The Role of Skin Tightening in Improving Cellulite

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Doris Hessel
Hessel Dermatologic Clinics

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The Role of Skin Tightening in Improving Cellulite

Doris Hexsel, MD,*† and Camile Hexsel, MD*‡

D. Hexsel has worked as a consultant for Cynosure Inc. and conducted a trial for Syneron Inc. C. Hexsel has indicated no significant interest with commercial supporters.

Cellulite is characterized by alterations to the skin surface of the affected areas, giving an orange peel, cottage cheese, or mattress-like appearance. Depressed lesions are the most frequent and occur because of the presence of fibrous septa pulling the skin down, whereas raised areas result from the projection of underlying fat to the skin surface. These lesions affect mainly women after puberty, and on the posterior upper thighs and buttocks.

With the aging process, the skin becomes hyperdistended and loose, resulting in a draped appearance, and consequently worsening all cellulite lesions. Skin laxity is a significant aggravating factor of cellulite, commonly seen in patients after the fourth decade of life, sometimes earlier. Hexsel and colleagues¹ included this aspect in the Cellulite Severity Scale (CSS).

The clinical evaluation of cellulite is done with the patient in standing position and relaxed gluteus muscles. Skin laxity is notable on examination or can be highlighted by pulling the skin up against gravity, resulting in improvement of the skin surface irregularities (Figure 1A,B).

Technologies for Skin Tightening

Some devices use different technologies alone or in combination to treat skin laxity, such as radio-frequency (RF), infrared (IR) light, microwaves, lasers, ultrasound, and acoustic waves.

Radiofrequency uses an electric current that heats the dermis and the subcutaneous tissue. The devices can be monopolar, bipolar, both, or tripolar. Its mechanism of action (MOA) includes stimulation of neocollagenesis, stimulation of fibroblasts, and skin tightening due to contraction of the connective tissue and fibrous septa.² It is also suggested that RF induces apoptosis of fat cells.³

The IR light MOA is by dermal heating. It causes the collagen denaturation and immediate contraction and thickening of the collagen. This results into the tightening of the skin.⁴

VelaSmooth (Syneron Inc, Irvine, CA) combines IR (680–1,550 nm) with bipolar RF and mechanical massage by vacuum suction. Suction promotes lymphatic drainage, as well as stretching and relaxation of the connective tissue around the fat, inducing remodeling of the fat deposits. VelaShape (Syneron Inc, Irvine, CA) has similar MOA as VelaSmooth with higher potency of RF, allowing faster heating of tissue with shorter treatment duration compared with VelaSmooth.

TriActive (DEKA M.E.L.A., Florence, Italy) has 6 diode lasers (808/810 nm) combined with mechanical...
massage, suction, and localized cooling. The laser acts on collagen stimulation, and massage allows stretching of connective tissue and lymphatic drainage. SmoothShapes (Cynosure Inc., Westford, MA) is a device that combines low-level, dual-wavelength diode laser (650–915 nm) with heat induction and mechanical massage by suction. Both wavelengths induce neocollagenesis; 915 nm induces lipolysis. The 1,440-nm neodymium-doped yttrium aluminum garnet (Nd:YAG) is a laser with a side-firing fiber and temperature-sensing cannula that induces rupture of subcutaneous septa from heat generated and induces the remodeling of the dermis and subcutaneous tissue. Although the MOA of low-level laser (light) therapy (LLLT) on fat is not yet completely elucidated, it is believed that its effects result in the formation of transitory micropores, which allow the release of intracellular lipids from adipocytes.

Microfocused ultrasound causes fractionated injury zones in the superficial musculoaponeurotic system. This MOA induces collagen denaturation and consequent tissue tightening. The postulated MOA of extracorporeal shockwave therapy (ESWT) is to improve skin elasticity, whereas the MOA of acoustic wave therapy (AWT) is to enhance circulation and metabolism, and promote neovascularization and cell proliferation.

Published Results

Alexiades-Armenakas and colleagues conducted a blinded, randomized controlled trial (RCT), split-design (treated side and control) to assess the efficacy of up to 6 unilateral treatments (mean: 4.22) of unipolar RF (Accent, Alma Lasers Ltd., Buffalo Grove, IL) in cellulite Grades II–IV (n = 10). Two blinded investigators assessed the results by photographs with a quantitative 4-point cellulite grading system developed by the author. All participants responded to treatment and showed improvement in dimple density (11.2%), dimple distribution (10.7%), dimple depth (2.5%), and mean score (8 ± 2.8%).

In another RCT, 45 women with cellulite Grade I were included, 28 underwent a treatment with tripolar RF and 17 women were in the placebo group. Cellulite was reduced in 89.3% of the women who underwent RF treatment, and no changes were observed in the placebo group. Fifty patients were treated with RF (ThermaLipo, Thermamedic Medical System, Madrid, Spain) at 6 J/cm² for 12 sessions (end point of 42°C external skin temperature). Based on the photographs at baseline and at the 2-month assessment, the blinded independent clinicians’
assessments of the cellulite appearance demonstrated that results were apparent in 66% of patients.⁷

Nootheti and colleagues assessed 20 women who received 12 treatments with VelaSmooth on one side and TriActive on the other (randomized), resulting in 25% of improvement in cellulite in both sides, roughness improvement was 7% for VelaSmooth versus 25% for TriActive. There was a perceived change grade of cellulite; 75% of subjects showed improvement in the VelaSmooth leg while 55% of subjects showed improvement in the TriActive leg (p > .05 for all comparisons).⁸ In another study, 20 women with moderate cellulite received 8 treatments with VelaSmooth in a randomly selected side. Clinical improvement scores were approximately 50% after treatments (photographs assessed by blinded physicians).⁹ Sadick and Mulholland assessed 35 women who received 8 to 16 VelaSmooth treatments. Based on physician assessment using pretreatment and posttreatment photographs, all patients showed some level of improvement in skin texture and cellulite.¹⁰

In a controlled multicenter study, 83 subjects with mild to moderate cellulite received 8 SmoothShapes treatments on one thigh and none on the contralateral. There was subjective clinical improvement of cellulite appearance when comparing pretreatment and posttreatment photographs.¹¹ Hexsel and colleagues reported the results of shortened treatment protocol with 3 consecutive SmoothShapes treatment sessions: 93% of the 15 patients improved in at least 1 of the 4 CSS categories, whereas 60% improved in both the number and depth of depressions at follow-up visits (7, 30, and 60 days posttreatment).¹²

Fifty-seven patients underwent 1 treatment with a 1,440-nm Nd:YAG. At 6 months posttreatment, blinded evaluators rated at least a 1-point improvement in the appearance of cellulite in 96% of treated sites, assessed using a 5-point, 2-category ordinal photonumeric scale (number of evident dimples and severity of linear undulations/contour irregularities). Blinded evaluators correctly identified baseline versus posttreatment photographs in 95% of cases.¹³ A study of the efficacy of treatment with 1,440-nm pulsed Nd:YAG laser on Grade II and III cellulite (n = 20) showed, with objective measurements at 2 years, an increase over the baseline mean skin elasticity (34%) and mean dermal thickness (11%), and in the average percentage of dermal thickening determined by ultrasound imaging. Treatment efficacy was assessed by cellulite reduction by the Muller–Nurnberger scale. Most patients dropped to a lower severity level of cellulite within the same Grade (II or III), but most did not change the grade of cellulite by that scale.¹⁴ Katz showed that blinded evaluators were able to identify baseline versus posttreatment 2D photographs in 90% of cases (one 1,440 nm Nd:YAG session; n = 15). Improvement in contour irregularities occurred in 94% of the sites. With 3D imaging, the average decrease in skin depressions was 49%, and 66% of patients showed improvement in overall skin contour at 6 months.¹⁵ DiBernardo reported increase in mean skin thickness (as shown by ultrasound) and skin elasticity after single treatment with a 1,440-nm pulsed laser (n = 10). Subjective physician evaluations indicated improvement in the appearance of cellulite.¹⁶

A double-blind RCT evaluated subjects after 6 LLLT sessions using green 532-nm diodes (n = 34) or sham treatment (n = 34) with green light-emitting diode. Nineteen subjects in the LLLT group achieved a decrease of 1 or more stages on the Nurnberger–Muller grading scale (55.9%) versus 3 subjects (8.8%) in the sham-treated group (p < .0001). Low-level laser (light) therapy–treated subjects also showed significant decreases in percent surface area affected by cellulite (p < .0005) versus no change for any parameter among sham-treated subjects.¹⁷

A double-blind RCT enrolled 53 females with cellulite: 25 in the intervention group (6 sessions of focused ESWT [2,000 impulses, 0.35 mJ/mm², plus specific gluteal strength exercise training]) and 10 in the control group (SHAM-ESWT plus specific gluteral strength exercise training). Cellulite Severity Scale was 10.9 ± 3.8 before intervention versus
8.3 ± 4.1 after 12 weeks (p = .001; 95% confidence interval [CI], 1.43–3.62) in the intervention group; and 10.0 ± 3.8 versus 10.1 ± 3.8 (p = .876, 95% CI, 1.1–0.97) in the control group. The change of the CSS in Group A versus Group B was significantly different (p = .001, −24.3 effect size, 95% CI, −36.5 to −12.1). A double-blind RCT (n = 17, treatment group = 11, placebo = 5) evaluated 8 sessions with AWT (D-ACTOR 200). The overall result of skin waviness surface and volume of depressions and elevations at 1 and 3 months of follow-up visits indicates more than medium-sized superiority (Mann-Whitney = 0.6706) in the treatment group. Improvement in the appearance of the cellulite at 3 months after the last session was noted by 4 blinded observers on 2D pictures using a modified Hexsel CSS.

Conclusion

The diagnosis of cellulite is clinical and skin laxity is present in a significant number of patients. In these cases, skin tightening devices can be beneficial. More and larger RCT, using objectives assessments, would establish the real efficacy of each device in promoting skin tightening and consequent improvement of cellulite.

References


Address correspondence and reprint requests to: Doris Hexsel, MD, Dr. Timoteo 792, 90570-040 Porto Alegre, RS, Brazil, or e-mail: doris@hexsel.com.br