

Shockwaves induce cellular responses in diabetic skin ulcers

Author:

Ching-Jen Wang (1), Feng-Sheng Wang (2)

Institution:

1) Department of Orthopedic Surgery,
2) Department of Medical Research, Chang Gong Memorial Hospital, Chang Gong University College of Medicine, Taiwan

Device and producing company:

Orthowave 180, NITS, Konstanz, Germany

Introduction:

Extracorporeal shockwaves were recently used for treatment of chronic diabetic skin ulcers. The preliminary data showed cell apoptosis in diabetic wounds before treatment and the reversal of cell apoptosis after shockwave treatment. This study was to evaluate the cellular responses in chronic diabetic skin ulcers before and after shockwave treatment.

Methods:

There are 17 patients with 20 diabetic skin lesions in this study. The energy level of the shockwaves is between 0.03 mJ/mm² to 0.04 mJ/mm² energy flux density, and the focal size is up to 20 mm in diameter. The protocol of shockwave application consists of 300 shocks + 100 shocks/cm' of the size of the ulcer to be performed bi-weekly for a total of three sessions. Clinical assessments included size and depth of the lesion, epithelialization, local sepsis, arteriopathy and denervation before and after treatment. Biopsies of the lesions were obtained before treatment and at 6 weeks after treatment. The specimens are subjected to histomorphological examination for tissue distributions, cell concentration, the tvnec of relic with intact or disrupted cell membrane and the vascularity, and immunohistochemical analysis for detection of proliferation cell antigen (PCNA) to reflect cell replication, terminal deoxynucleotidyl transferase-mediated dUTP nick end-labelling (TUNEL) for cell apoptosis.

Results:

Overall, 25% are healed, 50% improved and 25% are unchanged. Cell apoptosis was noted before treatment. After treatment, there was more active cell proliferation and less cell apoptosis.

Discussion:

Shockwave treatment showed 75% satisfactory results in diabetic skin lesions. Reversal of cell apoptosis and enhancement in cell proliferation were observed after shockwave treatment.

Conclusion:

Shockwaves appear effective in treating diabetic skin lesions. The cellular responses included the reversal of cell apoptosis and tissue regeneration.