

Cartilage and Heart Valve Tissue Engineering: Working Towards Noninvasive Construct Analysis

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Tissue engineering is an inter-disciplinary and multi-disciplinary subject requiring knowledge of several biological as well as engineering concepts. At a fundamental level, the common thread for tissue engineering strategies involves cells and scaffolds. In this section of the course, we will focus on 2 applications in tissue engineering/regenerative medicine research: i) cartilage and ii) heart valves. Both of these structures are avascular in nature and serve a mechanical role. Fundamental biomechanics concepts related to these applications will be briefly covered. We will continue with detailed discussions of how MRI can be used to assess constituents of the developing tissue at both the cellular and tissue level. Examples are techniques such as superparamagnetic iron oxide cellular labeling and the gadolinium exclusion method to monitor cell migration and the progression of extra-cellular matrix (ECM) constituents non-invasively. Hurdles that need to be overcome to realize clinical translation of these tissue engineered products as well as the role that MR can play as a monitoring tool during this process will be addressed.