

AbstractID: 13277 Title: Developing multimodality image analysis software for target definition and therapy response assessment

**Purpose:** Multimodality functional imaging in cancer chemo-radiotherapy holds promise for improved determination of tumor involvement in tissues and quantification of spatial and temporal changes in tumor pathophysiology in response to therapy. To address urgent needs for efficient analysis tools, we have developed an integrated software suite for retrospective research, prospectively evaluating the efficacy of functional imaging and facilitating streamlined data analysis for large-scale clinical trials.

**Methods:** Our software was developed using the MATLAB programming language version 7.6. The software runs on a Dell computer server with a 3-GHz Intel Quad Core Xeon processor and 16-gigabytes of memory. The software was designed to allow data exchange either directly with a patient image database or via a file system that organizes the data files hierarchically by institutional protocol, patient medical record number, imaging modality, study date, and series description. The spatial transformation matrix files generated in Siemens image registration applications can be read into our system and applied to image datasets in their original format.

**Results:** This software allows simultaneous visualization of spatially registered images and derived parametric maps from various functional and anatomic imaging modalities at multiple time points. DICOM-RT structure and dose files imported from treatment planning systems can be related to these multimodality images. Quantitative tools were implemented to perform image segmentation, histogram analysis of volumes of interest, and voxel-wise correlation across modalities. Image and dosimetry data from example patients were processed to illustrate the clinical applicability of the software.

**Conclusion:** We present an efficient image analysis software suite capable of simultaneously analyzing longitudinal patient images and radiation dose map with user-defined volumes of interest or structures previously drawn for treatment planning. We hope this study illustrates well the unique needs of multimodality imaging in radiation therapy practice and encourages collaborative research between medical imaging sciences and radiation oncology.