Improving the Clinical Response of Skin Tightening By "Targeted Temperature" Subdermal RF Probe Heating Using a Method of Subsurface Temperature Monitoring Combined with Skin Surface Infrared Imaging.

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Background: "Making skin tighter without surgery" is perhaps the most common patient request in aesthetics. Gaining for the patient a consistent result of desired tightening remains today in aesthetic medicine still challenging. One of the challenges is that all FDA cleared methods of skin tightening rely on transdermal delivery of energy, energy whether ultrasound, laser, whether 1320nm, 1440nm, or 1064nm, or radiofrequency (RF), all of these applications are energy that is flowing from outside of the skin into and thru the skin.

How to place and work with that energy directly beneath the skin, and to place that energy where the tightening is needed, whether that is right beneath the skin, or in the structural collagen of mid fat, or deeper to tighten the collagen over muscles and do so safely, simply hasn't existed. Lasers have been used, but current laser use beneath the skin is associated with getting rid of fat, and "getting rid of fat" in the face and neck that gets thinner as we age, may simply be going in the wrong direction.



Safe beneath the skin use would need (1) small size (2) blunt tip to avoid trauma, (3) tight energy confinement for control, (4) most importantly "feed back" loop monitoring. What does that mean? - the small size blunt probe needs to be computer "smart", that it can sense temperature and be able to turn it self instantly off if the temperature is too high, even by a fraction of a degree, and (5) and being able to have a destination, which is being able to see, to actually image the skin surface temperature, to be better able to target the desired temperature elevation in the skin that will best enable skin tightening.

Image of Desired Skin Surface Temperature



Thermistor controlled subdermal skin tightening (ThermiTight) using ThermiRFTM (ThermAesthetics) presently off label, is the only subsurface method of skin tightening that meets these above requirements, that combines: (1) Tight energy confinement, at 50 degrees C, the ThermiTight isotherm is limited to a 3 mm radius. (2) The 18 gauge, 10cm length probe combines small size, and bluntness of the tip with auto feed back loop temperature sensitive monitoring. (3) Skin surface temperature "targeted endpoint" imaging both for the purposes of skin safety, and for better achieving a homogeneous pattern of skin heating as seen with the use of the FLIRTM infrared camera

Methods: Subsurface RF probe heating and monitoring were combined with simultaneous skin surface thermal imaging in 47 procedures of which 16 procedures were the under-chin neck and jowl and 24 procedures were limited to the under-chin neck. After tumescence with lidocaine 0.125% with epinephrine dilution of 1:800,000, with preheating of the tumescent fluid to 37 degrees, through percutaneous entry the 18 gauge blunt RF probe was introduced into the subcutaneous plane through an 11-blade point entry with a 16-gauge dilator, through a lateral mandibular point of entry as well as two midline points of entry. The subsurface RF probe temperature was set at a default not to exceed of settings between 50 to 60 degrees C, with an average of 56.4 degrees. Skin maximum surface thermal imaged temperatures, i.e. skin targeted temperatures were 41+/- 4 degrees C, as measured by FLIR infrared imaging. This was in contrast to the average peak temperature of hand held "gun" temperature peaks of 37+/- 2.5 degrees C.

Syringe assisted fat aspiration was performed with both 16 and 14 gauge Klein micro cannulas. To note 21 patients had less than 1 cc of lipo-aspirant, of which 14 patients had no aspiration.

Safety: With an average skin surface temperature of 41+/-4 degrees C, as measured with infrared FLIR imaging and an average subsurface endpoint of 56.4 +/-7 degrees, only one patient of 47 procedures, experienced focal surface vesiculation, which fully resolved. This was at an unintended surface focal

area endpoint of 49 degrees C, as measured by infrared imaging in contrast to 42 degrees C as measured with the more usual means of temperature measurement, a hand held temperature "gun". As a general observation the temperature peaks as seen with FLIR infrared camera imaging, were not "seen" with the hand held temperature measuring devices.

Patient Satisfaction: "Would you repeat your procedure again, and would you recommend this procedure to a friend?" Of 47 patients, 43, answered, "Yes", i.e. 91%.

Conclusion: Subsurface use of RF probe delivery of thermal energy for the purposes of both skin and beneath the skin collagen structure of fat and fascia can safely be administered when subsurface real time temperature monitoring with auto feed back loop temperature limits are combined with skin surface infrared thermal imaging, both for safety limits as to skin surface heating, but as well to target a desired endpoint of sustained temperature elevation to best achieve a clinical delayed endpoint of observed skin tightening.

