ABOUT THE AUTHOR

Brittany Waller, MD

Dr. Brittany Waller is a board-certified dermatologist in Canada and the United States of America. Currently practicing in Toronto and Peterborough, Dr. Waller is well versed in pediatric, adult and cosmetic dermatology, with a focus on aesthetic medicine. Dr. Waller first obtained a Bachelor of Science degree in microbiology, followed by a medical degree at the University of Saskatchewan. She completed her 5-year dermatology residency and a subspecialty fellowship in dermatologic laser surgery and aesthetic dermatology through the University of Toronto. Dr. Waller has experience in clinical trials and has given many presentations at scientific conferences both locally and abroad. Dr. Waller has authored numerous publications in peer-reviewed journals, is often quoted in media features and has won awards in areas of medical education and quality improvement.

SKIPPING THE SCALPEL: UPDATES ON NON-INVASIVE SKIN TIGHTENING

Introduction

The cosmetic consult is often the initial step in a patient's positive aging journey. It is a moment where the patient may feel at their most vulnerable, stripped of the usual makeup they might use to make themselves feel better, or commonly, to hide perceived imperfections. The patient may be excited, nervous, or hopeful that in your hands their aesthetic goals will be reached. Patients may arrive informed, they may have "no idea where to start" or may want the "same thing" that a friend of a friend achieved under your care. It is the physician's expertise that will guide both the discussion and the recommendations that are made. The initial consult helps to establish patient goals and expectations and is a foundation for a successful treatment plan. Observing the patient as they discuss their area(s) of concern is often accompanied by their self-analysis in the mirror, words they associate with how they feel, or occasionally, to the exact physical goals they hope to achieve. "I just wish I could get a little lift", the patient might say as they pull along their zygomatic arch and jawline. It comes as no surprise to experienced clinicians that discussions around the concepts of "lifting" and "tightening" frequently permeate the cosmetic consultation.

Discovering effective methods of non-invasive and minimally invasive correction of skin laxity have long been elusive goals of aesthetic medicine, with patient demand for such services increasing over 600% in the past 15 years.[1] Providing solutions to patients with minimal downtime, while still delivering impactful results, is often a challenge given the multifactorial nature of laxity. While metabolic and behavioural factors such as age, smoking and weight loss may contribute, the biology of skin laxity is a complex process. Decreasing skin elasticity, bone resorption, muscle atrophy and connective tissue changes all lead to the dreaded "sag". Is skin tightening without a scalpel still a myth, or is it now a reality?

The following review will outline selected in-office treatments with the primary objective to improve skin laxity, and to tighten or firm the patient's skin. Readers should note that many dermatologic procedures and devices can indirectly contribute to skin tightening, however this article will focus on those with this outcome as their primary treatment objective (**Table 1**).

Injectables
Hyaluronic Acid
Calcium Hydroxylapatite
Poly-L-Lactic Acid
Devices
Microfocused Ultrasound with Visualization (Ultherapy®)
Non-Invasive Radiofrequency (Thermage®, INFINI®, Profound® RF, Exilis®, Morpheus8®)

Table 1. *Select Non and Minimally Invasive Modalities for Skin Laxity Improvement; courtesy of Brittany Waller, MD*

Hyaluronic Acid Fillers

Addressing volume deficiencies with hyaluronic acid (HA) can improve not only the treatment area, but also have a positive impact elsewhere, as volume loss and facial proportions become more balanced. The satisfaction of filling the mid face and noticing improvement in tear troughs, nasolabial folds, marionette region or jawline is rewarding for both patient and injector alike.

While traditionally used to volumize or restore structure lost as part of the aging process, the injection of microaliquots of HA into large areas of the dermis has recently been shown to induce neocollagenesis and enhance skin turgor and firmness.[2] The hydrophilic nature of HA also contributes to positive effects in skin elasticity, hydration and structure.[2] A more brighter and smooth surface appearance can be achieved after a series of treatments.[2] The most common adverse events while using a microaliquot HA injection technique include bruising and edema but are generally minimal and well tolerated.

Calcium Hydroxylapatite

Calcium hydroxylapatite microspheres (CaHA, Radiesse®; Merz Pharmaceuticals GmbH, Frankfurt, Germany) comprise biodegradable particles in an aqueous carboxylmethyl cellulose gel carrier.[3] After injection, the particles induce histiocytic and fibroblastic response, acting as a scaffold for new tissue formation and stimulate collagen and elastin production around the implant for sustained aesthetic improvement.[4]

CaHA is approved to correct moderate-to-severe folds/wrinkles and to address soft-tissue volume loss in the face and hands.[5] More recently, subdermal injection using dilute CaHA has been found to improve skin laxity without creating a volumizing effect.[4] CaHA, a highly viscoelastic product, is typically suited for supraperiosteal, subdermal and deep-dermal placement but can be injected superficially for dermal rejuvenation when hyperdiluted.[6] When given as a subdermal wash across the treatment area, hyperdiluted CaHA is felt to be more biostimulatory than the undiluted form. Hyperdiluted CaHA encourages targeted neocollagenesis in the injection area to improve laxity and overall skin quality in the mid- and lower face, neck, decolletage, upper arms, abdomen, upper legs and buttocks. Dilution ratios of at least 1:1 for pan facial rejuvenation and 1:2-1:6 for neck, decolletage and body are often reported in the literature.[4]

Treatments are often used as an adjunct to volume augmentation or combined with additional modalities such as energy-based devices for optimal results. Adverse events include bruising, swelling, pain and induration. In thinner and darker skin types, too-superficial product placement may lead to additional adverse events such as product visibility and hyperpigmentation.[7]

Poly-L-Lactic Acid

Poly-L-lactic acid (PLLA) is a biodegradable, biocompatible, synthetic polymer from the alpha-hydroxy-acid family.[8] PLLA was initially approved by the FDA in 2004 for the treatment of facial lipoatrophy associated with human immunodeficiency virus, with approval for cosmetic indications in immunocompetent patients achieved in 2009.[8] Sculptra® (Dermik Laboratories, Bridgewater, NJ) is a commercially available injectable implant that contains microparticles of PLLA in a carboxymethylcellulose and mannitol powder. After reconstitution, Sculptra® is injected into the reticular dermis/subcutaneous plane, stimulating the production of fibroblasts, subsequently leading to collagen production and gradual increase in facial volume after a series of treatments.[9]

The collagen boosting response of hyperdiluted PLLA has also been explored off-label in the neck, chest and body for rejuvenation. Similar to CaHA, when hyperdiluted, the effects of PLLA are thought to be more biostimulatory than volumizing in nature.[10] Even distribution of the product is of utmost importance for minimizing the appearance of papules, nodules and granuloma formation. Most adverse events are mild, including bruising, erythema and edema which typically resolves in a matter of days.[9]

Microfocused Ultrasound with Visualization

Microfocused ultrasound with visualization (MFU-V) (Ultherapy®, Ulthera Inc, Mesa, AZ) is a Health Canada approved treatment for non-invasive eyebrow, submental and neck lift as well as for improvement in lines and wrinkles on the décolleté.[11] Ultrasound imaging is incorporated as part of the treatment protocol to visualize treatment target and to assess proper coupling of the transducer to the skin.[12]

MFU-V is designed to produce microthermal zones of coagulation in the mid-to-deep reticular dermis and sub-dermal fibromuscular layers including the superficial musculoaponeurotic system (SMAS).[12] A wound-healing response resulting in neocollagenesis and tissue contraction occurs, while sparing the papillary dermis and epidermal layers of the skin (**Figure 1**).[12]

While traditionally a facial rejuvenation treatment, MFU-V has more recently used on the neck, chest and body to promote skin tightening and mild-to-moderate lifting in the appropriate candidate. With little to no downtime, MFU-V is one of the most in-demand non-surgical skin tightening treatments available. Results typically appear within 3-6 months and usually only require one or two treatments, making it an attractive modality for patients. Adverse events including pain, erythema, bruising and swelling are typically transient and mild, making this an excellent treatment in the appropriate patient looking to improve skin quality while managing a busy schedule.

Non-Invasive Radiofrequency

Radiofrequency (RF) energy is a form of electromagnetic current that can be delivered through various tissues including skin, fat and muscle to generate thermal energy.[13] Unlike lasers which target chromophores, RF generates heat because of different tissue resistance or impedance to the electromagnetic current giving desired therapeutic benefits.[12] When RF is applied to skin and soft tissue, contraction occurs secondary to (1) cleavage of hydrogen bonds in collagen triple helix leading to shortening and thickening of collagen fibrils and (2) initiation of a wound healing cascade to trigger neocollagenesis, neoangiogenesis and elastin reorganization over the subsequent 3-4 months.[1]

While the first RF device approved in 2002 was monopolar in nature (ThermaCool®; Thermage Inc., Hayward, Calif), more sophisticated devices including bipolar, multipolar and fractional RF now exist. Thermage®, Profound® RF, Exilis®, and Morpheus8® are just some of the devices available on the market today. The technology has been shown to be a safe and effective method to obtain soft tissue tightening and lifting of the skin on the neck, hands and body. RF technology is often combined with other modalities including microneedling (INFINI®, Lutronic, Goyang City, South Korea) or intense pulsed light (IPL) for improved cosmetic benefit.[14]

Contraindications include elderly patients with thin skin, autoimmune or collagen vascular disease, smoking, patients on anti-inflammatory medications (which may impair collagen remodeling) and the presence of a pacemaker or other implantable device.[1] In addition to skin tightening, RF devices are being used for fat reduction, and will likely continue to see expanded cosmetic indications in the future.

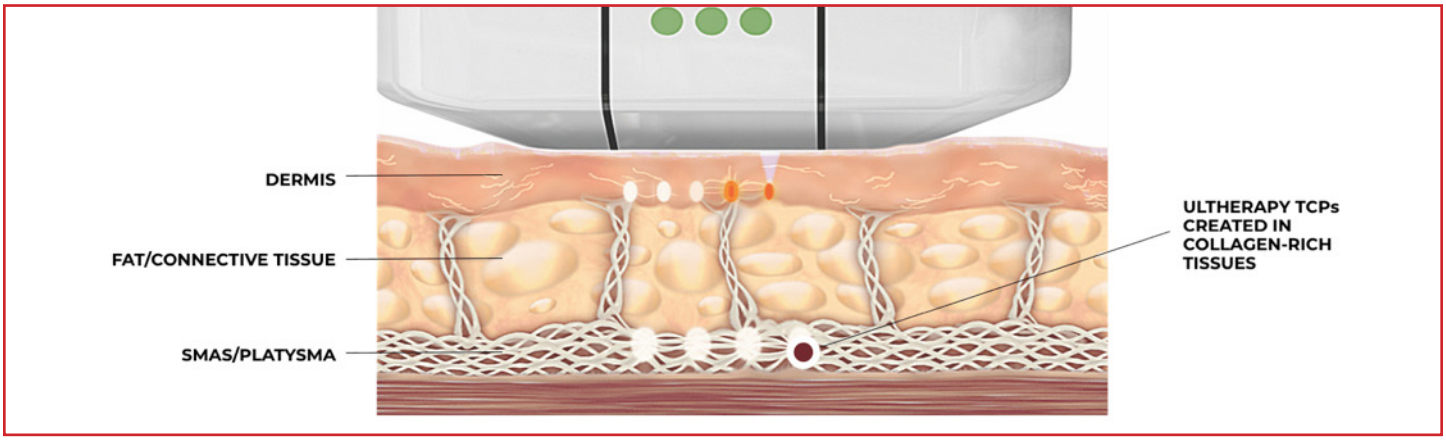

Figure 1. *Proposed Mechanism of Action of Ultherapy®. Microfocused ultrasound precisely targets dermal and subcutaneous tissues to create thermal coagulation points (TCPs), heating tissues to the optimal temperature for collagen contraction, denaturation and neocollagenesis. Merz Aesthetics, www.Ultherapy.com*

Conclusions

As patient demand for non-invasive skin tightening continues to grow, further technologies and innovations will likely emerge. It is important to note that neocollagenesis, elastin reorganization and the resulting lift or tightening effect does take time and often requires a series of treatments. Depending on the modality used, results may take 3-6 months to fully materialize, thus many of the above procedures are best suited to patients who are properly counselled on goals and expectations of treatment results.

As aesthetic specialists, in addition to offering novel treatments and procedures, it is also important to practice restraint where appropriate. The clinician must identify the limitations of each treatment modality and patient selection remains of utmost importance. Adverse effects including infection, skin necrosis, and scarring are possible with each of the technologies. Non-invasive skin tightening treatments may be suitable for those seeking modest-to-moderate improvement, with surgery still being the gold standard in many cases. Setting realistic expectations is of paramount importance to ensure positive outcomes, optimal patient satisfaction and to avoid disappointment.

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