810 nm Wavelength light: an effective therapy for transected or contused rat spinal cord.

Wu X[1], Dmitriev AE, Cardoso MJ, Viers-Costello AG, Borke RC, Streeter J, Anders JJ.

Lasers Surg Med. 2009 Jan;41(1):36-41. doi: 10.1002/lsm.20729.

Abstract

BACKGROUND AND OBJECTIVES:

Light therapy has biomodulatory effects on central and peripheral nervous tissue. Spinal cord injury (SCI) is a severe central nervous system trauma with no effective restorative therapies. The effectiveness of light therapy on SCI caused by different types of trauma was determined.

STUDY DESIGN/MATERIALS AND METHODS:

Two SCI models were used: a contusion model and a dorsal hemisection model. Light (810 nm) was applied transcutaneously at the lesion site immediately after injury and daily for 14 consecutive days. A laser diode with an output power of 150 mW was used for the treatment. The daily dosage at the surface of the skin overlying the lesion site was 1,589 J/cm(2) (0.3 cm(2) spot area, 2,997 seconds). Mini-ruby was used to label corticospinal tract axons, which were counted and measured from the lesion site distally. Functional recovery was assessed by footprint test for the hemisection model and open-field test for the contusion model. Rats were euthanized 3 weeks after injury.

RESULTS:

The average length of axonal re-growth in the rats in the light treatment (LT) groups with the hemisection (6.89+/-0.96 mm) and contusion (7.04+/-0.76 mm) injuries was significantly longer than the comparable untreated control groups (3.66+/-0.26 mm, hemisection; 2.89+/-0.84 mm, contusion). The total axon number in the LT groups was significantly higher compared to the untreated groups for both injury models ($P<0.05$). For the hemisection model, the LT group had a statistically significant lower angle of rotation ($P<0.05$) compared to the controls. For contusion model, there was a statistically significant functional recovery ($P<0.05$) in the LT group compared to untreated control.

CONCLUSIONS:

Light therapy applied non-invasively promotes axonal regeneration and functional recovery in acute SCI caused by different types of trauma. These results suggest that light is a promising therapy for human SCI.