AbstractID: 9422 Title: Regarding the registration of PET/CT information to ultrasound images used in intraoperative planning of permanent prostate implants.

Purpose: Use of PET/CT information in biological planning of prostate implants is contemplated; however, registration of PET-positive voxels to intraoperative ultrasound images used for planning requires an alignment along the superior-inferior axis. Methodology for performing this transformation is described.

Methods: Patient posture and prostate deformity are similar for MRS and ultrasound imaging, therefore transfer of data from one to the other require mapping only[1]. However, in PET/CT the reference system is sufficiently dissimilar to employ appropriate coordinate transforms. A rotation, translation and distortion matrix, **M**, is determined by digitizing easily definable urethral points on the two studies. Once a least squares solution for **M** is achieved, the previously acquired PET/CT data may be registered with the ultrasound data. By connecting inter-slice contour points, a pseudo volume is generated from which new contours can be calculated. This contour information is directly comparable such that ROI's can be transferred by existing ratio dependent algorithms. Dosimetry may then be optimized with proper attention to suspect regions.

Results: The inter-plane contour extrapolations, the heart of the treatment, agree markedly with expectations. Phantom studies, being designed to assure identification of points imaged by differing modalities and geometric vantages, show errors in the millimeter range.

Conclusion: Phantom studies provide substantive proof of reliability in the algorithm. Even with drastic changes in orientation, which would not occur in a clinical procedure, the process clearly maps points in disparate studies correctly.

[1]Mizowaki et al IJROBP V54:5, 1558-64, 2002.