Neuroplasticity of Motor Pathways

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Fact Sheet

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SPINAL CORD INJURY
SPECIAL INTEREST GROUP

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ACADEMY OF NEUROLOGIC PHYSICAL THERAPY

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Motor Disruption After SCI

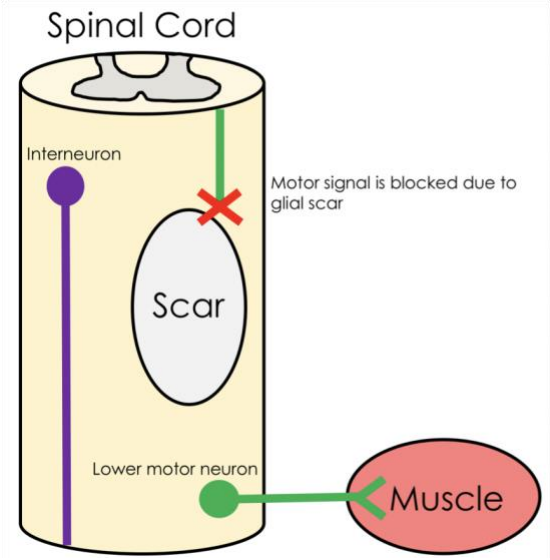

Figure 1: Motor signal is blocked due to descending motor tract injury and glial scar

Following a spinal cord injury (SCI), there is a disruption to the signal between the brain and the lower motor neuron that drives muscle activation and movement.[1] Both the initial injury to the spinal cord and the scar that forms afterward contribute to this disruption (see Figure 1).[1]

Rewiring May Be Possible

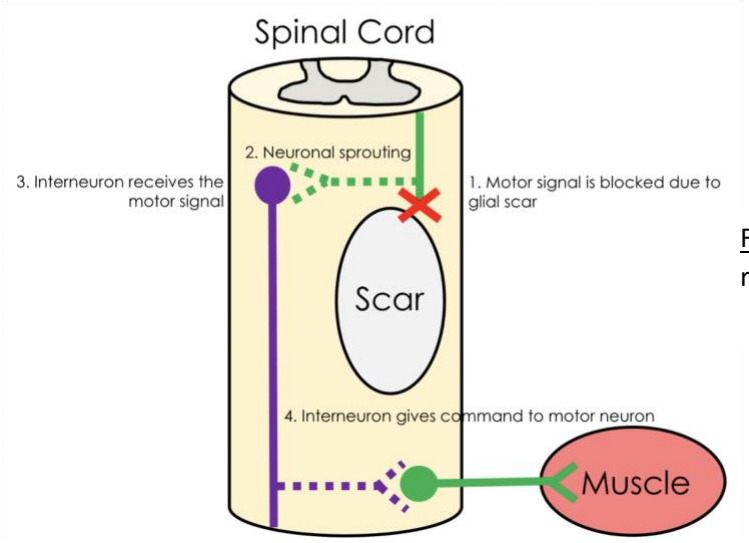

Figure 2: mechanism of rewiring in the spinal cord.

Incomplete SCI refers to an injury where some motor or sensory function is still present below the level of the injury.[2] In the case of an incomplete SCI, the re-wiring of nerves plays an important role in recovery.[2] Studies in animals have helped us understand how this re-wiring works.[3,4] In these animal studies, as little as 25% of remaining nerves allowed for recovery of voluntary walking ability.[3,4] These studies suggest that nerves are able to sprout outwards to

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communicate with spinal interneurons, which then relay the motor command to the muscle via the motor neuron (see Figure 2).[5-10] This motor pathway-interneuron connection can be enhanced with medication and with activity-based interventions such as treadmill training.[11,12]

Research in humans using brain stimulation and nerve stimulation suggests that this pathway is preserved in humans.[13-19] While more research is needed, the available evidence provides clinicians with an understanding of what is likely taking place in the nervous system of our patients with SCI. With active physical therapy interventions such as locomotor training on a treadmill[2] and repetitive practice of task-oriented activities,[20] we are likely encouraging and promoting this re-wiring. This ability of the spinal cord to re-wire means that neurologic recovery is possible... which is exciting and hopeful news!

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