Effects of ESWT on neuroregeneration after median nerve reconstruction with autologous nerve grafts or three different conduits in the rat

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1. Introduction

Several studies evaluating the effects of ESWT on nerve regeneration in the sciatic nerve model of the rat have shown proregenerative effects of this non-invasive treatment method. Effects of ESWT on nerve conduits remain mostly unstudied so far. A feasible alternative to the murine sciatic nerve model, which has some severe disadvantages regarding animal welfare and evaluation of experimental outcome, is the median nerve model of the rat. The aim of this work was to evaluate nerve regeneration following conduit repair of the median nerve with and without immediate ESWT in rats.

2. Material & Method

We microsurgically resected a 7-mm segment of the right median nerve in 123 male Lewis rats. The nerve defect was reconstructed with either an autologous nerve graft, muscle-in-vein conduit, chitosan- conduit, or silk fibroin conduit. Half of the animals in each group received a single application of ESWT (MTS, defocused, electrohydraulic applicator, 300 impulses, 3 Hz, 0.1 mJ/mm2). Functional recovery during the 12-weeks observation period was assessed via the grasping test, computerized gait analysis and electrophysiological evaluations.

3. Results

Regarding grasping strength, no significant effects of ESWT were apparent when comparing different reconstructive techniques, despite some positive tendencies. Electrophysiological evaluations did also not reveal any significant differences between reconstructive techniques, although autologous nerve gratis + ESWT were superior to both groups treated with muscle-in-vein conduits ($p<0.05$) and animals treated with silk fibroin conduits ($p<0.05$). Computerized gait analysis did also not reveal any significant effects of ESWT when comparing different reconstructive techniques.

4. Discussion

No significant effects of ESWT on peripheral nerve regeneration were observable in our study. This could on the one hand be related to the animal model we used, on the other hand the exact modes of action and optimum application forms of ESWT remain to be elucidated in future studies. The same applies to the materials used to manufacture nerve conduits. While evaluation of functional recovery via the grasping lest was impeded in our study due to the animals' limited motivation to participate in the procedure, we were able to show that functional recovery was evaluable via computerized gait analysis.