

AbstractID: 10888 Title: Study of Image Registration Methods Based on the Pelvic Bone and its Contour for Prostate Cancer Treatment

Purpose: Because of different imaging contrasts in the MVCBCT and the planning CT, image registration between the two modalities may introduce additional uncertainties in image guided radiotherapy (IGRT). For a group of ten prostate patients concurrently treated with the pelvic lymph nodes, we compared two alignment methods: one directly aligns the pelvic bone from the MVCBCT to that of the planning CT; the other aligns the pelvic bone from the MVCBCT to the contour of the pelvic bone from the planning CT.

Method and Materials: On the first day of treatment, the treatment positions for all patients were verified with an extended field of view (FOV) MVCBCT to include the entire pelvic bone. Subsequently, the reduced FOV-MVCBCT was used daily to localize the prostate with implanted markers. Only the FOV-MVCBCT was used to identify uncertainties in patient positioning. For each patient, the MVCBCT was manually registered with the two alignment methods. Each alignment method was repeated three times by a single observer in three separate times.

Results: For each patient, the difference of mean shift along the left-right (X), anterior-posterior (Y), and inferior-posterior (Z) directions was small between two alignment methods. The mean standard deviation of 10 patient measurements for the contour based and bone based registration were 0.6 mm vs. 0.7 mm, 1.2 mm vs. 1.2 mm, and 0.6 mm vs. 1.6 mm along the X, Y, and Z directions, respectively. Particularly, more large deviations ($> 2\text{mm}$), 4 out of 10 patients, were observed in the Z direction with the bone based registration method.

Conclusion: The contour based image registration method achieved more consistent measurement than the bone based registration in verification of the treatment position for prostate patients concurrently treated with pelvic lymph nodes.

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