Repairing Peripheral Nerves: Is there a Role for Carbon Nanotubes?

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Abstract

Peripheral nerve injury continues to be a major global health problem that can result in debilitating neurological deficits and neuropathic pain. Current state-of-the-art treatment involves reforming the damaged nerve pathway using a nerve autograft. Engineered nerve repair conduits can provide an alternative to the nerve autograft avoiding the inevitable tissue damage caused at the graft donor site. Commercially available nerve repair conduits are currently only considered suitable for repairing small nerve lesions; the design and performance of engineered conduits requires significant improvements to enable their use for repairing larger nerve defects. Carbon nanotubes (CNTs) are an emerging novel material for biomedical applications currently being developed for a range of therapeutic technologies including scaffolds for engineering and interfacing with neurological tissues. CNTs possess a unique set of physicochemical properties that could be useful within nerve repair conduits. This progress report aims to evaluate and consolidate the current literature pertinent to CNTs as a biomaterial for supporting peripheral nerve regeneration. The report is presented in the context of the state-of-the-art in nerve repair conduit design; outlining how CNTs may enhance the performance of next generation peripheral nerve repair conduits.

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