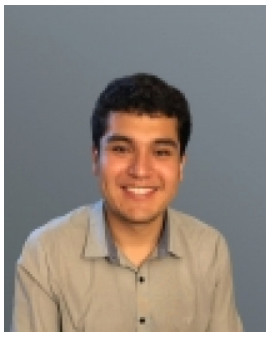
University of Houston - Biomedical Engineering Seminar

Friday, September 9, 2022, 12 noon

SEC 206

High resolution 3D biomechanical mapping of embryos with Optical Coherence Elastography



Christian Zevallos Delgado

Abstract

Healthy development of embryos depends on several critical biomechanical processes, such as neurulation and cardiovascular development. Understanding the structural modifications and changes in stiffness during embryo development is important for understanding the etiology of various congenital diseases, such as anencephaly or spina bifida. The noninvasively high-resolution 3D mapping of the biomechanical properties of the embryos was done using reverberant optical coherence elastography (Rev-OCE) without any exogenous contrast agents. Rev-OCE measurements were performed in both murine and zebrafish embryos to showcase its capability to map the stiffness of commonly used models of disease. Murine embryos were dissected from CD1 mice at different gestational days, and the zebrafish embryos were at different hours and days post fertilization. Rev-OCE imaging was performed using a phase-sensitive optical coherence tomography (PhS-OCT) system, the wave generation of wave was done using a piezoelectric bender in the samples. The bender vibrated and generated randomly oriented shear waves in the samples, which were detected by the PhS-OCT system. The results show clear spatial distribution of stiffness in the embryos. For example, the spinal region of the murine embryos was stiffer than other tissues, and in the zebrafish embryos, the head and swim bladder were stiffer. Embryonic elasticity could provide valuable insight about critical embryonic developmental process and etiology of various congenital defects.

Biosketch

Christian Zevallos Delgado is a Ph.D. candidate and research assistant on Dr. Larin's lab at the University of Houston. He received his Master of Science in Bioinformatics and Molecular Biochemistry from the George Washington University, Washington DC in 2020 and Bachelor of Engineering in Biotechnology from the Universidad Catolica de Santa Maria, Peru in 2016. His research interest involves the use of Optical Coherence Elastography and biomedical imaging.