How Can We Improve Sagging Skin and Deep Wrinkles?

By L'ACADEMIE, Editor

Treating sagging skin and deep wrinkles

As people age, the collagen and elastic fibers that make up the dermal structure change. This "skin aging" can happen intrinsically through the passing of time and a variety of facial muscle movement and extrinsically through the damaging effects of the environment, especially chronic exposure to the ultraviolet component of sunlight.

This combination of chronological aging and photoaging gradually deprives the dermis of its natural strength provided by the collagen fibers, and its elasticity, the ability of the elastic fibers to reform skin when it is deformed. Clinically this first appears in the form of small folds and wrinkling in those areas over the muscles, which make us smile or frown. As these folds get larger they are gradually echoed in the upper layers of the dermis, which results in the appearance of wrinkles.

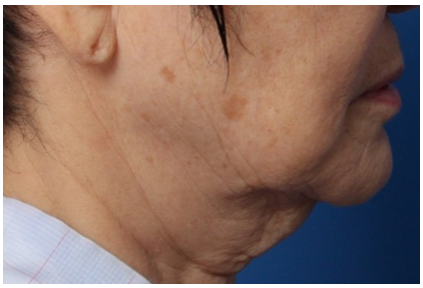
In addition, this double loss of strength and elasticity means that the skin loses its power to resist the downwards pull of the force of gravity, resulting in gradually increased drooping skin in the lower part of the face and neck, forming noticeably visible jowls. These anatomical sequelae of aging result in adverse changes to the outward appearance of the face, such as sagging skin and deep wrinkles.

Unfortunately, these visible symptoms are the hardest to treat as they are representative of the contour changes of the deep layers rather than the reflective characteristics of the skin.

Neocollagenesis and neoelastogenesis

Relevant research in the literature suggests that bipolar fractional radiofrequency treatment induces the formation of new elastin and collagen via, neoelastogenesis and neocollagenesis respectively. Various studies of human tissue have show that coagulation occurs when the when the temperature of the dermal layer has been raised to around 65°C - 80°C within a matter if milliseconds to seconds. At this ideal temperature range, a volumetric coagulation zone can be acquired, i.e., controlled damage which starts the body's natural wound healing process, leading to neocollagenesis and neoelastogenesis.)

In additional to creation of these new dermal fibers, remodeling of the existing dermal structure occurs in the final stage of wound healing. In the case of many purported "skin tightening" methods, a much lower bulk temperature range is reached in the dermis, from around 42° - 55°. This leads to sub-coagulative protein denaturation and degradation that result in mild inflammatory based collagen remodeling or best case (55°) moderate collagen restructuring. Monopolar RF technology, where the delivery electrode is placed over the target tissue and the return electrode, usually a large rectangle type electrode, is fixed to a distant part of the body, induces bulk heating, targeting a 43°C - 55°C temperature level. Due to the collagen denaturation and degradation that occur at this temperature level, the target tissue can be partially and temporarily damaged and constricted, and as such the degree and consistency of results can be quite variable from patient to patient. This "bulk heating" approach, should not be confused with the novel tissue building approach, which requires fractional irreversible tissue coagulation to force the foundational rebuilding of the collagen and elastic fibers that make upthe skin's dermal matrix.



Courtesy of JY Choi, MD, S.Korea

The key to volume creation is achieving the right temperature

In order to improve both sagging skin (multi-layered skin laxity) and deep wrinkles, the appropriate amount of fractional tissue damage must be created with a sufficient amount of density at the correct depths within the coagulation temperature range. It is theorized that this approach is the most likely to consistently treat sagging skin of a variety of skin thicknesses by creating both neocollagenesis and neoelastogenesis.

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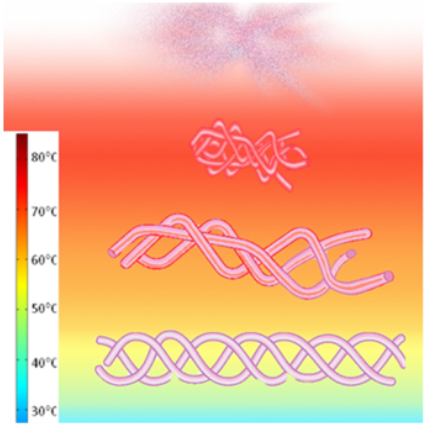


Too Hot

Fractional Tissue Ablation
= Tissue Removal

Just Right

Fractional Tissue Coagulation
= Tissue Rebuilding

Too Cool

Strong Bulk Heating with Surface Skin Cooling
= Partial Collagen Remodeling

Irregular Bulk Heating, Skin Temp 41 - 42℃
= Possible Superficial Collagen Remodeling

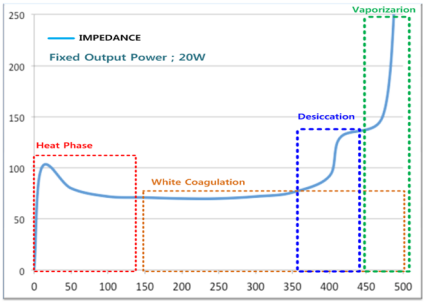
How to control the temperature and create a volumetric coagulation zone in the tissue

The first and most important task after establishing what the correct fractional target tissue temperature should be (65-80°C) is to know if you are reaching this temperature with each pulse during the treatment. This is an extremely difficult task because the skin's reaction to the energy delivered is effectively 'blind' to the treatment provider, i.e., we cannot see deep into the tissue to measure the temperature.

One of the ways that could be used to measure the real time internal skin temperature would be to place a temperature sensor inside each of the treatment needle electrodes, to make sure that the target temperature is reached.

While being the most accurate measuring tool, hollow needles are required to fit such temperature sensors, and therefore this greatly increases the size of the treatment needle. In addition this also greatly reduces the internal strength (hollow versus solid) increasing the risk of needle bending during treatment.

Recent developments in the analysis of the histological effect of both electrical resistance and energy have suggested that measuring the skin impedance in real time during the treatment can also provide a novel method for establishing tissue temperature while ensuring the highest strength and smallest diameters of the insertion needle-electrodes. Joule's law tells us that, when electricity passing through a conductor encounters resistance, or impedance, heat is generated: this is called Joule heating. When you apply the Joule heating model to dermal tissue, a small rise in temperature initially lowers localized skin resistance while high temperature changes that cross a certain threshold resulting in a significant and fast rise in local tissue resistance. Consider the figure above which shows a theoretical model of delivering a continuous 20 W to the target tissue over an exposure time of 500 ms.



When the tissue is first exposed to the electric current, the impedance initially is high and then quickly decreases, due to general warming of the target tissue: skin conductivity increases, resulting in lower electrical resistance until the reaction starts to stabilize. This initial effect of the tissue impedance can be shown as a function of skin temperature, where the issue temperature starts to increase. then plateaus as the collagen denaturation process and resultant coagulation of local tissue equalizes the localized electrical resistance. This phase can be called the initial heating phase where tissue temperature starts to increase, followed by a period of stability during which coagulation starts to occur at the ideal stable temperature range of 65° - 80°C.

However, if the power remains constant, the local tissue temperature then starts to increase further which in turn can drastically change the localized electrical resistance. This first results in desiccation of the tissue which occurs at temperatures > 80°C, If the temperature is allowed to further increase to 95°C or more the remaining localized water content can reach boiling point, resulting in vaporization of

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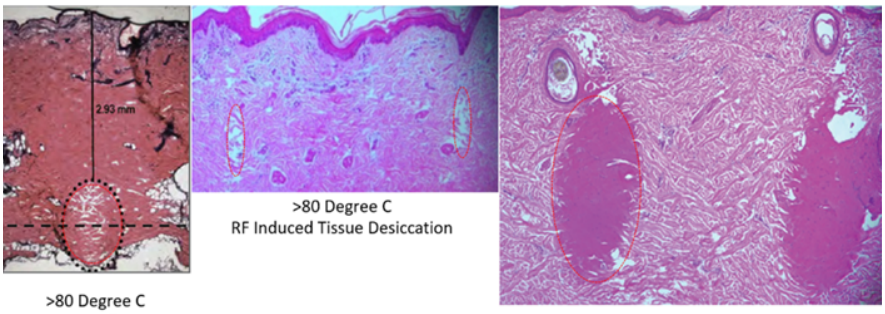


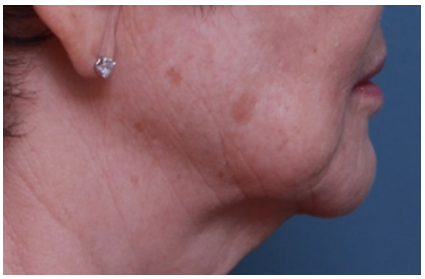
tissue creating voids in the dermis, and a complete loss of localized conductivity. If this occurs at a much faster rate than desired where the electrodes reach 80°C+ before and extended period of 65 - 80°C, it will drastically effect the size and shape of the effective treatment volume around the needle-electrodes.

To combat this effect and ensure only coagulation is taking place, the Genius intelligently monitors the impedance constantly every millisecond, stopping the pulse if the temperature reaches 80°C+.,

n other words, if the tissue impedance is measured in real time during treatment and the RF generator produces smooth flat power to the tissue., this intelligent feedback loop ensures that for each pulse at each layer of tissue ONLY tissue coagulation is achieved at the most apprporiate temperature. In addition with a feedback system of this type the longer the energy can be delivered within this range the larger the volumetric coagulation zone can be created. This results in a tunable injury size free from risk of over-heating and resulting in an undesired tissue response around the electrodes. For the operator this means a high degree of probability and consistency of energy delivery which overall leads to higher treatment efficacy. Both providers and patient can therefore expect a consistency of the theremodeling process which "Geniusly" results in turning back the skin aging clock, from the inside.

RF with real time impedance energy feedback control

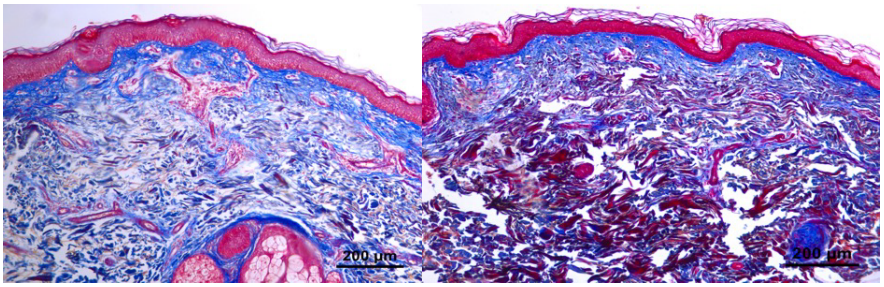
The clinical results below show the excellent treatment efficacy obtained delivering the correct amount of energy at multiple depths, managed automatically and intelligently with the Genius real time impedance energy feedback control system. As the result of this, both improvement of the lower face skin laxity can be seen together with volumetric changes in the mid face and neck, showcasing the ability to build the new dermal foundation. The figure below shows significant increases in both neocollagenesis as well as neoelastogenesis as a result of the controlled volumetric fractional coagulation zones in the deep dermis.



3 weeks after 1 treatment

Courtesy of JY Choi, MD, S.Korea

In summary, when it comes to tightening and lifting treatments, creating the correct amount of fractional volumetric coagulation zones at the correct temperature are of primary importance. Furthermore, once we can establish that these factors can be controlled in real-time using the Genius' impedance feedback energy control system, a new level of predictability in creating new collagen and elastin can be achieved. Creating new tissue volume as a function of dynamic energy delivery is a novel way to deal with both the lifting, smoothing and volumizing of sagging skin in patients of all ages.



Pre 3 Month