AbstractID: 7949 Title: Ultrasound

Methods for imaging the elastic properties of soft tissues have undergone rapid development in recent years. This is in part facilitated by the ever-increasing capabilities of ultrasound imaging systems. This presentation will describe the basic mechanics of soft tissues and terminology used in elasticity imaging (e.g., stress, strain, elastic modulus). Key developments in motion tracking for elasticity imaging will be reviewed with emphasis on the current state of the art in motion tracking algorithms for accurate estimation of displacement fields. That discussion sets the stage for an analysis of observations of soft tissue mechanics as seen via real-time elasticity (mechanical strain) images of breast tissues during relatively large deformations. For example, many benign lesions tend to lose contrast in strain images as deformation increases. That behavior can be understood given the measured mechanical properties of in vitro tissue samples. Unlike benign lesions most cancerous tumors tend to maintain a large negative contrast with increasing deformation, and that too can be understood from in vitro measurements. The utility of this information is summarized with a review of recent clinical trials of breast elasticity imaging. Specifically, a recent multi-institutional, multi-observer study has demonstrated that elasticity imaging increases the diagnostic confidence of breast ultrasound radiologists when attempting to classify a tumor as either “benign” or “malignant”. The presentation will conclude with a brief discussion of the prospects for future enhancements and improvements in elasticity image formation and information content.

Educational Objectives

1. Understand the basic vocabulary used to describe simple solid mechanics
2. Understand the methods used to form real-time elasticity images using ultrasound and the potential for significant improvements in the future
3. Understand the basic criteria for interpreting breast elasticity images