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Poster Presentation

Application of Nanofibrous Scaffolds with Biomolecules as a Promise Approach for Reconstruction of Peripheral Nerve Injury

Shahin Mohammad Sadeghi[1, 2], Hadi Aligholi[1], Zabihollah Khaksar[3], Hadi Kazemi[4], Arezou Eshaghabadi[1], Sayed Mostafa Modarres Mousavi[1], Sajad Sahab Negah[1, 3*]

[1]Shefa Neuroscience Research Center, Khatam Alanbia Hospital, Tehran, Iran.
[2]Plastic Surgery Group, Medical Faculty, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
[3]Histology and Embryology Group, Basic Science Department, Veterinary Medicine Faculty, Shiraz University, Shiraz, Iran.
[4]Pediatric Department, Shahed University, Tehran, Iran.

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Abstract

Peripheral nerve injuries caused by traffic accidents, resections of tumors or iatrogenic side effects of the surgeries are few of the most common form of trauma occurring with up to 500,000 cases each year in Iran. Conventional strategies including nerve coaptation, and the application of autografts, allografts and xenografts are restricted due to the limited availability of donors, immune-rejections or restrictions such as too big gap length. At the same time, these alternatives do not guarantee full recovery and functionality of the damaged nerves. Due to these reasons, approaches towards the development of biomaterial scaffolds for regeneration of peripheral nerve defects have gained a huge momentum. An ideal scaffold for nerve tissue regeneration requires sufficient biological and physiochemical properties, with major concern on biocompatibility, biodegradability, permeability for oxygen and nutrition, mechanical properties together with appropriate surface characteristics. The design of the engineered scaffold shall focus on mimicking the complex biological nanofibrous structure of the native extracellular matrix allowing the remodeling and repair of the damaged tissue by neighboring cell. Synthetic polymers such as poly-L-lactic acid and poly-e-caprolactone have been utilized to fabricate electrospunnanofibrous scaffolds and their compatibility towards peripheral nerve tissue regeneration has been investigated. However synthetic polymers alone might not meet all the requirements of an artificial tissue construct since they lack recognition sites for cell adhesion. Incorporating natural polymers, like proteins or peptides might overcome this problem and increase the biocompatibility of the scaffolds. Functionalization of nanofibers is usually performed by electrospinning of synthetic and natural polymer blends or by coating the nanofibrous scaffolds with biomolecules. Core-shell nanofibers prepared by co-axial electrospinning allows for the encapsulation of proteins within the core of the polymeric shell, thus may be preserving the bioactivity of the proteins or biomolecules better than blended or coated structures.

Keywords: Nanofibrous Scaffold, Road Accident, Poly-L-Lactic Acid, Poly-e-Caprolactone.

Corresponding Author: Sajad Sahab Negah

E-mail: *sahabsajad@yahoo.com*