

Vascularized Adipose Tissue Engineering by Using Adipose ECM/Fibroin Hydrogel

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Abstract : Adipose tissue engineering is a promising field for regeneration of soft tissue defects. However, only very thin implants can be used in vivo since vascularization is still a problem for thick implants. Another problem is finding a biocompatible scaffold with good mechanical properties. In this study, the aim is to develop a thick vascularized adipose tissue that will integrate with the host, and perform its in vitro and in vivo characterizations. For this purpose, a hydrogel of decellularized adipose tissue (DAT) and fibroin was produced, and both endothelial cells and adipocytes that were differentiated from adipose derived stem cells were encapsulated in this hydrogel. Mixing DAT with fibroin allowed rapid gel formation by vortexing. It also provided to adjust mechanical strength by changing fibroin to DAT ratio. Based on compression tests, gels of DAT/fibroin ratio with similar mechanical properties to adipose tissue was selected for cell culture experiments. In vitro characterizations showed that DAT is not cytotoxic; on the contrary, it has many natural ECM components which provide biocompatibility and bioactivity. Subcutaneous implantation of hydrogels resulted with no immunogenic reaction or infection. Moreover, localized empty hydrogels gelled successfully around host vessel with required shape. Implantations of cell encapsulated hydrogels and histological analyses are under study. It is expected that endothelial cells inside the hydrogel will form a capillary network and they will bind to the host vessel passing through hydrogel.

Keywords : adipose tissue engineering, decellularization, encapsulation, hydrogel, vascularization

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