

Purpose: To quantify positional variations of implanted markers for prostate localization using the ExacTrac system.

Method and Materials: Eleven patients were identified as having undergone IMRT boost for prostate cancer. The ExacTrac system was used to obtain implanted marker positions in the patient by means of two stereoscopic X-ray tubes and DRRs from CT simulation. Marker positions were recorded by the ExacTrac software and subsequently read using the PTDreader software. Implanted marker positions were analyzed for variations in individual marker coordinate displacement, inter-seed distances and area transcribed by the three markers. Comparisons of patient data was done for the initial boost phase (1980 cGy/11 fractions) and final boost phase (1080 cGy/6 fractions).

Results: Implanted markers had maximum deviations of 3.3 mm (LAT) 6.4 mm (AP) and 3.4 mm (SI). In cases where the maximum deviation was observed for one coordinate the other coordinates were also approaching their maximums. No correlation between individual marker positions was observed. Inter-seed distances were found to vary by +/- 2 mm over the treatment period. The area of a triangle contained by the three markers was shown to vary daily over the treatment period. In the 6 patients who were observed over both boost phases a trend was observed that indicated a progressive decrease in the area for the 4 patients not on hormone therapy and stable area size for the two on hormone therapy. Of the 11 patients followed over the final boost phase 8 were found to demonstrate a similar decrease but no correlation with hormone status was observed.

Conclusions: Implanted markers in the prostate demonstrate daily variations in their positions. The observed variations exceeded the precision of the ExacTrac system. Further work is needed to address the movement of implanted markers in the prostate in positioning algorithms and correlation with prostate volume.