Adaptive changes following crush injury of brachial plexus terminal branches in adult rats

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In the present study, we investigated the adaptive changes after a nerve crush lesion applied to the median, ulnar and radial nerves, both downstream and upstream to the lesion site. Animals were sacrificed at different time points after the injury and the nerves and the corresponding C5-T1 DRGs were extracted

Distal to the crush lesion, morphological analysis showed that axonal regeneration and maturation was very fast. Regenerated nerve fibers were significantly more numerous and densely packed. On the other hand axons were smaller and with a thinner myelin sheath compared to controls. Proximal to the crush lesion, morphological analysis of DRGS showed an unusual number of small size cells different from the glial satellite cells. Neurogenesis in the DRGs was then investigated by injecting rats with bromodeoxyuridine (BrDU). Most of the BrDU positive cells belong to the glial family although, some BrDU colocalized with neuronal markers (nestin, Sox-2) suggesting that neurogenesis occurs in adult DRGs neurons that undergo peripheral nerve injury.

Finally, a stereological analysis, using the physical dissector method, showed a significant increase in number (42%) of DRGs sensory neurons 1 month after nerve-crush injury compared to control. All together our data support the idea that the population of DRG's neurons increased as a consequence of the nerve damage. Evidence of morphological changes in the population of cells surrounding neurons and the immunopositivity for neuronal progenitor markers, suggested the hypothesis that the increased number of neurons is due to undifferentiated precursors localized within the adult DRG.

Taken together, these results provide further information about the adaptation of the nervous system to a axonal damage and suggest that nerve regeneration is supported by neurogenesis, at least in the sensory compartment.

Key words
Peripheral nerve, injury, regeneration, spinal ganglia, rat