

Nerve Decompression Does Not Improve Sciatic Function in Chronic Constriction Injury in the Rat

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BACKGROUND: Chronic constriction injury (CCI) of the rat sciatic nerve is a model injury for research of neuropathic pain with injured animals developing mechanical allodynia and thermal hyperalgesia after a few day of the lesion. The injury is described as causing marked nerve damage mainly but not exclusively to large diameter axons, and incomplete denervation of the peripheral field. Only a few attempts have been made to study recovery from this type of injury by surgical removal of constriction. The aim of the present study was to assess the severity of motor and sensory loss in CCI and its recovery with nerve decompression.

METHODS: Twenty male Sasco Sprague-Dawley rats (250-300g) were separated in an unoperated control group and three groups with CCI with one of them using resorbable suture. In one CCI group, the non-resorbable knots were removed after 4 weeks. Animals were sacrificed after 8 weeks. CCI was performed in deep anesthetized animals after exposing and encircling the right sciatic nerve with 4 loose ligatures using 0/4 thread. Motor deficit was assessed by the extensor postural thrust (EPT) and expressed as percentage of the contralateral side. Thermal algesia was evaluated by the withdrawal reflex latency (WRL) measured by the time taken by the animal to remove its paw from a hotplate. At the end of experiment, the injured sciatic nerves were removed and kept for histomorphometry of nerve regeneration.

RESULTS: Pre-operatively the EPT scores were similar in both sides and in all groups but quickly dropped to near null values at week 1 post constriction and at week 8, percentage motor deficit in CCI groups was between 92 and 93% compared to 0% in the control group. No differences existed for motor deficit between the three sciatic nerve constricted animals. All animals displayed normal WRL response pre-operatively but at week 1 all constricted animals reached the cutoff time of 12 sec. Unlike EPT, there was recovery of WRL scores with mean values in the CCI groups at week 8 between 4.0 ± 1.1 sec and 2 ± 0.0 sec, comparable to values in the control group (2.0 ± 0.0 sec). No statistical differences were observed between the CCI groups.

DISCUSSION: Sciatic nerve chronic constriction causes swelling and inflammation at constriction site and axon Wallerian degeneration. Axonal damage has been reported to be more severe in large myelinated motor axons [1] and in this study we confirm that CCI injury produces severe loss of muscle function. Thermal sensation was also deeply affected within one week of injury but unlike motor function it recovered to normality within 8 weeks. Surprisingly, nerve decompression had no beneficial effect on motor or sensory function which is in contrast to a previous study showing a positive effect of nerve decompression on allodynia and molecular markers of inflammatory response at the dorsal horn of the spinal cord [2]. Future quantitative histology of nerve regeneration of constricted sciatic nerves will enable us to have a better understanding of the functional data presented in this abstract.

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