode of ultrasound.

3. Aspiration of emulsion: Adequately lysed fat should then be removed with appropriate canula, moving symmetrically and evenly in the same subcutaneous plane for optimal results. Previous practice of simultaneous aspiration with ultrasound may not be advisable due to constant reduction of tumescent fluid enhancing the cavitation effect. This is judged to be the most challenging step to obtain a fine result.

Postoperative care may involve one or more of the following: suction drainage, foam pads, compression garment and Endermologie/lymphatic drainage.

Application: The most common and effective areas of treatment are for abdomen; lower back (love handles), chin/neck areas. For ladies, buttocks, thighs, upper back, upper arms, knees and may be breasts (controversial in view of the possibility of long term micro calcification seen in mammogram). For men, it is useful for reduction of gynaecomastia or in combination with surgical excision.

Complications:
Ultrasound assisted liposuction has been relatively safe with no serious complications, and the satisfaction rate is high due to minimally invasive and yet effective technique.

Short-term complications may include thermal injury and skin discoloration. Seroma is the most common problem, reported to be less than 3% and usually self-limiting. With appropriate training and experience, most of the thermal injury complications can be avoided.

Long-term complications have not been reported. Serum triglycerides have been measured before and after ultrasound liposuction and noted interesting enough, the postoperative level is lower, proving that the technique does not increase the risk of fat embolism.

Conclusions

Numerous articles can be seen daily concerning body liposculpture. It is no doubt that appropriate diet control; adequate exercise and body tuning such as Pilatus and aerobics can provide a long lasting nice body contour. Equal number of ideas and suggestions are written without scientific evidence and proven clinical trial in peer-reviewed journals. While it is almost equally disprove to disprove those unrealistic suggestions, we have to reply on our judgement and locally thinking, and not to believe in everything that is written. Even so, some of us are born with certain fat pockets in the body that simply cannot be removed without intervention, no matter how thin. There have been cases while the patient can lose enough weight to create a slim waist and abdomen, the concomitant excessive facial fat loss results in "looking ill" and malnourished.

Liposculpture by mesotherapy is a promising proposition. However, for lack of clinical papers in large volume fat dissolution and the concern with safety of the chemicals is used, we are still waiting for more research data. Laser assisted lipolysis has been approved by the FDA in the US recently. However, reports so far suggested its best application is in small volume fat removal, such as the face, neck and arms. Since it can be performed with local anaesthetics in doctor’s office, it may be most attractive in certain cases, when large volume fat extraction is not necessary.

The most proven and effective method of minimally invasive liposculpture is perhaps ultrasound-assisted liposuction. The principles are sound and the results can be duplicated.

For the abdomen, only two (3-4mm) incisions are necessary, and while only one is needed for treating the lower back "love handles". Recovery is quick, day surgery is possible or an overnight hospital stay is recommended for extensive areas. One can expect to return to non-strenuous work within a few days and delay heavy exercise for 3-4 weeks. This is suitable for
people with thick subcutaneous fat and minimal skin excess/laxity.

However, in selected cases, ultrasound liposuction can be combined with abdominoplasty, plication of the rectus diastasis and skin excision at the same time for ladies after pregnancy. For man with gynaecomastia, it can be combined with subcutaneous mastectomy for optimal reduction of enlarged breasts. Liposuction is also useful in removing large subcutaneous lipomas.

Although the technique is complex, involving three steps: tumescent infiltration (wetting), vaser ultrasound application and fat removal, the results are far superior to other means. The most common complications are aesthetic problems: asymmetry, residual fat, skin dimpling, and prolonged seroma. Serious complications are very rare.

References

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