

Laser, fibrin glue, or suture repair of peripheral nerves: a comparative functional, histological, and morphometric study in the rat sciatic nerve.

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Abstract:

OBJECT: This study was undertaken to evaluate CO₂ laser-assisted nerve repair and compare it with nerve repair performed with fibrin glue or absorbable sutures.

METHODS: In eight rats, the sciatic nerve was sharply transected and approximated using two 10-0 absorbable sutures and then fused by means of CO₂ milliwatt laser welding (power 100 mW, exposure time 1 second per pulse, spot size 320 microm), with the addition of a protein solder (bovine albumin) to reinforce the repair site. The control groups consisted of eight rats in which the nerves were approximated with two 10-0 absorbable sutures and subsequently glued using a fibrin sealant (Tissucol), and eight rats in which the nerves were repaired using conventional microsurgical sutures (four to six 10-0 sutures in the perineurium or epineurium). Evaluation was performed 16 weeks postsurgery and included the toe-spreading test and light microscopy and morphometric assessment. The motor function of the nerves in all groups showed gradual improvement with time. At 16 weeks, the motor function was approximately 60% of the normal function, and there were no significant differences among the groups. On histological studies, all nerves revealed various degrees of axonal regeneration, with myelinated fibers in the distal nerve segments. There were slight differences in favor of the group treated with laser repair, in terms of wound healing at the repair site. In all groups, the number of axons distal to the repair site was higher compared with those proximal, but the axon diameter was significantly less than that in control nerves ($p < 0.05$).

There were no significant differences in the number, density, or diameter of the axons in the proximal or distal nerve segments among the three nerve repair groups ($p < 0.05$), although there was a trend toward more and thicker myelinated axons in the distal segments of the laser-repaired nerves.

CONCLUSIONS: It was found that CO₂ laser-assisted nerve repair with soldering is at least equal to fibrin glue and suture repair in effectiveness in a rodent model of sciatic nerve repair.