

Clinical Review Understanding the Differences Between Laser Lipolysis and VASER Ultrasonic Lipoplasty

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Background

Modern lipoplasty was introduced in the late 1970s by Dr. Yves-Gerard Illouz and was accomplished with the infusion of fluid via a blunt cannula accompanied by high-vacuum suction. The 1980s brought the advent of the tumescent technique and lipoplasty was moved from the operating room to the out-patient setting. Today, lipoplasty is the most common cosmetic surgery performed in the United States, with laser lipolysis and ultrasound-assisted lipoplasty (UAL) being two of the most widely used new modalities.

Laser Lipolysis

Laser lipolysis was first developed in Europe and South America in the 1990s, and involves focusing a narrow beam of light across a very short distance, completely destroying the tissue within the target area. During the procedure a small cannula, typically 1.0 millimetre to 2.0 millimetres in diameter, containing a thin laser fiber is inserted into the target area. The cannula is moved back and forth delivering high intensity light energy and causing disruption of tissue, including adipocyte (fat cell) rupture, coagulation of small blood vessels, and reorganisation of the reticular dermis.

VASER Ultrasonic Lipoplasty

VASER ultrasonic lipoplasty utilises the VASER Lipo System, a third-generation UAL device. VASER technology employs mechanical and acoustic forces to emulsify fat within the target area, and unlike laser modalities, does not heat or destroy the fat cells. During body contouring with VASER Lipo, a tumescent fluid is infused throughout the target area. The tumescent fluid naturally contains small gas bubbles on the order of five to 10 microns. As the fluid is infused, the microbubbles become dispersed throughout the tissue matrix. Due to the relatively loose packing of adipose (fatty) tissue, the tumescent fluid surrounds the fat cells, allowing the gas bubbles to infiltrate between individual cells. However, the tight junctions between cells within blood vessel walls and connective tissues prevent gas bubbles from affecting these tissues. The VASER system delivers ultrasound pressure waves, or alternating regions of higher and lower pressure, at 36,000 Hz via a titanium probe. These waves produce a push/pull force on the dispersed gas microbubbles. As the pressure wave pulls on the microbubbles, they expand, increasing their surface area and allowing gas dissolved in the fluid to enter by diffusion. The pressure wave next pushes on the bubble, compressing it and causing some of the gas in the bubble to diffuse back out. Since the bubble is smaller when compressed by the pressure wave, less gas diffuses out during compression than diffuses in when the bubble is under tension. Thus, with the passage of every ultrasound wave, there is an overall net increase in the volume of the gas bubble. This

results in the microbubbles rapidly expanding from five to ten microns to approximately 180 microns, allowing the bubbles to act as a wedge between the fat cells dislodging the cells from the adipose matrix. This process of gas bubble action is called cavitation. Since adipose cells contain no gas, the individual cells are unaffected by this process since they cannot cavitate. Also, since the bubbles cannot intersperse between the cells of blood vessels, nerves, and other similar tissues, the bubble-mediated cavitation action only acts to dislodge the adipose cells, leaving the other tissues unaffected. This is the source of the natural tissue selectivity of VASER technology. As the lipocytes are displaced, they are mixed with the tumescent fluid by a process called acoustic streaming, resulting in a complete emulsion of the fat cells, which are subsequently aspirated. The benefits of the VASER Lipo System include tissue specificity, limited blood loss, adaptability to both small- and large-volume procedures based on physician choice of probe, ability to combine with other procedures, and preservation of fat cell viability. Since individual fat cells remain intact, fat collected during the VASER Lipo procedure may be harvested for autologous fat transfer (AFT). The fat aspirated during VASER Lipo is refined down to small lipocyte packets comprised of two to three fat cells, which supports growth and vascularisation upon reinjection. This is in contrast to the fat aspirated during other liposuction procedures, which may be harvested in large cell packets approximately 50 cells in diameter, and has been associated with central necrosis and sheer force disruption during AFT. Fat cannot be harvested from laser lipolysis, because the procedure completely evaporates or lyses all the cellular structures in contact with the laser tip.

Comparing a 25W Laser with a VASER Probe

A recent study exposed bovine fat infused with saline to laser energy (25W, 980nm, 1-second duration) and to VASER ultrasound energy (100 per cent setting, 3.7 millimetres, two-ring probe, one-second duration). Tissue exposed to the laser reached 50°C (ability to denature proteins) in less than 50 milliseconds and 100°C (boiling point) in 100 milliseconds. Data extrapolation estimated the highest temperature to reach 484°C. In comparison, at one second of use, the tissue exposed to the VASER probe increased only 9°C. The study authors concluded that the laser system produced extremely high, uncontrolled temperatures that were sufficient to vaporise tissue and damage structures within the body. Conversely, the VASER probe did not produce damaging temperatures.

Summary

Advances in lipoplasty have allowed for the feasibility of in-office, wide awake procedures. The availability of multiple modalities, including laser lipolysis and VASER Lipo, offer physicians

and patients the ability to customise procedures. While laser lipolysis has become well known for limiting blood loss and improving recovery time, it is limited to small procedures and does not allow for harvesting of viable fat cells for additional procedures. As more powerful lasers have come onto the market, issues of patient safety and the possibility of severe burns have become more critical. VASER Lipo utilises acoustic forces to safely dislodge adipocytes while protecting surrounding tissues, ultimately producing a clean, smooth aspirate with excellent cell viability, which may be used for concurrent treatments such as AFT.

Dr. Schafer is an internationally recognised expert in ultrasonic technology, with over 25 years of design and development experience. He is currently vice president of the Ultrasonic Industry Association (UIA), Chairman of the National Electrical Manufacturers Association (NEMA) Ultrasound Technical Committee, and serves on the board of governors of the American Institute of Ultrasound in Medicine (AIUM). Dr. Schafer holds a Ph.D. in biomedical engineering from Drexel University, an M.S. in acoustics from Pennsylvania State University and a B.S. in electrical engineering from the Massachusetts Institute of Technology. He has been published over 40 times and has been issued 13 patents. (Reprinted from Sound Surgical Technologies LLC www.vaser.com)

Colombian-based plastic surgeon, Dr. Alfredo Hoyos has gained a reputation for advanced body sculpting with VASER Lipo, known as VASER High Definition LipoSculpture (VHD). Dr Hoyos is keynote speaker at the Cosmetex ACCS CPSA 2010 Conference in Adelaide, 21-24 April, which will be held at Adelaide Convention Centre (<http://www.iceaustralia.com/cosmetex2010>). Here he outlines his experience with VASER.

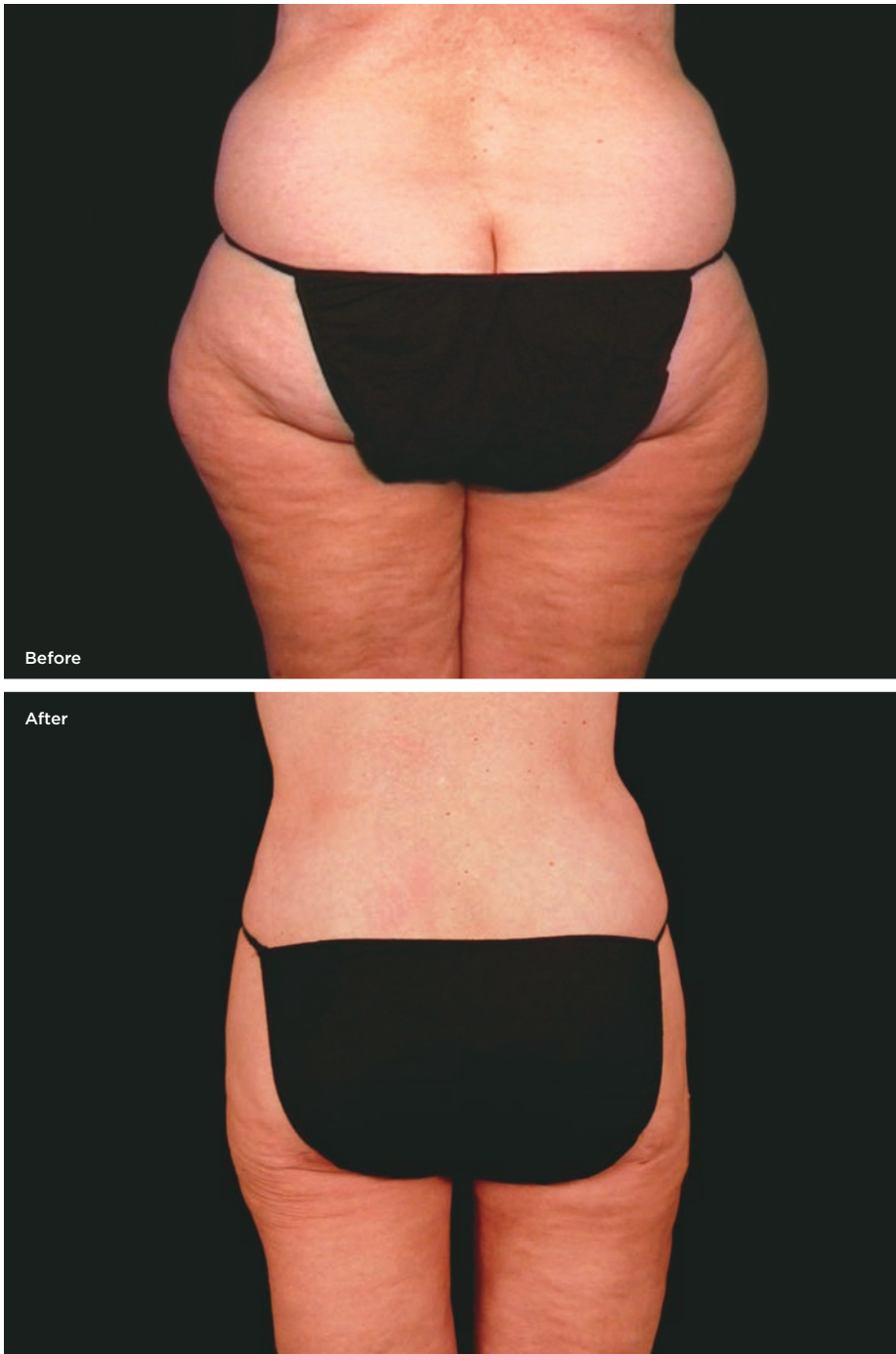
What led you to a career in plastic surgery?

I was always inclined to the sciences, so medicine was a clear option for me. However, the decision to become a plastic surgeon came later. I started med school when I was 15, so of course I had no idea of what I wanted to do at that stage. I was under the impression that I would like to mix science with art, which is my second preference.

What motivated you to develop the VASER High Definition LipoSculpture (VHD) procedure?

Whilst in med school I did a rotation in plastic surgery. I noticed that most of the aesthetic surgeries required a lot of artistic sense and skill. However, when I watched liposuction, I found the procedure lacked this art. I shared my impressions with plastic surgeons, who acknowledged "it lacks creativity and is a somewhat boring procedure, but it brings food to the table!" With that in mind I embarked on incorporating a stronger aesthetic to the procedure which would make lipo more "artistic".

Years later, after my training finished, a young female patient presented seeking lipo. Other



surgeons had turned her down because she was deemed skinny. However what she wanted was a real contour and a more feminine body. She was a model, yet she was not getting any jobs because of her “childish” shape. So this gave me an opportunity to apply the ideas I had designed previously. She became my first HiDef patient.

Can you describe the research and development involved in the refinement of the procedure?

It involved going back to the books and researching previous techniques and literally anything that was published about lipo. To my surprise there were hardly any works published on the relationship between liposuction and artistic anatomical features.

The first concepts behind HiDef were compelled by the patients. Those who wanted more: more athletic looks, a more sculpted contour, etc, however these patients were often previously rejected by surgeons before they came to me and some were taken as psychologically disturbed. But I believe where others say... why? You should ask yourself ... why not?

Traditional lipo has been proclaimed to be a solution to reduce fat, but the indications for it have been contradictory. Liposuction is not for the obese, but also not for the slim. Surgeons have been trying to push the envelope by expanding the horizons in this field, and I think right now we have the proper tools.

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not reach before, essentially - the superficial/subdermal layers of fat - and allow us to work on this layer and gain genuine sculpting capability over the fat.

HiDef involved more technology and art than any other technique. It demanded dedication in studying the superficial anatomy, which is the relationship on the internal structures over the skin, and also the natural dynamic changes in a human condition, such as a body in motion, or with gained or lost weight.

What are the main differences between VHD and conventional liposuction and how does it compare to other advanced liposuction techniques?

As I always say, it's a comparison between cars and drivers. Let us say a technology is a car, ie: tumescent can be a Toyota. So you can have a different range of technologies that can allow a surgeon to perform lipo. The big difference with VASER HiDef is we have also changed the technique. The goal of surgery is driven by how you want the body to look after the surgery, and this aesthetic is completely the opposite of traditional lipo. VASER HiDef shows hills and valleys, where traditional lipo wants to be flat. VHD is a combination of innovative technology and advanced techniques. To achieve this standard of advanced results, you need special technology; so I believe VASER in lipo is the Ferrari of cars, and the High Def, in this case, is like hiring a Formula One racer to drive that Ferrari.

How does the procedure work?

The main concept is to create a three-dimensional image of a shaped and athletic body. We must remember that all of us have the muscles inside; the idea is to make them show through using lipo in different layers. I know the concept can be a little complicated, but it is no more than than sculpting in a 3-D human frame.

Who presents as a suitable candidate? What are the contraindications?

The indications are the same as for a standard liposuction. That said, I must clarify that the traditional concept of lipo is not for the obese; there are other options for obese patients nowadays. In few words, those who present well for VASER HiDef are healthy people with normal weight through to moderate obesity, without excess skin or stretch marks.

My opinion is that some people have privileged metabolism and fat distribution, and others don't. Only five per cent of the population can achieve a six pack or a wonderful shape. So the rest of us mortals deserve a little help, I think.

The other consideration is that most people lack the self motivation to go to the gym every

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day, because they see little or no results. But if they can have the result in advance, surely that would act as the prime motivation for lifestyle change and a better approach to exercise?

How long does the procedure take?

The preparation for VHD is the same as any other surgery: lab tests should be performed, as well as a consultation with an anaesthesiologist, and following

of the surgeon's instructions. The length of the procedure is variable, ranging from two to four hours.

How long is the recovery time? What post-operative care is involved?

The recovery time averages one week, but the final results can be seen only after three to six months. Following an aftercare treatment helps to improve and speed the time for recovery.

Generally, how long do the results last? What's the recommended frequency for 'touch-ups'?

Lipo is in essence, a dynamic surgery. If you have a nose job, the result will last forever, unless you sustain a facial injury. With lipo, if the patient eats too much, they gain weight and if they don't eat enough, they will lose weight. I believe VHD is more stable over time than any other lipo, because of the multilayer management.

What are the possible side effects?

The side effects are the same as a regular lipo. They include: hematoma, infection or contour irregularities, but these are very rare.

What kind of training do plastic surgeons need to go through to be trained in VASER HiDef?

Firstly, VHD is an advanced technique which requires an

experienced surgeon. Secondly, they must undergo a dedicated three-day course under my guidance which jump-starts VASER HiDef. After that, the training usually depends on the surgeon and the number of cases they handle to achieve experience. *Alfredo Hoyos, MD Plastic Surgery. alhoyos@gmail.com, www.alfredohoyos.com*

Dr Ron Bezic is a cosmetic surgeon at **All Saints Cosmedical Clinic**, Darlinghurst, Sydney. Dr Bezic handles numerous liposuction treatments and finds that using Vaser gives precise, smooth results and makes the procedure more comfortable for patients – with less pain and bruising. “With Vaser I can achieve predictable, smooth results, better skin retraction and with less pain involved. As well as targeting the deep and middle layers of fat, Vaser can also remove superficial fat, allowing for overall contouring and sculpting of the body. It is possible to strip away most of the fat and reveal the underlying muscle structure,” says Dr Bezic. 🍷

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