May 2011
Vol. 32, No. 5

Dermatology Times®

The Leading Newsmagazine for Dermatologists

www.dermatologytimes.com

ADVANSTAR MEDICAL COMMUNICATIONS GROUP

cosmetic dermatology

light on lasers

Andrei I. Metelitsa, M.D., F.R.C.P.C., is a board-certified dermatologist in private practice in Calgary, Canada.

Joely Kaufman, M.D., is assistant professor of clinical dermatology at the University of Miami Miller School of Medicine and director of lasers for the University of Miami Cosmetic Group.

Jeremy Green, M.D., is a board-certified dermatologist in private practice in Coral Gables, Fla.

Noninvasive innovation

Intense ultrasound therapy for facial, neck skin tightening proves promising

Patients desire cosmetic procedures that are noninvasive and offer minimal downtime and reliable results. Until recently, such options for facial and neck skin tightening were limited to broadband light and monopolar or bipolar radiofrequency devices.

Introduction of an exciting application of ultrasound technology is changing this paradigm. High-intensity focused ultrasound as a therapeutic modality was first employed in the 1950s by neurological surgeons attempting to treat conditions such as Parkinson's disease. Subsequently, intense ultrasound energy (IUS) was investigated for solid-organ malignancies of the prostate, liver and kidney, among others.

Ultrasound induces tissue damage by causing molecules to vibrate, creating frictional mechanical energy that is converted to heat. Above 56°C, rapid thermal toxicity occurs, causing coagulative necrosis (Kennedy JE, et al. *Br J Radiol*. 2003;76(909):590-599). There is a steep temperature gradient between the focus and surrounding tissue, as demonstrated in histological studies in which necrotic tissue was sharply demarcated from the adjacent normal cells (Chen L, Rivens I, Ter Haar G, et al. *Ultrasound Med Biol*. 1993;19(1):67-74).

The Ulthera System (Ulthera) is the first device to employ IUS for face and neck tightening. It uses ultrasound for imaging and treatment. Once the handpiece is applied to the skin, the clinician can visualize 8 mm to the subcutaneous tissues and ensure appropriate treatment delivery. The 4 MHz handpiece delivers IUS to a 4.5 mm depth, while the 7 MHz handpiece can focus energy at 3 mm or 4.5 mm. The handpiece creates about 1 mm^3 thermal injury zones (TIZ) spaced from 0.5 mm to 5.0 mm apart in 25 mm long exposure lines. Heat within the TIZ disrupts the intermolecular peptide bonds of the collagen triple helix (denaturation), resulting in immediate contraction (Kirsch KM, Zelickson BD, Zachary CB, et al. *Arch Dermatol*. 1998;134(10):1255-1259).

An advantage of Ulthera is its ability to deliver thermal energy while sparing the epidermis, reducing the risk of inadvertent injury. IUS is also sharply focused. With monopolar RF, heat energy is delivered diffusely and involves the dermis as well as the subcutaneous tissues (Abraham MT, Ross EV. *Facial Plast Surg*. 2005;21(1):65-73).

In 2007, a group with Massachusetts Eye and Ear Infirmary introduced the device to the scientific literature with a gross and histologic study of its effects on the facial skin of six human cadaveric heads (White WM, Makin IR, Barthe PG, et al. *Arch Facial Plast Surg*. 2007;9(1):22-29). They showed the device produced discrete zones of thermal-induced coagulative necrosis with thickened collagen bundles, sparing surrounding tissue including the epidermis and deep to the SMAS. It produced a dose-

> One distinct advantage of Ulthera versus other available tightening options is its ability to deliver thermal energy while sparing the epidermis.

response pattern whereby increased energy led to increased size of the cigar-shaped TIZs.

The same group performed the first clinical study of Ulthera, treating the periauricular skin of 15 patients scheduled to undergo facelift surgery (Gliklich RE, White WM, Slayton MH, et al. *Arch Facial Plast Surg.* 2007;9(2):88-95). Topical lidocaine was applied prior to the procedure. Most patients found the treatment produced slight to mild discomfort and resulted in transient erythema. Histologic examination of the treated area confirmed a linear pattern of TIZ of consistent sizes and at consistent depths.

The first study to assess ultrasound tightening on live patients was performed at the Northwestern University (Alam M, White LE, Martin N, et al. *J Am Acad Dermatol.* 2010;62(2):). Thirty-five patients received a single ultrasound treatment to the forehead, temples, cheeks, submental area and side of the neck. The investigators applied topical anesthetic for 45 minutes and completed the treatment in 15 to 25 minutes. All patients developed trace edema and erythema and on average rated the pain as three out of 10.

At 90 days follow-up, 86 percent of the cohort was judged by blinded clinicians assessing standardized photographs to demonstrate a clinically significant browlift. Objective measurements showed a mean brow height elevation of 1.7 mm. The authors emphasized that efficacy was not optimized, as one pass was performed at a single energy density and single depth. The device has yielded similar results in clinical settings.

Ulthera is cleared by the Food and Drug Administration for treatment of the face and neck, with a specific indication for browlift. Browlift studies were performed using a validated protocol previously used to study the efficacy of a monopolar radiofrequency tightening device (Fitzpatrick R, Geronemus R, Goldberg D, et al. *Lasers Surg Med.* 2003;33(4):232-242). Using anatomic landmarks, objective browlift is demonstrable. The standardized assessment of low face/neck skin laxity has proven challenging.

Based on the published data and the authors' experience, IUS has potential to deliver results safely and tolerably. DT

Disclosures: Drs. Kaufman, Green and Metelitsa report no relevant financial interests.