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Future of general ultrasound in tissue regeneration, wound and skin care: Technologies, systems, devices, science and clinical outcomes

Purpose: Last 30 years use of general ultrasound in wound and skin treatment has been shown grate results in hospitals, clinics; wound care centers and doctors' offices.

In this presentation I'll share of my 50+ years worldwide scientific/academic, industry and clinical experience on research (*in vivo* and *in vitro*, laboratory, bench, etc.), review and evaluate the results, safety, validity and efficacy of treatment of all types of acute and chronic wounds including diabetic foot ulcers and share the results with the existing and future users by enhancing their understanding of potential positive outcomes from using the variety of ultrasound devices.

Methods: For tissue regeneration and wound treatment purposes, the different ultrasound devices (low and high frequency) have been used, which are been marketed worldwide. The ultrasonic parameters and design of instruments are very influential and critical for different aspects of tissue regeneration and wound treatment, such as ultrasonic energy delivery methods and concepts of ultrasound waves and energy to target, tissue fractionation/ fragmentation/ debridement, liquefaction/ histotripsy, erosion, homogenization, liquation and wound therapy. Ultrasound treatment applies effective ways to prevent damage to surrounding healthy tissue and to succeed in therapeutic wound treatment. Treatment was both contact and non-contact modes, depending on the manufacturers, devices and wound conditions such as acute, infected, chronic, trauma, burn, gun shut, hard-to-heal, etc.

Results: All wounds have reacted well to all ultrasound treatment; some of the wounds have exceeded expectations compared to standard-of-care treatment vectors. Even painful wounds have been aggressively

debrided with some devices without local anesthetics and without patient complaints.

Discussion/Conclusion: Ultrasound systems and devices including methods recommended for use in treatment of all types of wounds, depending on size, body parts, tissue type, depth, infection and other conditions, treatment time will vary. It cleans the wound from necrotic (dead) tissue very precisely, stops the bleeding, kills the pain if there are any, activates tissues growth factors, destroys the bacteria cells without hurting healthy tissue cells, increases blood flow in wound bed and peri wound. Use of the numerous aspects or methods of ultrasound wave and energy delivery and distribution of ultrasound energy to wound bed, different energy level, parameters, signal shapes, wave delivery concepts, e.g., contact and non-contact, creation of macro and micro-streaming are critical.

Recent publications

1. E Babaev, Ultrasonic method and device for wound treatment. Acoustical Society of America Journal, 2004

Biography

Eliaz Babaev, Co-Founded Arobella Medical, LLC in 2006 and serves as its chief executive officer and president. Dr. Babaev Co-founded Celeration Inc. and served as its chief technical officer until July 2009 and chief executive officer. Babaev worked as an ultrasound system design engineer and research scientist for DiaSorin, Inc., SpectRx and AeroPag-USA, Inc. He served as the head of biomedical engineering laboratory and a professor for State Technical University, Baku, USSR for 25 years. Dr. Babaev has more than 40+ years expertise in non-imaging medical ultrasound and particularly in ultrasound wound management, live tissue repair and in all the areas of advances in skin, wound care, nursing, tissue science, drug delivery systems, wound treatment technologies, tissue engineering and body architectonics research and cancer research including apoptosis. 50+ US and 100+ worldwide patents are issued, numerous are pending, 50+ scientific articles, abstracts are published.

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