

AbstractID: 10690 Title: Daily Image Guided Localization for Pediatric Brain Tumor Patients

Purpose: Establish the setup uncertainty (SU) for intracranial pediatric radiotherapy patients based on daily pre-treatment CBCT and quantify the residual uncertainty (RU) based on post-treatment CBCT. Also, quantify the inter-observer uncertainty (OU) and mechanical uncertainty (MechU) of the CBCT system.

Methods and Materials: 94 intracranial pediatric patients have completed therapy under an IRB approved localization protocol, and stratified based on treatment position (Supine/Prone) and the use of general anesthesia (GA). Patients received a localization CBCT prior to each fraction and at the end of every other fraction. The CBCT used was an investigational MV imaging beam line; the output was adjusted such that the patient isocenter dose was 1cGy per CBCT. The offset based on the registration of the pre-fraction CBCT to the Sim-CT, comprising the SU, were recorded in an electronic database and the patient moved into the correct position. The offset in the post-fraction CBCT to the Sim-CT comprised the RU.

Nine individuals independently registered the first five CBCTs of the same five randomly chosen patients. The comparison established the inter-observer uncertainty (OU). The mechanical uncertainty (MechU) was determined by acquiring a CBCT of a localization phantom monthly and recording the discrepancy between the known positions of landmarks within the phantom and the positions based on the CBCT.

Results: The mean age of the 94 patients was 12.7 ± 7.3 years. 69 were treated supine and 25 prone; 41 with GA and 53 without. The various uncertainties in mm were as follows: SU_Supine=3.5, SU_Prone=3.8, SU_GA=3.7, SU_noGA=3.6; RU_Supine=1.8, RU_Prone=2.4, RU_GA=1.5, RU_noGA=2.3. The OU was 0.9 and the MechU was 0.5 mm.

Conclusion: The 1cGy CBCTs produced with the investigational imaging beam line can be used to confidently localize the patient before treatment and thereby reduce the setup uncertainty.

Conflict of Interest: Supported in part by Siemens Medical USA.