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# The Pulsed Nd:YAG Laser Therapy Enhanced Nerve Regeneration via Apoptosis Inhibition in a Rat Crushed Sciatic Nerve Model

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## Abstract

The study was aimed to validate the efficacy of the pulsed Nd:YAG laser on nerve regeneration in a rat sciatic nerve crushed model. 54 Wistar rats were randomly assigned into three groups: shame control, crush control, and laser treated group. For the laser treated group, the pulsed Nd:YAG laser (10 Hz) with 350 mJ per pulse in energy density and 50 J/cm<sup>2</sup> in fluence was applied extracorporeally at the lesion site for 12 min to daily deliver 500 J immediately and consecutive 9 days following the crush injury. At week 1, the apoptosis-related activities in the injured nerve were examined (n = 8/each group). The sciatic functional index (SFI) was measured preoperatively and weekly until 4 weeks after the index procedure. The injured nerve and the innervated gastrocnemius muscle histology were assessed at week 4 (n = 10/each group). At week 1, the laser group showed the significant less TUNEL-positive ratio (P < 0.05), and the lower expression of cleaved caspase3/procaspase-3 and beclin-2/beclin-2-associated protein X ratios compared with the crush control. Furthermore, the laser group revealed significantly better SFI since week 1 and throughout the study (P < 0.05, all) compared with the crush control. At week 4, the laser group showed significantly higher axon density, lower myelin g-ratio, and the corresponding higher glycogen expression (P < 0.05, all) in the gastrocnemius muscle compared with those in the crush control. The pulsed Nd:YAG might enhance the injured nerve regeneration via apoptosis inhibition.

**Keywords:** Animal model; Apoptosis; High intensity laser therapy; Nd:YAG; Peripheral nerve injury.

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