

# **Shock wave Therapy in peripheral nerve repair: Investigation in a rat sciatic nerve repair model**

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## **Institutions:**

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## **Device and producing company:**

DERMAGOLD (USA), Tissue Regeneration Technologies (TRT) ORTHOWAVE 180c (Outside USA), MTS Europe GmbH

## **Introduction:**

De-focused low energy extracorporeal shock wave therapy has been used in various clinical and experimental models. Reports showed a significant increase of angiogenesis following shock wave application. The aim of our study was to investigate the effects of shock wave therapy on peripheral nerve regeneration, applied after a nerve grafting procedure.

## **Methods:**

72 Sprague Dawley rats underwent mid-thigh sciatic nerve transection at two different levels creating an 8mm nerve graft. The nerve graft was now rotated 180 degrees and epineurial coaptation was performed immediately. All animals were randomly assigned to two experimental groups: Group 1: Shock wave therapy (300 impulses, 3 Hz) was applied over the graft using an ultrasound gel as a conductive and protective layer immediately after wound closure. Group 2: (sham control) Nerve graft without shock wave therapy. Serial functional tests (BBB locomotor rating scale, Inclined plane test, Toe spread test, Sensory and Proprioceptive placing tests as well as Catwalk<sup>®</sup> locomotion assessment device) were performed in weekly intervals within the period between the 1st and the 12th week after the grafting procedure. Electrophysiological studies were carried out 3, 6 and 12 weeks after surgery. Histologic and immuno-histochemical evaluation of neural collagenic connective tissue, axonal sprouting, axonal diameter and axonal count as well as angiogenesis was performed 1, 3 and 12 weeks after surgery.

## **Results:**

The shock wave group showed a significantly better functional recovery. The sensory function in the shock wave group reached a maximum (1.0 out of 1.2 mean points) 8 weeks after the surgery. In the control group, sensory performance reached a maximum (0.7 out of 1.2 mean points) 12 weeks following the surgery. The motor performance showed a significant improvement in the shock wave group in all intervals. The histological assessment indicated an increase of neural vessel count and a slight decrease of neural collagenic connective tissue within the nerve graft in the shock wave treated group in all intervals. The immuno-histochemical evaluation indicated an increase in the axonal sprouting rate distal of the nerve graft in the shock wave treated group. Moreover, electrophysiologic assessment illustrated the positive effect of the therapy on the regeneration of the sciatic nerve.

## **Discussion:**

It seems that improvement of angiogenesis and increase of the axonal sprouting rate may result in enhanced functional recovery. Further research for better understanding is necessary.

## **Conclusion:**

The results of this nerve transection and repair study in the rat shows that SW treatment immediately after surgery is effective. There is improvement of functional recovery. This may be due to an increased neural angiogenesis, decreased neural collagenisation and improved axonal sprouting.