Vascularization of soft tissue engineering constructs

Vascularization is recognized to be the biggest challenge for the fabrication of tissues and finally, organs in vitro. So far, several fabrication techniques have been proposed to create a perfusable vasculature within hydrogels, however, the vascularization and perfusion of hydrogels with mechanical properties in the range of soft tissues has not been fully achieved.

My project focused on the fabrication and the active perfusion of hydrogel constructs with multi-dimensional vasculature and controlled mechanical properties targeting soft tissues. Specifically, the initial part of the research has focused on: (1) the fabrication and characterization of gelatin constructs with 2D and 3D perfusable vasculature and (2) the development of a fluidic platform to allow the direct perfusion of the fabricated constructs. Throughout the developed technology, it was possible to fabricate and perfuse densely populated constructs integrating a 3D vasculature. Also, it was possible to fabricate and test a hydrogel-based fluidic system integrating sensors capable of simulating a barrier environment.

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