Topic of interest: Clinical applications of AlignRT 3-cameras real-time surface image-guided positioning system (IGPS) for positioning patients to reduce the number of X-ray images and tracking intra-fractional movements in proton therapy.

Purposes: To position patients and track the intra-fractional movements, the AlignRT system was implemented in proton incline-beam-line (IBL) at Procure Oklahoma-City center.

Methods: The AlignRT3c system was configured near perpendicular to the gantry rotation for accommodating the X-ray IGPS. To evaluate positioning accuracy, more than 10 surfaces of each patient for ten patients with intracranial tumors were acquired after patients positioned by X-ray IGPS. Displacements between acquired surfaces and the reference surface taken at 1st day of treatment were examined. Intra-fractional movements with respiratory was studied with gated surface that allows setting the reference surface for patient at exhale during breathing. Intra-fractional movements due to respiratory were monitored on 10 sections of each patient for three patients with thoracic tumors.

Results: Accuracy of positioning patient is 2.0 mm at both anterior-posterior and lateral directions, and is 3.5 mm in superior-inferior (SI) direction by aligning the surfaces of masks. Observed larger displacements along SI direction can be due to patient’s movements within the mask. Periodical displacements within 5 mm compared to its reference were seen for the three patients with thorax tumors. However, 10 mm sharp displacements with a few seconds were observed when patient moved the body.

Conclusions: We have implemented the first AlignRT3c IGPS for proton therapy for positioning patients within 2.0 mm, and successfully tracked intra-fractional respiratory motion during treatment after positioning patient.

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N/A