Fabrication of Nerve Conduit with Biodegradable Hydrogels and Nanofibers Releasing Growth Factors for Guidance of Axonal Growth

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Although more than 200,000 patients are suffering for peripheral nerve injury, there is still not an effective treatment to replace surgical repair. Development of nerve graft with biodegradable hydrogels and nanofibers can be alternative to the methods.
In this study, we fabricated scaffolds consist of poly(ethylene glycol) [PEG] hydrogel, polycaprolactone [PCL] aligned electrospun nanofibers, and poly(lactide-co-glycolic acid) [PLGA] random electrospun nanofibers which it is rolled to make a conduit-form. The scaffold consists of three layers, one PCL aligned fibrous sheet and two PLGA random sheets. 1st PLGA sheet is made up of 65% PLA and 35% PGA [PLGA 65:35], and 2nd PLGA sheet is composed of 85% PLA and 15% PGA [PLGA 85:15]. They are known for having different degradation speed; PLGA 65:35 degrades faster than PLGA 85:15, generally. PEG hydrogel enveloping both ends of scaffold play a role as a support fixture to hold fibrous sheet on. The PCL sheet functions as a cell-attached area, whereas the PLGA sheets acts as reservoirs to release some growth factors like NT-3 [Neurotrophin-3], BDNF [Brain-derived neurotrophic factor] or PDGF [Platelet-derived growth factor].