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论文

# 大鼠脊髓全横断损伤后不同时间的组织改变

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摘要：

目的 观察大鼠脊髓全横断损伤后不同时间的神经元、神经胶质及髓鞘结构的改变。方法 将60只大鼠随机分为假手术组(sham组)和脊髓损伤组(SCI组)，SCI组又分为术后1d、3d、7d、14d、21d组，每组10只。SCI组行脊髓T9段全横断损伤，sham组仅行椎板切除术，分别在各时间点灌注固定后取材、制片，对脊髓损伤后不同时间的神经元、神经胶质及髓鞘进行光电镜观察。结果 肉眼观察，假手术组各时间段脊髓外观形态均正常。SCI 1d组脊髓断端间隙增大；3d组断端轻度水肿；7d组残端结构形成液化坏死区；14d组横断区残端空洞形成；21d组断端萎缩变细。光镜下：1d组灰质部分神经元尼氏体溶解、消失,白质结构紊乱;3d组灰质神经元水肿,灰白质交界消失,胶质细胞增生;7d组灰白质结构完全破坏，灰质中出现大小不等空泡,大量胶质细胞增生;14d组神经元水肿减轻;21d组部分神经元与胶质细胞形态接近正常。电镜下：1d组部分神经元水肿，线粒体变形空泡化，髓鞘板层出现紊乱；3d组神经元、神经胶质及髓鞘的损伤逐渐加重，胶质细胞体积增大、增多；7d组神经元胞核固缩，核膜破裂、核孔增大，染色质聚集成块，胞质内细胞器崩解，髓鞘变形、扭曲，板层分离，见成堆增生的胶质细胞；14d组神经元、神经胶质及髓鞘的损伤逐渐减轻；21d组神经元核膜、核仁清楚,胞质内细胞器清晰可见。结论 脊髓损伤后不同时间的神经元、神经胶质和髓鞘结构随时间变化呈多样性，这种多样性结构改变为临床SCI提供了可靠的实验依据。

关键词： 脊髓损伤；神经元；神经胶质；髓鞘；组织结构；大鼠，Wistar

## Structure change of complete transected spinal injury at different times in rats

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Abstract:

Objective To observe structure changes of neurons, neuroglia and myelin at different times in the rat model of complete transected spinal injury. Methods A total of 60 Wistar rats were randomly divided into the sham operation group (sham group) and the spinal cord injury group (SCI group), the SCI group was randomly subdivided into 1, 3, 7, 14 and 21 days subgroups according to operation time, 10 in each group. SCI groups rats were established at the T9 spinal cord segment, and rats of the sham group had laminectomy performed. After being sacrificed at various time points, the morphological changes at different times were observed under a light microscope and a transmission electron microscope(TEM). Results For the 1d group, the crevice of broken ends were widened. For the 3d group, the broken ends had light oedema. For the 7d group, those structures had become a zone of necrosis. For the 14d group, the scar of broken ends had become porous. For the 21d group, broken ends showed atrophy and thinning. Under the light microscope, for the 1d group, the nissl body of some of neurons in the grey matter had dissolved and disappeared, and simultaneously the white matter structure became disordered. For the 3d group, some of the neurons in the grey matter showed dropsy. The boundary of the grey matter and the white matter had disappeared. Some reactive glial appeared. For the 7d group, those structure had completely been demolished, and some vacuoles and reactive glial appeared. For the 14d group, the oedema of the neurons had been gradually mitigated. For the 21d group, the neurons and glia morphous had become approximately normal. Compared with the sham group under TEM, for the 1d group, some of the neurons became edematous, their chromosomes were deformed and even vacuolation occurred, and the lamellar of myelin sheath became deranged. For the 3d group, the neurons, glia, and myelin damage were gradually increased, and the volume of glial cells were augmented, and increased in number. For the 7d group, the neurons showed karyopyknosis, the nuclear membranes were disrupted, the nuclear pores were dilated, and the chromatin were concentrated into a massive structure. Organelles in cytoplasm had disintegrated， the myelin was deformed with distortion, and lamellar separation, and cumulated glial cells could be observed. For the 14d group, impairment of neurons, glial cells and myelin had been gradually mitigated. For the 21d group, the neurons had a distinct nuclear membrane and nucleoli, and the rough endoplasmic reticulum and ribosomes in cytoplasm were all clearer. Conclusion The ultra structural change of neurons, glial cells and myelin after spinal cord injury had diversity with change over time, this might provide a reliable theoretical basis for the clinical diagnosis and treatment of spinal cord injury.

Keywords: Spinal cord injury; Neuron; Neuroglia; Myelin sheath; Structure; Rats, Wistar

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