

The role of lasers in noninvasive fat reduction and body contouring

By Laura Ninger

ACCORDING TO DATA FROM A 2008 survey conducted by the American Society of Aesthetic Plastic Surgeons, liposuction is one of the top five cosmetic procedures. While it remains the most effective treatment for fat removal, the disadvantages of liposuction are well known. Therefore, the quest for noninvasive alternatives that will target selected areas of fat to decrease volume and improve cosmetic appearance continues. Ideally, such a treatment would decrease fat deposits without the incisions, anesthesia, surgical risk, damage to surrounding tissues, prolonged recovery time, scarring, and expense typically incurred with liposuction.

Several different types of treatments are currently available or under study for body contouring and fat reduction, using a variety of modalities including laser, radiofrequency current, cryotherapy, ultrasound, massage, and other means. All of these treatments are intended to target localized areas of fat, such as in the hips, abdomen, and thighs (eg, “love handles”; “saddlebags”) and other areas such as the face, arms, and knees. None of the procedures are intended for weight loss in very obese patients.

Laser-Assisted Liposuction

Lasers of various wavelengths (eg, 924, 975, 1064, and 1320 nm) are being used increasingly in conjunction with liposuction, and sometimes without liposuction, to aid the removal of fat and improve the appearance of cellulite. In this minimally invasive procedure, infrared light is delivered via a cannula through a 2- to 3-mm incision, precisely targeting fat and heating it to liquefy cellulite and fatty deposits. Laser-assisted

liposuction potentially improves upon traditional liposuction by emulsifying fat so that it is easier to remove, as well as by

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decreasing blood loss, improving hemostasis, and providing better skin tightening. It is reportedly less painful than traditional liposuction.

Laser Treatment of Cellulite

A distinction should be made between noninvasive treatments for cellulite (i.e., body contouring) and those for fat reduction, according to Mathew Avram, M.D., J.D.,

director of the Massachusetts General Hospital Laser and Cosmetic Center at Harvard Medical School. “The fat removal technologies are geared toward removing fat, making the circumference less, and reducing fat layers. Cellulite is a different entity; it has to do with the architecture of the

skin in women versus men.” Avram believes that the lumpy appearance of cellulite may be due to a lesser degree of reinforcement by connective tissue and a thinner dermis than in men, which may allow bulging of the fat layer into the dermis.

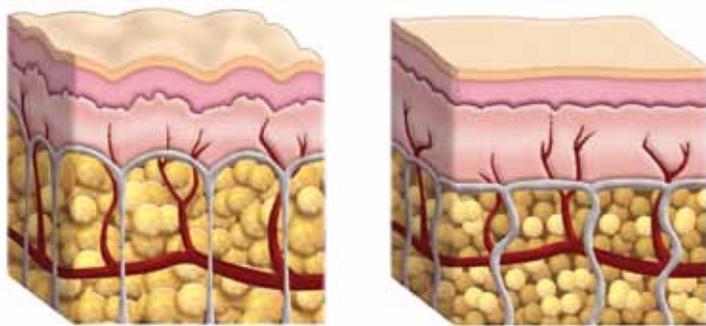
Several devices have been FDA approved for the temporary treatment of cellulite. As a group, these techniques are intended to destroy fat cells, tighten loose skin, build collagen, and thicken the dermis, which will smooth out the skin and make it appear less lumpy. Two of these treatments include a low-level laser component. Massage may also be included with the rationale that if cellulite is caused in part by poor lymphatic drainage, as some researchers believe, massage may improve drainage and combat vascular congestion.

Candidates are relatively healthy patients with specific areas of unwanted fat. Multiple treatments are usually needed, and unlike liposuction, these therapies neither eliminate cellulite nor prevent its recurrence. The reason for this is that “Cellulite is normal human skin exposed to estrogen,” says David J. Goldberg, M.D., J.D., director of Skin, Laser & Surgery Specialists of New York and New Jersey and director of Laser Research in the department of dermatology at Mount Sinai School of Medicine. “Cellulite is not a disease — no matter what treatment is used for cellulite, it will come back.” Therefore, regular maintenance is needed in addition to proper diet and exercise.

The exact role of lasers in some of these devices is uncertain. Experts say it is not clear exactly how effective they are and whether laser (as opposed to suction and deep massage) is the active component. The key to all of the devices incorporating laser, radiofrequency, or ultrasound is the delivery of energy in the form of heat, according to Dr. Goldberg. “Those of us who understand the science of this have moved well beyond the term laser. Laser is just a machine and is one method of delivering heat to the skin.”

Laser Treatment of Fat

Laser applications for reducing fat, as distinct from cellulite resurfacing or skin tightening, are still being researched, and none are yet FDA approved. Laboratory studies have proven that lasers can target fat. Says Dr. Avram, “We know scientifically, at least in



Several devices have been approved by the FDA to treat cellulite. The illustration above compares a cross section of skin with subcutaneous tissue with cellulite (left) to a cellulite-free cross section.

See **NONINVASIVE FAT REDUCTION** on p. 14

BUY OR LEASE from p. 7

one bad decision when you're starting out, especially in this economy, can be catastrophic economically and will put a huge chill on the next potential purchase." •

AAD programs assist with laser purchase/lease

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NONINVASIVE FAT REDUCTION from p. 10

the laboratory, that in certain wavelengths lasers will target the lipids that are in fat preferentially over other targets in the skin. That was a big breakthrough in the lab." Subsequent experiments corroborated these findings in fat samples removed during abdominoplasty.

Success requires that optical energy must reach and be absorbed in the adipose layer without damaging the dermis. Wavelengths used for heating adipose tissue are typically higher than those used for cellulite, such as 1000 to 1250 nm. In a study that he coauthored, Dr. Avram and his colleagues tested a 1210-nm laser and obtained histologic evidence that laser targeted the fat layer with good safety, but drawbacks included swelling, bruising, and pain, possibly due to inadequate skin cooling.

Despite the promise inherent in the "theory of selective photothermolysis," it is still technically difficult. No laser is available on the market for noninvasive fat reduction because "it is something that requires a lot of refinement in terms of what the proper energy is and how long to have the laser exposed to the fat and how painful it might be," explains Dr. Avram. "So at this point we know theoretically, we've seen in the laboratory and in early experiments that we can do this, but we're not at the point yet clinically where we can apply this technology to patients."

Melanie C. Grossman, M.D., a dermatologist and laser specialist in New York City, agrees with this assessment. Based on the research, she says, "It seems to be possible to use laser to noninvasively reach fat and destroy it. How long it will actually take to make a laser that will be clinically used to do that, I do not know."

In the interim, some of the treatments that are used in the US for cellulite treat-

ACNE ROSACEA from p. 8

ments, a new device that combines intense pulsed light with a mild vacuum suction does help extract the comedones. The device, called Isolaz™, "is approved for everything except nodular cystic acne," says Dr. Dover. "We've had some very nice successes in our practice; all of my patients who have tried it have responded except two sisters."

Acne Scarring

Dr. Kauvar points out that lasers are effective against a broad variety of acne scars. "Most people have combinations of different types of scars, some of which need multiple treatment approaches," she says. "If someone has only rolling scars, we can treat them with our fractional non-ablative laser alone for improvement. But if they have boxcar scarring, they may need a combination of subcision and something more aggressive, either a fractional CO2 or a fractional erbium laser. With the development of the fractional non-invasive lasers, which go much deeper than the traditional non-invasive laser, and the fractional ablative (either CO2 or erbium lasers), we're able to improve acne scarring to a much greater extent than we were previously." Treating acne with photodynamic therapy and with some infrared lasers can also help to reduce scarring at the same time, Dr. Kauvar adds.

Lasers in Rosacea Therapy

Light-based therapy is effective against the redness and telangiectasia that characterize rosacea, while medical therapy is used to treat the papules and pustules of inflammatory rosacea. Dr. Dover recom-

ment have also been approved in Canada and/or Europe for fat layer reduction and manufacturers have applied for FDA approval for this indication.

Caution and Optimism

Several noninvasive treatments exist for cellulite, and laser may have a role in the effects observed. Other techniques for fat reduction are showing promise in research studies. "There's a tremendous interest in this field, for obvious reasons, because Americans and people around the world really care about their appearance and how fit they look," says Dr. Avram.

Noninvasive fat removal has obvious potential for patients who want to avoid an invasive liposuction procedure. Says Dr. Grossman, "I think that this whole topic of noninvasive device-based fat reduction and body contouring, whether it be lasers or other types of devices, is very interesting and very encouraging. That patients would be able to have this type of treatment without having to go under the knife or have any sort of anesthesia is incredibly groundbreaking and will make these types of treatments more available to people."

mends treating the inflammatory component first with topical or systemic therapy, then "once that's under control we can bring the patient back. And it's clear that light therapies can help the redness and the telangiectasia quite nicely; in fact, we can achieve up to 90 percent improvement of those components." Dr. Kauvar maintains that "for most people with early rosacea, their rosacea is limited to facial redness, flushing or telangiectasia, and the only way to destroy it is using a laser or an intense pulsed light. Some people, as the rosacea gets more advanced, get a pimple component, and certainly that can be controlled with either topical or oral medications, but if you perform the laser treatment you will not only improve the redness, but you will put the inflammatory component into remission as well."

Dr. Kauvar and Dr. Dover use pulsed dye lasers, KTP lasers and intense pulsed light to treat rosacea. Dr. Katz uses intense pulsed light but adds that "pulsed dye laser by itself, not with aminolevulinic acid," can eliminate telangiectasia in one or two treatments. For patients, who cannot be offered a cure for their rosacea, controlling the obvious symptoms is the next best thing. "If you treat the inflammatory component and still have the redness and telangiectasia, patients are still very embarrassed about their appearance," says Dr. Dover. "That's why I think lasers have made a huge contribution to our ability to make people with rosacea look and feel better about themselves." •

¹Thiboutot, D, et al. New insights into the management of acne: An update from the Global Alliance to Improve Outcomes in Acne Group. *J Am Acad Dermatol* 2009;60 (suppl):S1-S50

The experts believe that several new technologies will emerge over the next few years and will show true clinical effects. However, Dr. Avram warns, "At this point in terms of lasers specifically, we're still in the infancy of this field and we just need to be very skeptical and honest about what's effective and what isn't. Hopefully there will be some truly effective devices. But at least for the next few years, these technologies will target focal areas of excess fat; these are not designed and shouldn't be thought of as competition for liposuction any time in the near future."

Dr. Goldberg also points out that some machines currently being studied for fat reduction do not include lasers. He believes that the immediate future lies in combination treatments: "I think the future of fat removal and noninvasive body contouring will involve more than one device. Most people will be treated with more than one approach because some will be better at tightening skin; some may be better at fat removal. They undoubtedly will include lasers, but a whole variety of other devices, with the goal being to do body contouring and fat removal without surgery. And the day may come when liposuction is no longer being used." •