AbstractID: 14312 Title: Change-based Image Quantification for Cancer Diagnosis

Purpose: Cancer diagnosis is usually confirmed by biopsy, which may cause risk and may occasionally introduce tumor cells into lymphatic and blood vessels. A method for creating tumor molecular or physiologic 3D signatures, for quantifying signature changes in response to a small dose of a therapeutic agent, and for correlating changes with diagnostic likelihoods, has been developed.

Methods and Materials: Software was designed to connect voxels of similar intensity value, from MRI, MRSI, PET, SPECT, or other imaging sources, to form 3D "isonumeric contours." Series of contours, with each contour representing a separate narrow intensity value range, are displayed to reveal tumor molecular or physiologic topography. Contour parameters were then considered for relevance to quantifying change. A software-based model for correlating change with diagnosis was designed

Results: Measured isonumeric and topographic parameters include volumes, surface areas, shape, inter-contour distances, median or peak intensity values within contours, numbers of intra-tumor (subvolumetric) "elevations" (analogous to conventional topographic elevations), elevation height (difference between the elevation's base contour and peak intensity value), and others. Pre- and post-treatment contour profiles are compared. Treatment-induced changes are represented mathematically. Changes can be compared with predetermined values stored in databases for which diagnosis is known. Specific diagnostic probabilities can be quantitatively estimated. Rules engine-based recommendations for further work-up or can be made.

Conclusion: Via quantification of small stimuli-induced tumor and subvolume molecular and physiologic changes, and via correlation of changes with particular diagnoses, this method has the potential for greater specificity than an approach incorporating only anatomic morphology at a single time point. It may eventually replace biopsy in some situations. The system is applicable to PET, SPECT, and multiple forms of MR-based imaging, and combinations of these modalities. It also has many potential non-oncologic applications.

Conflict of Interest: Research sponsored by ImQuant, Inc.