

Public Abstract

First Name:Jeffrey

Middle Name:Thomas

Last Name:LaCroix

Adviser's First Name:Mark

Adviser's Last Name:Haidekker

Co-Adviser's First Name:

Co-Adviser's Last Name:

Graduation Term:SP 2009

Department:Biological Engineering

Degree:PhD

Title:A Fiber-Optic Confocal Scanner for Scattering Tissue

Advances in sheet based tissue-engineering has opened the door for tissue-engineered products such as skin and vascular grafts. In order for tissue-engineering to progress towards clinical applications, non-invasive quality control becomes increasingly important. This research offers a prototype device based on the principle of confocal microscopy, a technique with can examine tissue structures on the micrometer scale. The confocal scanner is used to identify thickness and density in tissue-engineered sheets as well as evaluating defects within the tissue structure itself. Furthermore, the use of the confocal scanner has been expanded to include more general uses such as examining scattering in common tissue phantoms. The effectiveness of the scanner has also been tested in a clinical application as a possible method to determine the optical effects in aged skin.

Testing of the confocal scanner verifies its ability to serve as quality control for tissue-engineered sheets and is comparable to commercially available methods to serve this purpose. It was also shown that while the device was successful in quantifying optical effects in tissue phantoms, some changes are necessary in order to be used for diagnostic purposes in human skin. Nevertheless, this research has shown that the need for such a device is present, specifically in the field of tissue-engineering, and that this prototype confocal scanner is successful in filling the void.