



Ultrasound- assisted Facial Skin Rejuvenation

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Is it possible that the same benign technology we use to view fetuses in the womb will tighten redundant facial skin? And does it make sense that a non-invasive, painless and inexpensive topical treatment can provide the same facial rejuvenating benefits credited to laser technology?

Within the last few years there has been a consumer explosion in the demand for no downtime, non-invasive methods of non-ablative facial resurfacing. Many companies are spending an overabundance of dollars educating you and the consumer that their laser is ideal for reducing wrinkles, decreasing pore size, evening out pigmentation and reducing skin laxity. Although the research is very promising we are still in the process of determining which laser is best and what the optimal parameters are in order to achieve the maximum outcome. In the meantime laser technology is expensive and can be



dangerous if misused by inexperienced personnel. Additionally, state and local agencies highly regulate who can use the laser and to what degree. Therefore access to such treatments is limited and most states restrict paramedical professionals from performing such treatments. Effort and research has been expended in order to identify alternative methods of facial rejuvenation, beyond the recognized capabilities of superficial peel and microdermabrasion yet short of lasers.

Ultrasound technology is well accepted and ubiquitously used in physical therapy and geriatric circles for treating musculoskeletal ailments. Additionally it has reach wide spread acceptance as a method for stimulating wound repair in patients with poorly healing skin wounds.

Research with ultrasound has demonstrated its ability to stimulate fibroblast activity, increase local circulation and increase the wound rate repair. (1)

How does ultrasound work?

Ultrasound is a method by which sound waves are created by a rapidly oscillating hand piece probe. By altering the frequency of the oscillations we can limit the depth of penetration, the higher the frequency the less penetrating the waves. Wavelengths in the 1 MHz range can extend deeply to muscle and bones and are at greater risk for causing local tissue damage if not properly used. However, in the 3 MHz range ultrasound waves should stay more superficial. The waves are conducted to the epidermal tissues via a coupling water base gel placed between

the ultrasound's hand piece and the skin's surface. Physiological benefits are categorized as thermal and non-thermal. Thermally, ultrasound waves may cause local tissues to heat up to 40-45 degree Celsius. In turn increasing blood flow and perhaps directly stimulating fibroblast activity resulting in collagen production. Ultrasounds non-thermal modalities include cavitation, acoustic streaming and phonophoresis. By creating micron- sized bubbles of blood, lymphatic and tissue fluids, ultrasound induced cavitation may influence cellular membrane permeability, ionic gradients and cellular calcium uptake. Increased intracellular calcium can act as a signal inducing fibroblast cells into wound repair and a collagen production response.

An additional and wildly potential benefit of ultrasound is the capability to deliver medicinal products through the skin via a process known as phonophoresis. Animal model studies have clearly shown the ability of ultrasound to deliver significant levels of hydrocortisone, certain viricidal agents and even salicylic acid (2). Many of you already know that salicylic acid is a Beta hydroxy acid with proven age reducing benefits to the skin.

Over the last year I have become very interested in this possibility, as have many others. At the University of Illinois, we



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have just completed a 3 -month study in the laboratory evaluating the ability of ultrasound assisted technology to extend the delivery of glycolic and salicylic acids deeper into the dermis. Concomitantly, clinically we have treated thirty patients with a combination salicylic acid and ultrasound treatment. Preliminary results have been very encouraging and promising. Long-term outcomes and conclusions are pending. However, treated patients have reported improved skin texture, reduction in skin laxity and a youthful plumping out of the skin. The procedure takes minutes, is painless, and there is no associated downtime. Following treatment, patients may immediately reapply their make-up and return to their social or work activities. Additionally, unlike visible light lasers and pulsed light systems patients of all skin types may achieve benefits.

Time will tell if this modality is the answer for non-invasive facial rejuvenation. But if it is, expect it to "catch-on" quickly as it is an easily transportable and relatively inexpensive technology that has been safely used for many years by a multitude of paramedical professional. In the continuing search for better and more convenient methods of facial rejuvenation, ultrasound may be poised to become a breakthrough modality.

1. Lehman JF., Guya AW. Ultrasound therapy. In Reid J., Sikov M., (eds): Interaction of Ultrasound and Biological tissues. DHEW Publication (FDA) 73-8008. Government Printing Office, Washington DC 1972, P. 141.
2. Mitragotri S., Blankschtein D., Langer R. Transdermal drug delivery using low frequency sonophoresis. Pharm Res 1996;13:411-420.