Motor impairment

Motor impairment is an important index for assessing the extent of brain injury.

Motor impairment induced by traumatic brain injury (TBI) may be mediated through changes in spinal molecular systems regulating neuronal plasticity. Kononenko et al., assessed whether a focal controlled cortical impact (CCI) TBI in the rat alters expression of the TGF beta 1, c-Fos, Bdnf, and Gap43 neuroplasticity genes in lumbar spinal cord.Approach/Methods:Adult male Sprague-Dawley rats (n=8) were subjected to a right-side CCI over the anterior sensorimotor hindlimb representation area or sham-injury (n=8). Absolute expression levels of Tgfb1, c-Fos, Bdnf, and Gapd43 genes were measured by droplet digital PCR in ipsi-and contralesional, dorsal and ventral quadrants of the L4 and L5 spinal cord. The neuronal activity marker c-Fos was analysed by immunohistochemistry in the dorsal L4 and L5 segments. The contra- vs. ipsilesional expression pattern was examined as the asymmetry index, AI.

The Tgfb1 mRNA levels were significantly higher in the CCI vs. sham-injured rats, and in the contra- vs. ipsilesional dorsal domains in the CCI group. The number of c-Fos-positive cells was elevated in the L4 and L5 segments; and on the contralesional compared to the ipsilesional side in the CCI group. The c-Fos AI in the dorsal laminae was significantly increased by CCI.

The results support the hypothesis that focal TBI induces plastic alterations in the lumbar spinal cord that may contribute to either motor recovery or maladaptive motor responses [1].

The movement capture analysis (MOCA) system, for assessing motor damage after acute ischemia.

Longa score and MOCA were used to assess motor injury one day after ischemia. Infarct volume was delineated with 2% 2,3,5-triphenyltetrazolium chloride (TTC) staining. The correlation of infarct volume with Longa score and MOCA data was calculated. Results: Compared with the sham-operated group (0.10 ± 0.31), Longa scores of MK-801 (2.33 ± 0.73), GBE (1.80 ±0.58) and standard (2.88 ± 0.83) groups showed a statistical difference (P<0.05); however, it was unable to discern the difference between MK-801 and standard groups. MOCA was able to clearly discern the differences in motor disparity among the four groups, standard (1.00 ± 0.19), sham-operated group (0.17 ± 0.02), MK-801 (0.79 ± 0.08), GBE (0.38 ± 0.05) (P<0.05). Both MK-801 (18.03 ± 0.96%) and GBE (10.82 ± 1.93%) treatment reduced infarct size compared with the standard ischemia group (25.88 ± 1.16%) (P<0.05). The MOCA data showed a more significant correlation with infarct size than Longa score (r = 0.85:0.53). Conclusions: MOCA system proved to be more sensitive than the Longa score. It may potentially be more accurate method for behavioral evaluation in clinical trials [2].

1)
Kononenko O, Watanabe H, Stålhandske L, Zarelius A, Clausen F, Yakovleva T, Bakalkin G, Marklund N. Focal traumatic brain injury induces neuroplastic molecular response in lumbar spinal cord. Restor Neurol Neurosci. 2019 Mar 7. doi: 10.3233/RNN-180882. [Epub ahead of print] PubMed PMID: 30856132.
2)
Hu ZC, Ma H, Fan Q, Yin J, Wei MH, Lin YZ, Fan M, Sun CK. A New Method for Evaluation of Motor Injury after Acute Brain Ischemic Damage. Int J Neurosci. 2014 Jun 5:1-31. [Epub ahead of print] PubMed PMID: 24901953.