Engineered Meniscus Scaffolds using Sonication Decellularization Treatment System

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Abstract

Meniscus located in the weight-bearing area responsible for the movement and functions of the knee. However, the frequent injuries within the avascular region of meniscus have lack of healing capability. Thus, the emerging decellularized scaffolds serve as one the interventions for the regeneration of new tissues to treat early degenerative joint disease. The aim of this study is to investigate the effectiveness of sonication treatment system in decellularization of meniscus tissues. The decellularization process was conducted in 40 kHz frequency with 0.1% SDS solution for 10 hours and proceeds with five days washing process. The decellularization efficiency was evaluated through histology, gel electrophoresis and biochemical assays to observe the cellular components removal and preservation of extracellular matrix (ECM). Compared to the control group, the histological evaluation of sonication decellularized scaffolds based on staining van Gieson showed complete removal of cellular components. Picrosirius red and Safranin O/fast green staining revealed the well preservation of the distribution of collagen and glycosaminoglycan networks (GAGS) in sonication decellularized scaffolds and no visible of DNA bands in the electrophoresis of agarose gel. Biochemical assessment for DNA quantification illustrated a significant decrement of DNA residues and GAGS for sonication decellularized scaffolds while maintained in collagen content. Based on the results, it can be deduced that sonication decellularization treatment system successfully prepared scaffolds with low cellular contents and maintained extracellular matrix components. Therefore, sonication decellularization treatment sy stem can serve as one of the potential physical decellularization method in tissue engineering and regenerative medicine fields.

Keywords

Author Keywords: meniscus; sonication; decellularization; extracellular matrix; scaffolds
KeyWords Plus: MATRIX; TISSUES; COMPLEX; REPAIR

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