HIGH FREQUENCY (20 MHz) FOCUSED ULTRASOUND - A NOVEL METHOD FOR DERMAL INTERVENTION

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OBJECTIVES

High intensity focused ultrasound (HIFU) at high frequencies is not well explored, and commercial systems with frequencies above 15 MHz are not available. High frequencies however allow very small focal zones, and thereby precise confinement of lesions in e.g. the dermis layer of human skin. The objective of the work is to demonstrate a method and a HIFU system working at 20 MHz suitable for a wide range of indications in dermatology.

METHODS

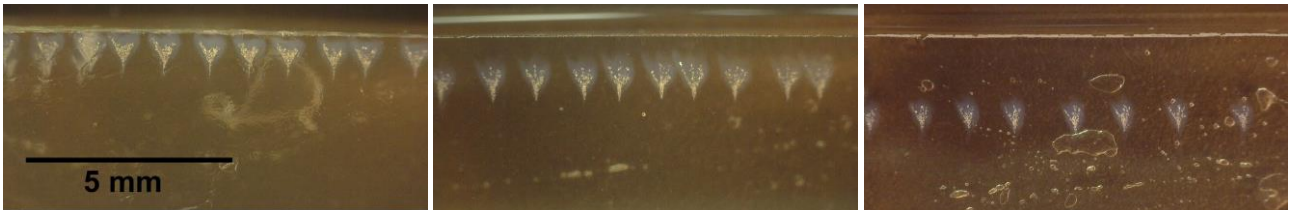
A new 20 MHz HIFU system has been used in the presented experiments. Tissue mimicking phantoms gel were used to verify acoustic field distribution and depth of treatments. The system was used to demonstrate the safety in a minipig animal study. Human experimental treatments were used to verify the efficacy of the method for tattoo removal, basal cell carcinoma and actinic keratosis.

RESULTS

Pre-clinical, animal studies and human clinical results are presented. Treatment on human skin demonstrate efficient removal of tattoos, regardless of color. The results indicate that a protocol for tattoo removal in 2 or 3 sessions is feasible. Initial treatments of basal cell carcinoma and actinic keratosis show similar encouraging results with significant removal and/or reduction of symptoms from single treatments.

CONCLUSIONS

High frequency HIFU has been used for research-based human treatment. A very effective method for tattoo removal as well as promising preliminary results in basal cell carcinoma and actinic keratosis is demonstrated. The method therefore has the potential to supplement or replace lasers and/or photodynamic therapy in both hospital and dermatology clinics.



Cross section of 20 MHz HIFU lesions in tissue mimicking gel made with an acoustic energy of 1.05 J (7 W, 150 ms). Focal depts are 1.7 mm (A), 2.2 mm (B) and 2.7 mm (C).