

**AbstractID: 7386 Title: Automated "prostate-only" registration of CT/MR images for post-implant dosimetric assessment of permanent seed brachytherapy**

**Purpose:** To determine the ability of a normalized mutual information (NMI) algorithm to perform automated "prostate only" rigid-body registration of CT/MR prostate images for I-125 seed post-implant dosimetric assessment.

**Method and Materials:** CT/MR image volumes for three patients were obtained approximately 4 weeks post-implant. CT data were acquired using a non-helical scan with 3.0 mm slice thickness and ~0.3 mm pixel pitch. MR data at 1.5T were obtained using two pulse sequences: T2-weighted with TE/TR=91/4748 ms, and balanced fast-field echo (B-FFE) with TE/TR=9.6/4.8 ms. A surface coil (Sense Cardiac) was used to acquire axial slices 3 mm thick with no gap having a pixel pitch of ~0.3 mm. NMI-based registration was performed using the MatchLab module in the Analyze 7.0 software package, which affords control of an extensive range of registration parameters. These parameters were varied systematically to determine their influence on registration accuracy.

**Results:** Automated "prostate only" registration of T2-weighted MR images with CT was unsuccessful. For B-FFE-weighted MR, registration to sub-millimeter accuracy transaxially and millimeter accuracy in the scan direction was achieved for all three patients using a common set of registration parameters. These parameters served to define a box-shaped registration volume containing mostly prostate, eliminate CT intensities below -100HU, sample 6400 points per image slice, create 8-level individual and joint entropy histograms, and specify a transformation search strategy. Analysis of additional clinical data is ongoing.

**Conclusion:** Automated "prostate only" registration of CT/MR images of the implanted prostate to sub-millimeter accuracy transaxially and millimeter accuracy in the scan direction is feasible. Achieving this level of accuracy requires appropriate and sufficient information content in the MR images (which a B-FFE sequence can provide), pre-selection of imaging data containing the most relevant information, and specification of appropriate NMI algorithm search parameters.

**Conflict of Interest (only if applicable):**