

D. Gigo-Benato · S. Geuna · A. de Castro Rodrigues  
P. Tos · M. Fornaro · E. Boux · B. Battiston  
M. G. Giacobini-Robecchi

## Low-power laser biostimulation enhances nerve repair after end-to-side neurorrhaphy: a double-blind randomized study in the rat median nerve model

Received: 30 December 2003 / Accepted: 26 April 2004 / Published online: 30 July 2004  
© Springer-Verlag London Limited 2004

**Abstract** Previous studies have shown that low-power laser biostimulation (lasertherapy) promotes posttraumatic nerve regeneration. The objective of the present study was to investigate the effects of postoperative lasertherapy on nerve regeneration after end-to-side neurorrhaphy, an innovative technique for peripheral nerve repair. After complete transection, the left median nerve was repaired by end-to-side neurorrhaphy on the ulnar “donor” nerve. The animals were then divided into four groups: one placebo group, and three laser-treated groups that received lasertherapy three times a week for 3 weeks starting from postoperative day 1. Three different types of laser emission were used: continuous (808 nm), pulsed (905 nm), and a combination of the two. Functional testing was carried out every 2 weeks after surgery by means of the grasping test. At the time of withdrawal 16 weeks postoperatively, muscle mass recovery was assessed by weighing the muscles innervated by the median nerve. Finally, the repaired nerves were withdrawn, embedded in resin and analyzed by light and electron microscopy. Results showed that laser biostimulation induces: (1) a statistically significant faster recovery of the lesioned function; (2) a statistically significant faster recovery of muscle mass; (3) a statistically significant faster myelination of the regenerated nerve fibers. From comparison of the three different types of laser emissions, it turned out that the best

functional outcome was obtained by means of pulsed-continuous-combined laser biostimulation. Taken together, the results of the present study confirm previous experimental data on the effectiveness of lasertherapy for the promotion of peripheral nerve regeneration and suggest that early postoperative lasertherapy should be considered as a very promising physiotherapeutic tool for rehabilitation after end-to-side neurorrhaphy.

**Keywords** Low-power laser biostimulation · 808 nm · 905 nm · Nerve repair · End-to-side neurorrhaphy · Rat

D. Gigo-Benato · S. Geuna (✉) · M. Fornaro  
M. G. Giacobini-Robecchi  
Department of Clinical and Biological Sciences,  
San Luigi Hospital, University of Turin, Regione Gonzole 10,  
10043 Orbassano (TO), Italy  
E-mail: stefano.geuna@unito.it  
Tel.: +39-11-6705433  
Fax: +39-11-9038639

A. de Castro Rodrigues  
PRPPG/USC and Department of Biological Sciences/USP,  
Bauru, São Paulo, Brazil

P. Tos · E. Boux · B. Battiston  
GIM, CTO Hospital, Turin, Italy