Nerve guidance conduit

A nerve guidance conduit (also referred to as an artificial nerve conduit or artificial nerve graft, as opposed to an autograft) is an artificial means of guiding axonal regrowth to facilitate nerve regeneration and is one of several clinical treatments for nerve injuries. When direct suturing of the two stumps of a severed nerve cannot be accomplished without tension, the standard clinical treatment for peripheral nerve injuries is autologous nerve grafting. Due to the limited availability of donor tissue and functional recovery in autologous nerve grafting, neural tissue engineering research has focused on the development of bioartificial nerve guidance conduits as an alternative treatment, especially for large defects. Similar techniques are also being explored for nerve repair in the spinal cord but nerve regeneration in the central nervous system poses a greater challenge because its axons do not regenerate appreciably in their native environment.

The treatment of peripheral nerve defects has always been one of the most challenging clinical practices in neurosurgery. Currently, nerve autograft is the preferred treatment modality for peripheral nerve defects, while the therapy is constantly plagued by the limited donor, loss of donor function, formation of neuroma, nerve distortion or dislocation, and nerve diameter mismatch. To address these clinical issues, the emerged nerve guide conduits (NGCs) are expected to offer effective platforms to repair peripheral nerve defects, especially those with large or complex topological structures. Up to now, numerous technologies are developed for preparing diverse NGCs, such as solvent casting, gas foaming, phase separation, freeze-drying, melt molding, electrospinning, and three-dimensional (3D) printing. 3D printing shows great potential and advantages because it can quickly and accurately manufacture the required NGCs from various natural and synthetic materials. This review introduces the application of personalized 3D printed NGCs for the precision repair of peripheral nerve defects and predicts their future direction [1)]

Tyrosine-Derived Polycarbonate Nerve Guidance Tube

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Liu K, Yan L, Li R, Song Z, Ding J, Liu B, Chen X. 3D Printed Personalized Nerve Guide Conduits for Precision Repair of Peripheral Nerve Defects. Adv Sci (Weinh). 2022 Feb 18:e2103875. doi: 10.1002/advs.202103875. Epub ahead of print. PMID: 35182046.