AbstractID: 5896 Title: The use of deformable registration model to improve visibility of the lesion in gated PET images

Purpose

Gated PET images from a respiration-correlated 4D PET/CT protocol potentially provide more accurate definition of tumor compared to motion averaged non-gated PET images. However, gated PET images have reduced event statistics in each phase bin, due the shorter acquisition time relative to the clinical study. We have previously demonstrated that a deformable registration algorithm can accurately model changes in lung lesion position from CT images obtained at different respiration phases. The purpose of this study was to evaluate method of deformable image registration to improve the visibility of lung tumors in gated PET

Methods and Materials

The data for two patients were acquired on a PET/CT scanner using a respiration-correlated PET/CT protocol, which yielded CT and PET images at different phases of the patient's respiratory cycle. For each patient PET and CT data were sorted in 8 bins. Application of a deformable CT-to-CT registration algorithm produced a set of 7 deformation fields that mapped the CT images at different phase bins onto a reference CT phase (end inspiration). The set of deformation fields was then applied to deform the gated PET images to the reference phase. The deformed PET images were summed with the PET image at the reference phase to produce a single PET image.

Results

We have examined T/B ratio in the images by drawing ROIs in the lesion and in the vicinity of the lesion. The most noticeable changes in visibility of lesion were observed in the periphery of the tumor. In two patients the T/B ratio in the summed warped image sets improved by 80% and 21% in periphery, 31% and 16% in the center of the tumor relative to single gated image.

Conclusion

Deformable registration can be used to improve T/B ratio and the visibility of lesions in gated PET data.