

عنوان مقاله:

Fabrication of a biomimetic injectable hydrogel with improved mechanical properties for cartilage tissue engineering

محل انتشار:

شانزدهمین کنگره ملی مهندسی شیمی ایران (سال: 1397)

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خلاصه مقاله:

Since cartilage has limited self-regeneration, in-situ forming hydrogels can act as an ideal scaffold for cartilage tissue engineering to fill the defect gap due to their ability to homogeneously encapsulate the desired cells, efficient mass transfer and minimally invasive characteristics. In this project an injectable hydrogel with improved structure by adding silk fibroin (SF) nanofibers and better biochemical properties by employing cartilage extracellular matrix (ECM) was fabricated. The in-situ forming hydrogel is consisted of different concentrations of ionic crosslinked alginate incorporated with different concentrations of SF nanofibers and 1% w/v enzymatically digested decellularized cartilage ECM. The result showed that increasing the alginate concentration caused an increase in the compressive Young's modulus and gelation time of the samples. However, increasing the SF nanofiber concentration could not necessarily increase the mechanical stiffness because it may act as a barrier for crosslinkers diffusion within the hydrogel bulk. Scanning electron microscope (SEM) images showed that SF nanofibers were homogeneously dispersed in the hydrogel, mimicking the natural cartilage environment. It can be concluded from the obtained results that the hydrogel with alginate and SF nanofiber with concentrations of 1.651% w/v and 2.662% w/v, respectively, has the optimum compressive Young's modulus and gelation time, which may have potential to be applied as an injectable hydrogel in articular cartilage defects.

کلمات کلیدی:

.Cartilage Tissue Engineering, Injectable Hydrogels, Alginate, Extracellular matrix, Silk Fibroin, Mechanical Properties

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