Noninvasive body contouring is the fastest growing area of cosmetic dermatology. It entails the use of specific technology to optimize the definition, smoothness, and shape of the human body in a safe and effective manner. There are currently 4 leading modalities used for noninvasive body contouring: cryolipolysis, radiofrequency, high-intensity focused ultrasound, and laser therapy.

Devices utilizing these 4 modalities have been found to be safe and effective in reducing subcutaneous fat tissue and improving skin laxity.

Dermatologists utilizing body contouring treatments need to be familiar with available devices to determine which treatment is appropriate for each patient.

Cryolipolysis

Cryolipolysis is unique in that it employs the principle that lipid-rich adipocytes are more susceptible to freezing than surrounding water-rich cells, allowing selective apoptosis while preserving the adjacent structures. As macrophages digest the apoptotic adipocytes, patients experience a decrease in subcutaneous fat volume over the subsequent 2 to 3 months. They have been gaining popularity since 2010, when it was first approved by the US Food and Drug Administration (FDA) for fat reduction in the flank areas; it was later approved for the abdomen in 2012, thighs in 2014, and submental area in 2015. Most recently, cryolipolysis was approved for fat reduction in the arms, back, and buttocks in 2016.
The most popular cryolipolysis device applies suction to the treatment area and vacuums the tissue between 2 cooling panels for 30 to 60 minutes. Clinical studies investigating the safety and efficacy of cryolipolysis have reported a high degree of patient satisfaction with the procedure and only minimal side effects. Common complications of cryolipolysis include erythema, swelling, and sensitivity at the treatment site followed by a lesser incidence of pain, tingling, and bruising, all of which generally resolve within a few weeks of treatment. With the removal of adipocytes, there has been concern regarding elevations in blood lipid levels and liver enzymes; however, these laboratory values have been reported to remain within normal limits during and after cryolipolysis. Of note, patients should be advised of the risk of paradoxical adipose hyperplasia, a rare side effect of cryolipolysis in which a large, demarcated, tender fat mass develops at the treatment site 2 to 3 months after treatment, with an estimated incidence of 1 in 20,000. However, the incidence of paradoxical adipose hyperplasia may be underestimated, as a single practice reported an incidence of 0.47% in 422 cryolipolysis treatments. This complication has not been associated with any of the heat-induced fat reduction modalities.

Cryolipolysis has been found to be safe for all skin types with no reported pigmentary changes. It should not be performed in patients with cold-induced conditions (eg, cryoglobulinemia, cold urticaria) or in those with severe varicose veins or atopic dermatitis. Patients benefitting most from this procedure are those who require only small or moderate amounts of adipose tissue and cellulite removal with separate fat bulges. Interestingly, cryolipolysis also has been used off label to treat pseudogynecomastia in male patients.

Radiofrequency

Radiofrequency has become an important and frequently used modality in cosmetic dermatology. This modality differs from cryolipolysis in that it relies on exploiting the difference in water content and impedance between tissues: the skin has low impedance, whereas fat tissue has high impedance. Radiofrequency induces thermal injury to targeted tissue layers, rather than the cold-induced damage seen in cryolipolysis, through devices that focus thermal energy on tissues with high impedance, inducing apoptosis of cells in the subcutaneous adipose tissue with minimal risk of damaging the epidermis, dermis, and muscle. Ultimately, thermal exposure to 43°C to 45°C over several minutes results in a delayed adipocyte death response. In addition to adipocyte death, RF has been shown to cause denaturation of collagen fibrils, leading to subsequent remodeling, neocollagenesis, and skin tightening.

Radiofrequency devices can be broadly classified as monopolar or bipolar. Bipolar devices generally require more frequent treatments, whereas monopolar devices tend to require fewer treatment sessions with superior circumference and fat reduction. Overall, RF devices have a favorable side effect profile. The most common side effects are erythema and edema at the treatment site lasting less than 24 hours after the procedure. The absence of complications such as abdominal discomfort, erythema, and burning during treatment have been reported, with the exception of 1 case of hyperesthesia on the abdomen that lasted for 3 days after a treatment session. Although RF has beneficial effects on circumference reduction in the abdomen and thighs and can improve the appearance of cellulite, an increase in body weight may occur during treatment. When a localized area of fat such as the thigh is targeted for treatment but the remaining fat cells in the body are not affected, the remaining cells can continue to grow and expand; for instance, although fat cells destroyed with RF will not continue to expand, fat cells in untreated areas may continue to grow due to continued weight gain (eg, from excessive eating), leading to overall weight gain. Thus, patients must understand that weight gain is not an indication of treatment failure after RF or any other method of reversible fat destruction.
High-intensity Focused Ultrasound

High-intensity focused ultrasound recently was introduced as a new treatment modality for body contouring, specifically for skin tightening and rejuvenation. The mechanism of HIFU is similar to that of RF in that it also relies on heat to cause adipocyte apoptosis; however, it utilizes acoustic energy rather than electric energy. High-intensity focused ultrasound devices can deliver energy to the deep dermis, subdermal connective tissue, and fibromuscular layers in precise microcoagulation zones without damage to the epidermis. The high temperature induces a high temperature (≥65°C) within 1 to 3 seconds, causing cell protein coagulation in the targeted area. In addition to its thermal effects, HIFU induces a mechanical effect that disrupts cell membranes immediately, which contributes to the coagulation necrosis process, further promoting necrosis and apoptosis. The effects of these devices can be visualized, as there always is a sharp demarcation between the targeted and untreated tissue. Additionally, microcoagulation is thought to cause gradual skin tightening through collagen contraction and remodeling.30

High-intensity focused ultrasound first received FDA approval for eyebrow lifting and has been used safely and effectively to treat facial and neck skin in a variety of skin types as well as to improve the clinical appearance of the abdomen and thighs. This technique is best suited for patients with mild to moderate laxity of the skin or soft tissue who have a body mass index less than 30 kg/m² and are seeking mild body contouring. The ideal patient is young with normal wound healing, since the clinical response to treatment is partly dependent on new collagen synthesis. Older patients with extensive photoaging or severe skin laxity are not good candidates for HIFU.

There are a variety of available HIFU devices, which utilize special transducers that direct ultrasound energy to a small focal point in the subcutaneous tissues that harmlessly passes through the skin. By using newly developed transducers with different energy outputs and focal depths, dermatologists can tailor HIFU treatment to meet the unique physical characteristics of each patient.

Adverse effects of HIFU are limited to transient pain more mild than with all other body contouring procedures, with several studies reporting no adverse effects. Complications of LLLT generally are fewer and more mild than with all other body contouring procedures, with several studies reporting no adverse effects. Others reported swelling or erythema at the treatment area, pain or tingling during treatment, and increased urination, all of which were temporary and resolved spontaneously. Additionally, although the lipids released from treatment are cleared through the lymphatic system, LLLT has not been shown to increase serum lipid levels.

Conclusion

The field of noninvasive body contouring is undoubtedly growing and will likely continue to rise in popularity as the efficacy and safety of these treatments improve. Although the available technologies vary by mechanism and side effect profiles, several devices have been revealed to be safe and effective in reducing subcutaneous fat tissue and improving skin laxity. However, additional studies are needed to evaluate these devices in a standardized manner, especially considering the high costs associated with treatment. Current studies investigating these devices vary in treatment protocol, treatment area, number and timing of follow-up sessions, and outcome measures, making it challenging to compare the results objectively. Dermatologists offering

Lasers

Laser technology is a rapidly growing modality in noninvasive body contouring. A novel device recently emerged as the first and only FDA-cleared hyperthermic laser for fat reduction and noninvasive body contouring of the abdomen, flanks, back, inner and outer thighs, and submental area. The device is a 1060-nm diode laser that uses thermal energy to destroy adipose tissue, leading to permanent reduction in stubborn fat without surgery or downtime through the use of a flat, nonsuction applicator that is designed for consistent, natural-looking results. The device includes a contact cooling system that helps to limit thermal discomfort and prevent damage to the surface of the skin during the procedure. Initial improvement can be seen as quickly as 6 weeks posttreatment, and optimal results usually occur in as few as 12 weeks. This device was found to have an excellent safety profile and was well tolerated among patients, with only mild pain reported.

Prior to the development of this new 1060-nm diode laser, the initial application of lasers for noninvasive body contouring involved low-level laser therapy (LLLT), also known as cold laser therapy. One device has 5 rotating diode laser heads that work at a wavelength of 635 nm. Treatment sessions last up to 30 minutes, and 6 to 8 sessions are required to obtain optimal results. Low-level laser therapy is a unique modality that is not based on thermal tissue damage, but rather on producing transient microscopic pores in adipocytes that allow lipids to leak out, leading to fat reduction. Because LLLT causes immediate emptying of targeted adipocytes, results are noticeable as soon as treatment is completed; however, there is no necrosis or apoptosis of adipocytes, so the recurrence of fat deposition is believed to be greater when compared to the other modalities. Because the results are temporary, long-term or permanent results should not be expected with LLLT. Depending on the patient’s goals, the temporary nature of the results can be either an advantage or disadvantage: some may prefer immediate results despite gradual diminishment over subsequent months, whereas others may prefer results that progressively increase over time and are more permanent, as seen with cryolipolysis, HIFU, and RF.

Complications of LLLT generally are fewer and more mild than with all other body contouring procedures, with several studies reporting no adverse effects. Others reported swelling or erythema at the treatment area, pain or tingling during treatment, and increased urination, all of which were temporary and resolved spontaneously. Additionally, although the lipids released from treatment are cleared through the lymphatic system, LLLT has not been shown to increase serum lipid levels.
body contouring treatments need to be intimately familiar with the available devices and determine which treatment is appropriate for each patient in order to provide the highest quality care. Most importantly, patients and physicians must discuss individual goals when choosing a body-contouring method in order to maximize patient satisfaction.

REFERENCES