AbstractID: 6563 Title: Improved target localization and set-up for CFRT/IMRT of the prostate by combining real-time infrared tracking and stereoscopic x-ray imaging

The NOVALIS linear accelerator (BrainLAB) with integrated miniMLC, TPS (BrainSCAN,v5.0) and real-time infrared tracking device (ExacTrac,v1.1) had been installed for stereotactic radiosurgery in March 2000. A feasibility study has been initiated for extracranial targets such as the prostate. The limited field size (10x10cm^2 at isocenter) emphasized the need for reliable positioning and reduction of treatment margins required in CFRT. The clinical performance of ExacTrac has been investigated on 30 prostate cases showing a significant reduction of several mm (both systematic and random errors: $p<0.01$) compared to the conventional approach based on room lasers. To further improve on set-up uncertainties, a prototype X-ray imaging tool has been integrated with Exactrac consisting of 2 tubes and a centrally located amorphous silicon detector. The system being developed to detect and correct set-up errors prior to treatment features 2 functions: a) Fully automated fusion of the actual treatment images with DDRs representing the desired position. b) Matching of implanted radio opaque markers. Phantom measurements of known shifts as well as hidden target tests (AAPMreport54, TG42) have been performed. Automated correction of set-up errors based on auto-fusion proved to be accurate within 0.5mm (SD:0.3mm) for shifts smaller than 10mm and rotations up to 5°, and within 1% for shifts up to 20 mm. Except for the cranio-caudal direction, where a residual error of 1.5mm (SD:0.6mm) persists. The results on implanted marker detection and a clinical feasibility of the auto-fusion module are currently being evaluated and will be presented.

Research partly supported by BrainLAB