The Latest Technologies to Fight the Bulge

Less invasive technologies give more options for your patients seeking to sculpt their bodies. BY R. STEPHEN MULHOLLAND, MD

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LAST YEAR ALONE, patients underwent about 1 million liposuction treatments, making it the top surgical elective procedure in the United States. Source: American Society for Aesthetic Plastic Surgery

In today's fast-paced world, lifestyle choices, such as fast food diets and inactive couch-bound activities, have increased the waistlines of Americans.

In 2008, the average American man had a waist size of around 40 inches, an increase of 5 inches compared to 40 years ago. The average woman had a waist size of 37 inches last year, an increase of 7 inches over the last 40 years.[1]

More patients are demanding quick fixes to this complex problem. While liposuction is never a substitute for diet and exercise, millions of patients have exhausted all options and still find themselves 10 pounds to 20 pounds over their ideal body weights. These individuals are often good candidates for focal areas of liposuction. They may seek out the treatment to shrink small stubborn areas, as well as garner more dramatic results in larger areas.

Luckily, liposuction techniques and technologies have undergone significant transformations over the last 30 years, moving towards less traumatic and invasive procedures with quicker recovery times. In addition, light and laser sources that make liposuction a gentler treatment also deliver an extra bonus of skin tightening and toning.

First Steps in Liposuction

Liposuction was first popularized in North America in the early 1980s and quickly grew to be the most commonly performed cosmetic plastic surgery. But this technique, known as suction-assisted liposuction (SAL), had limitations.

Surgeons needed to avoid certain areas, such as inner thighs, arms, neck and other small zones, because of the large diameter of the cannulas, which measured 10 mm to 15 mm. In addition, surgeons could only extract less than 1,000 cc of fat, due to potential blood loss.

Of course, new techniques incorporated the infiltration of large volumes of fluid and local anesthesia (tumescent infiltration) and smaller cannula sizes. Tumescent local anesthesia not only eliminated routine blood transfusions, but it elevated liposuction to an outpatient procedure with

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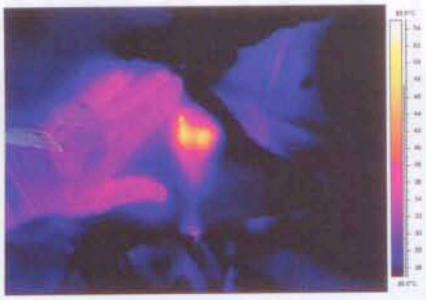

FIGURE 1 **Typical heat distribution shows hot spots associated with laser assisted liposuction.**
Photos courtesy of Dr. Stephen Mulholland

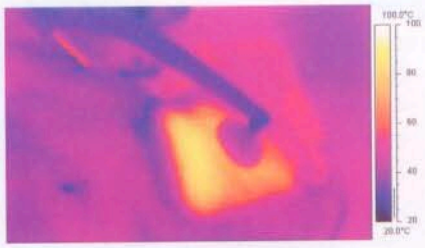

FIGURE 2 **Typical heat distribution shows more even heat distribution associated with radiofrequency assisted liposuction.**

significantly less swelling and postoperative ecchymosis. In addition, smaller diameter cannulas, ranging from 2.0 mm to 4.0 mm, made treatment less traumatic with reduced recovery times. The cannula also reduced the incidences of postoperative irregularities.

These steps in the mid- to late-1980s were among the first to help liposuction gain widespread patient and physician acceptance. But despite this, traditional SAL still raises some concerns and fears, including a significant amount of pain, swelling and bruising.

In addition, patients undergoing this procedure experience only a modest degree of skin area contraction, generally between 7 percent and 11 percent. This is often not enough to avoid skin laxity and skin texture irregularities—especially with larger volume aspirations in marginal skin tones.

Energy Sources for Liposuction

Energy sources are addressing some of the shortcomings of the first reiterations, specifically in the areas of pain, trauma and skin tone. Various energy sources are expanding the scope of liposuction and its mainstream acceptance.

Ultrasound. The first incorporation of

>> MARKET WATCH

Physicians adding body contouring procedures to their menus of service have plenty of modalities to choose from, including laser, water-based and ultrasound technologies. Here's an overview of some of the latest products on the market.

Laser-assisted lipolysis zaps away fat and tightens the skin with a variety of wavelengths and energy levels. **Eleme Medical**'s Smoothlipo contours the chin, arms, knees, abdomen and hips with a 980 nm diode laser. The continuous wave delivery is gentle enough on surrounding skin tissues that patients only experience minor bruising. Similarly, **Osyris**'s Lipotherme uses the continuous wave 980 nm wavelength but also features a pulsed delivery mode for greater skin tightening.

Erbium-based devices such as **Syneron**'s LipoLite 1,064 nm Nd:YAG are ideal for facial contouring. LipoLite can deliver a range of pulse energy up to 800 mJ and pulse duration from 100-800 µsec. This enables the physician to customize treatments for the patient. **Lutronic**'s AccuSculpt 1,444 nm pulsed Nd:YAG system provides controlled deep tissue heating to emulsify fat without harming nerves and vessels. The laser can be used in a variety of areas, including the abdomen, face, neck, inner thighs, flanks, buttocks, knees, back and arms.

The 1,320 nm wavelength is commonly used for treating vascular problems such as spider veins, and **CoolTouch**'s CoolLipo Trio system takes advantage of this function. The CoolLipo Trio 1,320 nm Nd:YAG system performs laser lipolysis, endovenous ablation and nonablative skin resurfacing in one platform. Physicians can expand their services with one purchase.

Other laser-assisted lipolysis devices on the market combine two wavelengths for added versatility. **Palomar's** SlimLipo diode laser melts fat and tightens the skin with two wavelengths. The 924 nm targets the fat, freeing the lipids contained in adipose tissue for easy aspiration. The 975 nm wavelength is absorbed by water in dermal tissue, which tightens the skin.

Frequently used as an adjunct to traditional liposuction, **Sciton**'s ProLipo PLUS Nd:YAG laser blends the 1,064 nm and 1,319 nm wavelengths at 40 watts to melt fat and tighten the skin. Similarly, **Cynosure**'s Smartlipo MPX system blends the 1,064 nm and 1,320 nm wavelengths. The device features temperature and motion sensing to reduce complications such as burns and scarring.

Another form of body contouring, water-assisted liposuction, is performed under local anesthesia with minimal discomfort and fast recovery. **Eclipsemed**'s Body-Jet liposuction uses a gentle pulsating spray of fluid to dislodge fat rather than the aggressive force used in traditional liposuction. The fluid is removed using a simultaneous irrigation/aspiration technique. The AquaShapeFT Lipocollector collects fat for reinjection for fat grafting or harvesting procedures.

For physicians interested in ultrasonic body contouring devices, **Sound Surgical Technologies** features the VASER system, which uses sound waves to emulsify small areas of fat for precision contouring or larger areas for rapid debulking.

Radiofrequency is another advance in body contouring technology. **Invasix**'s BodyTite, is a radiofrequency-assisted liposuction device in clinical trials for FDA approval. The RF energy travels from an internal electrode, which is simultaneously aspirating the coagulated tissue, to an external electrode, resulting in coagulation of adipose, vascular and fibrous tissue. The liquefied tissue is aspirated while the technology heats the soft tissue matrix.

—Compiled by Lauren Meade

energy was ultrasound assisted liposuction (UAL), which was developed in Italy in the early 1990s.

UAL uses a cannula tip that produces high frequency acoustic waves. These waves use selective mechanical destruction, which selectively cavitates and destroys adipose tissue. This action reduces the mechanical efforts to extract the fat tissue, which also reduces trauma and bruising. In addition, the ultrasound emulsifies the tissue, allowing for a more effective and gentle aspiration.

This method can treat fibrotic tissue, common in male patients or patients who have had previous surgery in the treated area. UAL also has some degree of selectivity; blood vessels and connective tissue are more resistant to cavitational action, allowing for less bruising and swelling.

In this procedure, a plastic port protector isolates the skin from the oscillating cannula and minimizes the risk of port burn. The drawback is an increase in the incision size from 5 mm to 8 mm, particularly unfavorable for dark and Asian skin, which has a higher risk of hyperpigmented and hypertrophic scars.

In addition, skin contraction has not been significant with UAL. The temperature increases in the UAL treated areas are due to partial conversion of mechanical energy into heat, and not significantly high enough to induce skin tightening.

Laser-assisted lipolysis. Another method, laser-assisted liposuction, was developed in Europe in the late 1990s and took a few years to gain popularity in the United States, principally on the marketing strength of the SmartLipo brand. Now, almost every laser manufacturer is introducing technology. Approximately 20 different types of lasers, from an equal number of manufacturers, are now available in the market with variations in parameters and features. (See related Market Watch sidebar on new body shaping technologies.)

All these choices perform the same adipocyte liquefaction. However, the laser lipolysis fibers range from 900 nm to 980 nm diodes to infrared wavelengths, most commonly 1064 nm and 1320 nm YAGs. Some wavelengths boast enhanced selective fat absorption and others have more vascular specificity. However, all these lasers create enough heat in the adipose space to induce thermal adipocyte liquification.

The skin tightening feature of laser lipolysis appears best suited to the pulsed infrared wavelengths (1064 nm and 1320 nm) rather than the continuous wave diodes.

LAL, like UAL, is a two stage procedure, performed in one sitting. In the first stage, the physician delivers laser energy to the tumescent adipose tissue through an optical fiber. This action coagulates the adipose tissue, causing heating of the subcutaneous tissue. Next, the liquefied fat is aspirated gently, with less bleeding. Thus, this technology is slower than SAL.

LAL also carries the potential to address skin tone concerns associated with traditional liposuction technology. LAL heats the reticular dermis, causing thermal skin contraction. Although some controversy surrounds the use of subdermal laser heat to induce skin contraction, a recent well designed, randomized, blinded comparative study of traditional SAL vs. LAL shows an average of 17 percent contraction in surface area following LAL while natural contraction after traditional liposuction was 11 percent.[2] Although this study will need validation in other centers, it makes sense that applying the heat directly under the dermis would induce more contraction than applying heat across the epidermis, as we have been doing with RF, laser and infrared laser devices for over a decade.

The inherent feature of LAL is the delivery of power through the tiny fiber having a diameter of less than a square millimeter. This strong concentration of laser energy near the fiber tip creates a risk of subdermal hot spots, which can cause full thickness skin burns, lack of thermal uniformity and undertreated areas. (See Figure 1, which shows typical thermal distribution on the skin after LAL treatment.) The small diameter of the LAL cannula allows a smaller incision port size. However, its flexibility results in less control of the position, especially during treatment of fibrotic tissue.

While LAL provides effective results for the small areas such as the neck or arm, it is not as convenient a method to treat large areas such as the abdomen, thighs or hips due to its relatively slow speed of treatment. The average treatment time for one thermal zone of 5 cm by 5 cm is four to five minutes. For a typical abdominal

RADIOFREQUENCY-ASSISTED LIPOSUCTION

These images show before and aftter results with radiofrequency-assisted lipolysis. Pictures illustrate the patient before the procedure and 12 weeks following. Photos courtesy of Dr. Stephen Mulholland

zone, the laser treatment time is usually longer than 1 hour, and that's before aspiration occurs.

Latest Developments

The latest development in the liposuction evolution uses radiofrequency (RF) energy. This technology was developed in Israel. It is available in Europe, but still awaiting FDA approval.

RF energy delivers a thermal effect to the adipose tissue, skin and subdermal matrix of connective tissue. The technology, radiofrequency-assisted liposuction (RFAL™), uses an electrode configuration with two electrodes: one external and one internal that creates a thermal profile. The external electrode contains a thermal sensor that allows the operator to continuously monitor the skin temperature to ensure desired thermal effects. (See Figure 2 for typical thermal distribution of radiofrequency assisted liposuction.)

In addition, the internal electrode also acts as an aspirating cannula and simultaneously delivers the RF current while aspirating pre-coagulated tissue, saving physicians time and energy, making this a one-step, energy-based procedure.

RFAL also provides real-time, continuous monitoring of the skin's temperature and a RF power cut-off mechanism when the target temperature is reached. This allows physicians to stay and treat in the area without affecting temperatures. The RF energy automatically turns active if the temperature in the zone starts to drop or if the physician moves to a new lower-temperature zone. Physicians can also adjust the cut-off temperature to tailor it to their approaches. Thus, RFAL provides a high speed treatment; simultaneous adipose, vascular and fibrous tissue coagulation; and uniform skin heating.

Initial studies show immediate linear skin contraction of 15 percent and long-term linear contraction of 30 percent to 40 percent over 12 weeks, enhancing the contour results in patients with marginal or compromised laxity.[3] (See photos, illustrating patients before the treatment and typical results obtained 12 weeks following the procedure.) Typical results show 20 percent to 41 percent area contraction.

These features and benefits, particularly the enhanced soft tissue contraction after localized, large volume fat removal, may allow RFAL technology to expand our patient base to those with higher BMI (generally between 28 and 32), and patients with skin laxity who may not have been candidates for existing liposuction techniques. That being said, RFAL is still a new procedure, and we await additional research.

Expanding the Base

All of these changes help us broaden our net, expanding the number of ideal candidates for body sculpting. For example, patients who were previously not good liposuction candidates because of poor skin tone can undergo treatments that tighten and tone—perhaps qualifying them for liposuction down the road.

In addition, these advancements, not the least of which has been the addition of energy devices, have made patients more willing to ask for these services. Thus, what began as a traumatic inpatient surgery that patients feared has come a long way, graduating to a safer outpatient procedure that patients are asking for by name. ■

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