New fibrin conduit for peripheral nerve repair.

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Abstract:

An ideal substitute to treat a nerve gap has not been found. Initially, silicone conduits were employed. Later, conduits were fabricated from collagen or polyesters carbonates. More recently, it has been shown that a bioresorbable material, poly-3-hydroxybutyrate (PHB), can enhance nerve repair. The present investigation shows the use of fibrin as a conduit to guide nerve regeneration and bridge nerve defects. In this study we prepared and investigated a novel nerve conduit made from fibrin glue. Using a rodent sciatic nerve injury model (10-mm gap), we compared the extent of nerve regeneration through the new fibrin conduits versus established PHB conduits. After 2 and 4 weeks, conduits containing proximal and distal stumps were harvested. We evaluated the initial axon and Schwann cell stimulation using immunohistochemistry. The conduits presented full tissue integration and were completely intact. Axons crossed the gap after 1 month. Immunohistochemistry using the axonal marker PGP 9.5 showed a superior nerve regeneration distance in the fibrin conduit compared with PHB (4.1 mm versus 1.9 mm). Schwann cell intrusion (S100 staining) was similarly enhanced in the fibrin conduits, both from the proximal (4.2 mm versus 2.1 mm) and distal ends (3.2 mm versus 1.7 mm). These findings suggest an advantage of the new fibrin conduit for the important initial phase of peripheral nerve regeneration. The use of fibrin glue as a conduit is a step toward a usable graft to bridge peripheral nerve lesions. This might be clinically interesting, given the widespread acceptance of fibrin glue among the surgical community.