Improve cellular infiltration of electrospun fibrous scaffold by side-by-side electrospinning

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In the field of tissue engineering, a scaffold is used to provide physical support where cells differentiate and proliferate. In order to emulate nano-fibrous structure of extracellular matrix(ECM) for the effective tissue regeneration, electrospinning has been utilized as a scaffold fabrication technique. However, the conventional electrospinning process produces sheet-like structure with small pore size and cells cannot penetrate into the scaffold. It means the 2-dimensional cellular environment is created rather than the 3-dimensional cellular environment as in real tissue. In this study, a bicomponent fibrous scaffold was fabricated by side-by-side electrospinning which utilizes two attached needles for the simultaneous electrospinning of two polymer solutions. We hypothesized that the scaffold composed of a rigid polymer and a swellable polymer have enhanced cellular infiltration ability since the swelling property of a polymer could contribute to make inter-fiber space in the scaffold. The alternate structure and bent fibers were confirmed by confocal laser scanning microscope after the scaffold had swollen. This scaffold fabrication technique may promote functional construction of specific tissue by creating 3-d microenvironment, thereby contribute to various tissue engineering processes.