Oral Presentation

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The potential effects of shock wave treatment on cellular senescence

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Introduction

Cellular senescence describes the process that drives cells into a controlled and irreversible cell cycle arrest and is initiated by diverse stress-triggering stimuli. Though halted in their cellular growth, senescent cells maintain high metabolic activity and control various physiological functions, such as counteracting tumour formation. Senescence can induce highly opposing effects, depending on whether it occurs in its transient or chronic form. Transiently active senescence is essential in development, regeneration and acute wound repair. On the contrary, cells that accumulate during chronological aging contribute to chronic senescence, leading to numerous tissue pathologies such as diabetic foot ulcers. Shock waves have been reported to be an effective treatment option for this type of pathologies – including impaired wound healing and excessive scar tissue formation. However, the role of cellular senescence in shock wave-induced effects in wound healing has not been investigated yet. Therefore, the current study aims to explore the potential effects of shock wave treatment on cellular senescence and their link to shock wave induced wound healing.

Material & Method (please include the kind of device you are using)

Human primary dermal BJ fibroblasts cultured under standard cell culture conditions were driven into either stress-induced premature senescence (SIPS) by doxorubicin treatment of cells with less than 40 population doublings or replicative senescence (achieved by their long-term subcultivation). Cells were treated in a standardised *in vitro* set-up using the electrohydraulic dermagold100 shock wave device (MTS Medical, Konstanz, Germany). Treatment was performed at different stages of SIPS as well as on cells that were continuously subcultivated (towards replicative senescence). Onset, progression or changes in cellular senescence were analysed by monitoring senescence markers such as SA-β-gal activity, γ-H2A.X foci formation or expression of tumor suppressor p53, and cyclin dependent kinase inhibitors p21 and p16 using immunofluorescent/immunohistochemical staining, quantitative real time PCR and Western blot techniques.

Results

Our preliminary data indicate a senescence-regulating effect of shock wave treatment, depending on the parameters of treatment (number of pulses, energy), type of senescence (SIPS or replicative senescence) and timepoint of shock wave application (before, during or after the induction of senescence).

Discussion

The underlying mechanisms to the beneficial effects of shock wave treatment have been investigated thoroughly in the last years. Adding to already identified signaling pathways, the findings of this study will for the first time address the potential role of shock waves as a modulator of cellular senescence that might play a vital part in wound healing effects of shock wave treatment.

Technology: Focused Shockwave

Device and Company: dermagold100 (MTS Medical UG, Konstanz, Germany)

COI: No conflict of interest