Histotripsy: Image-guided Ultrasound Therapy for Non-invasive Surgery

Abstract: Wouldn’t it be great to perform a surgery without incision or bleeding? “Histotripsy” is the first non-invasive, non-ionizing, and non-thermal ablation technique that is invented in Dr. Xu’s lab. Using ultrasound pulses applied from outside the body and focused to the target diseased tissue, histotripsy produces a cluster of energetic microbubbles at the target tissue using the endogenous gas pockets with millimeter accuracy. These microbubbles, each similar in size to individual cells, function as “mini-scalpels” to mechanically fractionate cells to acellular debris in the target tissue. The acellular debris is absorbed over time via metabolism, resulting in effective tissue removal. Off-target tissue remains undamaged and no incision is needed. Thus histotripsy can perform non-invasive surgery guided by real-time imaging. Histotripsy has potential for many clinical applications where non-invasive tissue removal is desired. Dr. Xu will talk about the mechanism and instrumentation development of histotripsy as well as the latest pre-clinical and clinical studies of histotripsy for cancer, cardiovascular, neurological, and immunotherapy application.

Biography: Zhen Xu is a tenured Associate Professor and Associate Chair of Graduate Education at the Department of Biomedical Engineering at the University of Michigan, Ann Arbor, MI. She received the Ph.D. degree in biomedical engineering from the University of Michigan in 2005. Her research focuses on ultrasound therapy and imaging, particularly histotripsy. She received the IEEE Ultrasonics, Ferroelectrics, and Frequency Control (UFFC) Outstanding Paper Award in 2006; National Institute of Health (NIH) New Investigator Award at the First National Institute of Biomedical Imaging and Bioengineering (NIBIB) Edward C. Nagy New Investigator Symposium in 2011, The Federic Lizzi Early Career Award from The International Society of Therapeutic Ultrasound (ISTU) in 2015, and the Fellow of American Institute of Medicine and Bioengineering in 2019. She is an associate editor for IEEE Transactions on UFFC and board member of ISTU. She is a principal investigator of grants funded by NIH, Office of Navy Research, American Cancer Association, and Focused Ultrasound Foundation.