LETTER TO THE EDITOR

Step training with severely damaged spinal cord

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Sir, In the recent study by Kubasak et al. (2008), implantation of presumed axonal growth-supporting cells (Olfactory Ensheathing Glia (OEGs)) into freshly trans-sectioned spinal cord of adult rats facilitated axons to cross the lesioned site and at the same time enabled some stepping capability to develop. Is this the dawn of a new way in treating spinal cord injured persons?

Unlike in an experimental setting, human implantable cells are not available at the time point of an accidental spinal cord injury in man, thus implantation in a chronic situation following scar formation probably is a more realistic scenario. However, first attempts of autologous transplantation of OEGs, though without removal of the scar tissue, did not restore locomotion in chronic paraplegic persons (Mackay-Sim et al., 2008). Apart from this notion, the findings by Kubasak et al. are important as they show that only a few neuronal connections across the site of spinal cord injury are required to evoke treadmill stepping. In spinal cord injured humans, near complete loss of voluntary muscle activity in one or both lower limbs still allows the entraining of bipedal over ground stepping (Wernig and Müller, 1992). Both these findings strengthen the idea that motor programs for stepping are located in the lumbar spinal cord and even a few descending tracts can trigger these. Kubasak et al. also reported that step-training in cell-implanted animals led to further improvement in stepping. In the human setting, functional improvements achieved by proper treadmill training were either attributable to enhanced voluntary muscle activity (which is not testable in rats) and/or to facilitate elicitation of motor programs during weight-bearing locomotion without substantial change in cumulated voluntary muscle activities (Table 2 in Wernig et al., 1998). These findings indicate that activity-related changes can occur in both the descending tracts and/or in the neuronal circuitry below spinal cord injury.

Taken together these results allow one to speculate that once axons have been made to cross the lesion site in sufficient numbers, proper training of stepping will help locomotor activities to develop also in humans.

References