AbstractID: 5877 Title: Sinogram-based respiratory gating for 5D PET

Purpose: PET/CT for tumor delineation is degraded when the tumor lies in a region of the body moved by breathing motion. It was recently determined that breathing motion is characterized by the depth and rate of breathing. This approach ("5D model") has been shown to accurately reproduce even very irregular breathing motion. We have developed the model for use in PET image reconstruction for the removal of breathing motion artifacts.

Methods and Materials: The PET acquisition is gated using the tidal volume and airflow and binned according to a user-specified breathing phase. One of the main considerations with researching this process is the ability to reconstruct PET images. For modern PET scanners, the manufacturer uses sophisticated image reconstruction that cannot be accurately reproduced in the lab, so manipulation of the sinogram data file with subsequent reconstruction by the manufacturer would be ideal. We tested this critical function by acquiring a cardiac-gated sinogram data file from a PET/CT manufacturer (Philips, Cleveland OH). The sinogram-header file was copied byte-by-byte to a new file and the remaining file examined to determine the relative cardiac phase between timing data. The sinogram file was rewritten with the events in the user-selected phase and sent to the commercial image reconstructor. The subsequent images compared against the commercial gating software produced images.

Results: The images were nearly identical and showed we had clearly and accurately gated the PET sinogram data. Because of a memory limitation, our gated sinogram data had 1/3 the number of events of the original sinogram file.

Conclusions: We have shown that the most complex part of studying 5D PET gating can be conducted using the commercial software package. This allows us to continue working on the 5D PET process and extend to dynamic phantom studies.

Supported in part by NIH R01CA96679