Effect of Low-Energy Extracorporeal Spinal Shock Wave Therapy on Spinal Cord Injury

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INTRODUCTION

Middle and high-energy shock wave therapy has been applied to fracture non-unions and plantar fasciitis. The low-energy shock wave has never been used for treatment of neurological disorders. Nishida et al[1] performed the low-energy extracorporeal shock wave therapy for chronic myocardial infarction model and acute myocardial infarction model in pigs. They reported significant increases of various cytokines and functional recovery in the ischemic heart.

We hypothesized that the low-energy extracorporeal shock wave would enhance the recovery after the spinal cord injury (SCI) with the increase of neurotrophic factors. In the present study, the low-energy extracorporeal shock wave was applied to SCI. This was the first trial of the low-energy extracorporeal spinal shock wave therapy for SCI.

MATERIALS AND METHODS

Animals A total of 36 adult female SD rats weighting 250-300g were used. Rats were randomly divided into four groups; Sham group (laminectomy only), Sham-SW group (shock wave applied after laminectomy), SCI group and SCI-SW group (shock wave applied after SCI).

Surgical procedures The T9 - 11 vertebrae were laminecomitized to expose the dura matter. SCI was induced using a NYU impactor. The height of impactor rod was 12.5mm. The intensity of impact was assumed as moderate. After SCI, the wound was carefully closed not to leave air in subcutaneous area.

Shock wave The low-energy extracorporeal shock wave was applied to 2 spot on the injured spinal cord 3 times in a week from the next day to 3 weeks after SCI. The condition of the shock wave was 0.1mJ/mm², 4Hz, 200shot/spot according to Nishida’s protocol[1].

RESULTS

Behavioral analysis Sham group and Sham-SW group did not show palsy. Both scores were full marks (Fig. 2A). There were significant differences between SCI group and SCI-SW group from 28 days to 42 days (Fig. 2B).

Quantitative RT-PCR BDNF and trkB mRNA expression was significantly increased in SCI-SW group (p<0.05).

DISCUSSION

In the present study, the low-energy extracorporeal spinal shock wave did not suffer the spinal cord, and it induced better improvement of motor palsy after SCI. The low-energy shock wave is considered to have a neuroprotective function by the increase of neurotrophic factors like BDNF.

SIGNIFICANCE

This is the first report about effect of the low-energy extracorporeal shock wave therapy on SCI. The low-energy extracorporeal shock wave would be the useful treatment for SCI.

REFERENCES