

A new surgical technique that allows proximodistal regeneration of 5-HT fibers after complete transection of the rat spinal cord.

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Abstract:

Shortening of the spinal column has been regarded as one possible method to obtain cord-to-cord apposition after total transection of the spinal column. However, to further improve regenerative possibilities, the problems of inconstant bony fusion and cyst formations within the junctions must be resolved. Modifying the method of de Medinaceli on the rat thoracic spine, we attempted several fixation devices to achieve better interspinal fixation after spondylectomy and transection, including transpedicular miniscrews, wiring of the transverse processes, and wiring of the posterior spinal processes. A dynamic model, based on retracting and compressing the cut ends of the spinal cord by means of adjustable fixation devices to allow swelling and shrinking of the stumps was also attempted to better compensate pathophysiologic changes of the transected cord. The best regeneration, as indicated by regrowth of 5-HT fibers below the level of transection, was obtained following application of fibrin glue and compressive wiring of posterior spinal processes. In this group, the distance between proximal and distal GFAP-rich spinal cord tissue (gap consisting of GFAP-poor components such as cysts, phagocytic cells, and scar tissue) of the two spinal cord stumps was also the shortest. With better approximation, the numbers of regenerated 5-HT fibers improved remarkably, suggesting that this descending fiber system is able to bridge the transection under these conditions.