Abstract

A spinal cord injury (SCI) is a damage to the spinal cord that causes permanent or temporary changes in motor and sensory functions. In humans, the traumatic impact to spinal cord is mostly directed from the ventral part of the spinal column, even though SCI models are principally directed from the dorsal part of the spinal column due to easier surgery. The aim of the work described in this thesis was to develop clinically more relevant, easily reproducible and relatively inexpensive model of the ventral spinal cord lesion in rats which replicates SCI in humans as closely as possible by its pathology, completeness, level and regeneration. For the surgery we used a modification of a balloon-compression technique. The balloon of the 2F embolectomy Fogarty’s catheter was placed to the anterior epidural space via laminectomy at the level of T10 and when the final position of the catheter was achieved at the spinal level T8 in front of the anterior median fissure, a balloon was rapidly inflated with 10 μl or 15 μl of water for 5 minutes. Other two groups – laminectomy only and ventral placement of the catheter without inflation were used as controls. The motor functions were evaluated by the BBB test and ladder walking test. In BBB test we observed significantly impaired motor functions in the 15 μl group as compared to other groups. The ladder walking test showed that animals in the 15 μl group were not able to cross the ladder which was significantly different from both uninjured groups and 10 μl group. The thermal hyperalgesia was measured by the Plantar test. This test showed slight asymmetry in thermal sensitivity in both legs. On the left leg we did not observe significant differences between groups, but on the right leg the results showed significantly lower withdrawal time in the 15 μl injured group in 3rd and 4th week. The tissue sparing, glial scar, number of motoneurons was evaluated in all 4 groups. Results showed that ventral compression made with the volume of 15 μl resulted in severe neurological deficit, as well as the significant loss of white and gray matter around the center of the lesion and both cranially and caudally, increased size of glial scar with the peak in the center of the lesion and with loss of motoneurons compared to 10 μl and control groups.

Key words: spinal cord injury, model, behavioral testing, morphometry, rat