The Effect of Shock Waves on Differentiation and Function of Myofibroblast

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Device and producing company:
DermaPACE (Sanuwave)

Introduction:
It is widely known that mechanical forces can influence cell proliferation; recent findings show that closure of chronic non-healing wounds in humans can be accomplished using devices that exert mechanical stresses on healing tissue. Extracorporeal shock wave therapy (ESWT) has been applied in lithotripsy and in the treatment of several musculoskeletal disorders over the past decade, but its effects on non-healing wounds remain unclear.

Methods:
We investigated in vitro how shockwaves influence the development and function of myofibroblasts, the cells that promote contraction during wound closure. Human dermal fibroblasts were subjected to 250, 500, and 1,000 shock wave impulses at different energy densities on day 1, 4, and 7. The expression of α-SMA (the hallmark of myofibroblast differentiation), TGF-b and TGF-b RII was assessed through immunofluorescence microscopy and western blots. The contractile function of fibroblasts was measured as a function of their ability to generate wrinkles on deformable substrates. The ability to contract extracellular matrix was quantified in 3D collagen gels.

Results:
The preliminary results show an increased proliferation rate among fibroblasts subjected to shock waves compared with controls; the myofibroblast differentiation is influenced by shock wave therapy as well.

Discussion:
The use of non-pharmacological inductors of cell proliferation such as shock waves is an intriguing possibility to accelerate and control wound healing

Conclusion:
These preliminary results, if confirmed, could support the use of ESWT to assist closure in various non-healing wounds.