Quantitative Analysis of Descending Spinal Projective Neurons by Using Retrograde Tracer in Rats with Neonatal Hemidecortication

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Introduction: The purpose of this study was to examine the compensatory mechanism in rats, underwent left decortication at postnatal day 7 by using retrograde tracing method.

Methods: Retrograde tracers, FITC-conjugated CTB and FastBlue were injected into the right and the left sides of upper cervical segments of spinal cord, respectively, at postoperative weeks 2, 3, 4, and 5. The number of retrogradely labeled descending projective neurons was compared to the number of the same neurons in normally developed rats.

Results: Significantly more ipsilateral corticospinal neurons were labeled with FITC-CTB in the experimental rats compared to normal rats at all cases. There were also some FITC-CTB and FB double-labeled corticospinal neurons in both experimental and normal rats. In decorticated rats the number of doubly labeled neurons increased sequentially, and was significantly greater than in normal rats at postoperative weeks 4 and 5. However, only few percent of all neurons were double labeled in the treated animals. Significantly more neurons were also labeled with FITC-CTB in the medullary ventral reticulospinal area and in the medullary raphe-spinal area in the experimental rats compared to control animals at postoperative weeks 4 and 5.

Conclusion: The present results suggest that main compensatory response after unilateral neonatal decortication was formed by unlesioned ipsilateral corticospinal neurons, which were not selective in development. Furthermore, the collaterals of the corticospinal tracts originate from the cerebral cortex on the unlesioned side and descending spinal projections from brainstem are also related to compensatory response.