Comparative study between the effects and mode of application of focused and radial shock wave treatment on the behaviour of human mesenchymal stem cells (MSC)

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Device and producing company:
Swiss DolorClast (EMS), Piezoson 100 (Richard Wolf)

Introduction:
Recent studies demonstrate the successful use of shock wave therapies for improvement of tissue repair and regeneration; processes where stem and progenitor cells are involved e.g. wound healing and bone repair. Human adult bone marrow derived mesenchymal stem cells (MSC) have the capability to differentiate into various mesenchymal tissues and rebuild these e.g. bone tissues, muscles, cartilage tissues or tendons. Therefore the question arises as to whether shock waves can influence stem cells involved in tissue regeneration. MSC dependent regeneration can by improved by enhancement of migration, increase of proliferation and reduction of apoptosis. Due to the fact that two different kinds of shock waves (focused and radial) improve stem cell dependent regenerative processes, it seems appropriate to investigate the influence of both kinds of shock waves on MSC.

Methods:
The first experiment with treatment conditions where the shock waves are reflected by culture dishes shows a dose dependent increase of MSC migration by shock wave treatment. We established a new experimental cell culture setup for shock wave treatment under absorbing conditions to better simulate in vivo circumstances. We tested the effect of different intensities of shock waves on cell vitality and we are performing different assays on MSC to investigate migration, proliferation and apoptosis under different conditions (impulses, frequency and intensities of energy) with both kinds of shock waves.

Results:
We developed methods for in vitro treatments of MSC with both kinds of shock waves with guarantee of cell vitality, which allow investigations of both kinds of shock wave treatments.
Conclusion: The present results indicate that MSC can be dose dependently influenced by shock waves.