Abstract ID: 18812    Title: Initial Clinical Assessment of a Gimbaled Linac Tumor Tracking System in a Patient Simulation Study

Purpose: A simulation study was conducted on patients to evaluate the workflow and quantify the performance of the BrainLab/MHI Vero dynamic tumor tracking system in clinical circumstances.

Methods: The gimbals hold the linac-MLC assembly which enables tracking of moving tumors. Two kV imaging systems are attached at Â±45Â° from the 6MV beam allowing simultaneous X-rays. A simulation study was conducted on 5 lung-liver patients. The procedure involved quantification of tumor motion based on localization of Visicoil gold markers implanted in the tumor. Except for switching on the treatment beam, the entire tumor tracking workflow was executed involving patient positioning, synchronized acquisition of skin marker motion and X-ray images, fiducial marker detection, external-internal correlation model calculation, skin marker surrogate guided tracking and monitoring imaging. Tracking error was calculated from gimbals log-files and the acquired monitoring X-rays. Imaging dose was measured with TLD on phantoms and on the patients.

Results: Imaging for correlation model building resulted in 17.6mGy skin dose. Taking the treatment duration of a 3x20Gy lung SBRT treatment, depending on the treatment fields orientation an additional maximal exposure of 28.8mGy was estimated for acquiring 1Hz X-ray monitoring during tracking. A mean absolute tracking error of 1.1mm was measured, with a 90% percentile of 2.1mm. The average time to set up the patient entering the room to the first MV beam-on was 9min. From the acquisition of the modeling images sequence up to beam-on took 3min.

Conclusions: A clinical version of the Vero tumor tracking system has been installed, including automatic detection of fiducial markers implanted in the tumor. An initial assessment has shown that the tracking system is functional and its performance adequate to move forward to final commissioning and initiation of patient treatments.

Funding Support, Disclosures, and Conflict of Interest:
This collaborative work was supported by the Flemish government through the Hercules foundation and the Fonds voor Wetenschappelijk Onderzoek - Vlaanderen grants G.0486.06 and G.0412.08, and corporate funding from BrainLab AG. There are no other conflicts of interest.