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PROCEEDINGS

Design and Optimization of Microgroove Nreve Guidance Conduits

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ABSTRACT

Peripheral nerve injury can result in significant motor or sensory impairment. Traditional treatments have certain drawbacks and often result in suboptimal clinical results. To overcome these limitations, tissue engineering and bioprinting technologies are promising approaches for manufacturing nerve guidance conduits (NGCs). NGCs are tubular biostructures that bridge the nerve injury site, provide an appropriate microenvironment, and promote peripheral nerve regeneration by guiding axonal growth. The architecture of NGCs needs to mimic the morphology of natural peripheral nerves by designing their topology to regulate nerve cell behaviours. Topographic guidance cues are an effective element in improving the effectiveness of nerve conduits in regenerating nerve injury. Typically, photolithography is used but this can be complex, costly, and has limited design freedom. This study focuses on the use of stereolithography as an alternative approach to fabricate master moulds for the development of microgroove thin film conduits. The microgrooves can enable cells to align linearly along the microgrooves and achieve directional growth and migration through the contact guidance effect. Polycaprolactone (PCL) and polylactic acid (PLA) solutions were used for casting onto the polydimethylsiloxane (PDMS) moulds made by 3D printed moulds with different microgroove dimensions to obtain the polymer thin films. The morphology, mechanical, wettability, and biological properties of the microgroove thin films were analysed.

KEYWORDS

3D printing; peripheral nerve repair; nerve guidance conduit; PDMS moulds

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