Spinal Injury Directory

Preconditioning with Hyperbaric Oxygen and Hyperoxia Induces Tolerance against Spinal Cord Ischemia in Rabbits

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Background: The aim of this study was to determine if the ischemic tolerance could be induced in the spinal cord by pretreatment with hyperbaric oxygen (HBO) and what components of HBO (hyperoxia, hyperbaricity, and combination of these two) were critical in the induction of tolerance against ischemic injury.

Methods: In experiment 1, 21 rabbits were randomly assigned to one of three groups (n = 7 each): animals in the control group received no HBO before spinal cord ischemia; animals in the HBO-1 and HBO-2 groups received HBO (2.5 atmosphere absolute [ATA], 100% O2) pretreatment 1 h/day for 3 and 5 days before ischemia, respectively. In experiment 2, 48 rabbits were randomly assigned to one of four groups (n = 12 each): the control group received no HBO (21% O2, 1 ATA, 1 h/day, 5 days) before spinal cord ischemia; the HB group received 1-h treatment in 21% O2 at 2.5 ATA each day for 5 days; the HO group received 1-h treatment in 100% oxygen at 1 ATA each day for 5 days; and the HBO group received HBO (2.5 ATA, 100% O2) treatment 1 h/day for 5 days. Twenty-four hours after the last treatment, spinal cord ischemia was induced by an infrarenal aorta clamping for 20 min. Forty-eight hours after reperfusion, hind-limb motor function and histopathology of the spinal cord were examined in a blinded fashion.

Results: In experiment 1, the neurologic outcome in the HBO-2 group was better than that of the control group (P = 0.004). The number of normal neurons in the anterior spinal cord in the HBO-2 group was more than that of the control group (P = 0.001). In experiment 2, the neurologic and histopathologic outcomes in the HBO group were better than that of the control group (P < 0.01). The histopathologic outcomes in the HO group was better than that in the control group (P = 0.05).

Conclusions: Serial exposure to high oxygen tension induced ischemic tolerance in spinal cord of rabbits. Simple hyperbaricity (2.5 ATA, 21% O2) did not induce ischemic tolerance.

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