The Adipofascial Nerve Patch as an Alternative to Grafting in Partial Transection of a Peripheral Nerve

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Peripheral nerve injuries can be secondary to trauma, crush injuries, ischemia, and traction events. Without appropriate management, significant patient morbidity can occur resulting in dysfunction. Peripheral nerves are encased in the epineurium that protects and nourishes the individual nerve

fascicles. Major blood vessels and adipofascial tissues run over the outer surface of the epineural layer. If a peripheral nerve in the upper extremity is completely transected, tension-free epineural repair should be performed with an operating microscope.

Fig. 1 (A) Epineural repair of peripheral ends of partially divided median nerve with 8–0 S&T. (B) Central section buckles and is under tension if epineural repair is completed with 8–0 S&T. (C) Adipofascial tissues elevated and patch rotated into epineural defect. (D) Patch sutured in with 8–0 S&T.

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There are occasions when there is partial nerve transection with loss of neuronal tissue and primary repair can be challenging as achieving tension-free repair may not be possible despite adjusting the patient's position on the operating table. Furthermore, these injuries may result in buckling and distortion at the repair site if epineural repair is attempted. Tension at the repair site will result in gapping, connective tissue proliferation, scar formation, and ischemia.¹ The latter can result in neuroma formation.² It is possible to bridge the gap with an autologous or synthetic nerve conduit; however, factors such as donor site morbidity as well as the high cost and limited availability of synthetic constructs do not justify their use in these situations. The authors present a novel method to circumvent these problems when encountering partial nerve injuries.

An 11-year-old boy sustained a glass laceration to the volar surface of his wrist. Exploration under general anesthesia revealed a partial division of his median nerve with loss of neuronal tissue on the anterior most aspect of the nerve (►Fig. 1A). The epineurium was repaired with 8-0 S&T peripherally; however, the central portion remained under significant tension and repair would result in buckling and distortion (►Fig. 1B). Vascularized adipofascial tissue surrounding the nerve was therefore harvested as a patch and rotated into the defect (►Fig. 1C). This was sutured with 8-0 S&T over the small defect to serve as a framework for nerve regeneration (►Fig. 1D).

Animal models have shown that wrapping of adipofascial conduits around the site of primary neurorrhaphy reduces scar formation;³ the same may hold true of vascularized adipofascial tissue over the repair site. Application of adipose tissue to sites of nerve damage promotes neuronal regeneration and functional recovery in rodent models by serving as a mechanical barrier protecting neuronal sprouts from their immediate environment.⁴ It is important to note that use of the adipofascial flap cannot substitute autologous nerve grafting, which

to date remains the gold standard of peripheral nerve repair in cases in which primary reapproximation is not possible.⁴ The role of the adipofascial flap in the case described is largely limited to protecting and guiding the regenerating axons. Other techniques of bridging nerve gaps are being developed and include vein filled with muscle graft and amnion muscle combined graft (AMCG) conduits, which have been shown to give good results in gaps up to 3 and 5 cm, respectively.^{5,6}

At 4-month follow-up, the patient had full sensation and normal static two-point discrimination, with full range of motion and normal thumb opposition. Minor scar sensitivity was noted over the wrist and there was no evidence of neuroma formation clinically.

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