

# Shockwave therapy on human fat-derived stem cells

## Author:

Tatjana J. Morton<sup>1</sup>, Joachim Hartinger<sup>1+2</sup>, Eva Tögel<sup>1+2</sup>, Anja Peterbauer<sup>1+2</sup>, Wolfgang Schaden<sup>3</sup>, Martijn van Griensven<sup>1+2</sup>

## Institutions:

1) Ludwig Boltzmann Institute for Experimental and Clinical Traumatology / AUVA Research Centre, Vienna, Austria 2) Austrian Cluster for Tissue Regeneration, Austria 3) Trauma Center Meidling, Vienna, Austria

## Device and producing company:

DermaGold, Tissue Regeneration Technologies (TRT), USA manufactured by MTS Europe GmbH, Germany

## Introduction:

The field of application for shockwave therapy has widened over the last few years. Electrohydraulic shock wave technology has been used successfully for improved healing of chronic wounds. Little is known about the mechanism of action of shockwave therapy. In this study we treated isolated and cultured human adipose-derived stem cells to find out more about the influence of shockwave therapy on cells in vitro.

## Methods:

Human adipose-derived stem cells were seeded 24 hours before shockwave treatment into 6-well plates and covered with DMEM/HAM'sF12 medium containing 2% FCS. Thirty or 50 pulses with a frequency of 1 Hz and an energy flux density of 0.1 mJ/mm<sup>2</sup> (DermaGold, MTS Europe GmbH, Germany) were applied on the bottom of the cell culture plates. At certain time points, photographs for evaluation of the cell morphology were taken. On days 2, 7 and 14, cells were collected and RNA expression levels of different markers were analysed.

## Results:

Macroscopically, human adipose-derived stem cells contracted their cytoskeleton to be only half the size directly after shockwave treatment. By day 2, cells had fully recovered their original size. Interestingly, shockwave therapy did not improve cell proliferation within 14 days. However, an upregulation of specific osteogenic expression genes in treated cells could be observed. Collagen 1 alpha 1 and the bone sialo protein showed significantly higher RNA expression levels in both treated groups compared to the control group (without shockwave therapy). Vimentin, desmin and alpha smooth muscle actin were also up-regulated in treated human adipose-derived stem cells.

## Conclusion:

In conclusion, shockwave therapy on isolated and cultured human adiposederived stem cells does not influence cell proliferation but seems to induce or accelerate osteogenic differentiation in these cells.