

AbstractID: 11661 Title: Evaluation of ExacTrac and CBCT patient positioning on the Novalis TX

Purpose: To evaluate the precision and accuracy of patient localization using a cone-beam CT (CBCT) and an orthogonal x-ray pair with infrared markers on the Novalis Tx treatment unit. **Method and Materials:** Twenty stereotactic radiosurgery/therapy patients with a total of twenty-five lesions over ninety sessions (ranging from 1-5 fractions per patient) were localized daily using both ExacTrac (ETX, BrainLab) and on-board CBCT (Varian) coupled to the Novalis Tx treatment unit. Each patient was first positioned using the ETX system accounting for variances in all six dimensions using a robotic couch top. Following these shifts, a CBCT was performed and further translations were made (x, y, z, table rotation) based on image fusion between the CBCT and simulation CT. A phantom study was also performed, mimicking the patient set-up method to assess the reproducibility of each system and to determine any systematic differences between the ETX and CBCT localization approaches. **Results:** Patient positioning between ETX and CBCT was consistent in all four dimensions within 1.1mm and 0.1°. The average discrepancy between each system across all sessions was 1.1±1.2mm A/P, 1.0±1.2mm S/I, 0.1±1.4mm M/L, and 0.1°±0.5° couch rotation. Phantom testing showed that both systems were reproducible within 1.5mm and 0.5° in all dimensions. A systematic discrepancy of 0.3mm A/P, 1.2mm S/I, 0.8mm M/L, and 0.6° rotation was found between the two systems; however, this difference was deemed to be within the calibration tolerance of both systems. **Conclusions:** The ETX and on-board CBCT systems were found to agree on tumor localization within 1.1mm (all dimensions) and 0.1° (couch rotation). Phantom studies showed the reproducibility of each system to be acceptable for stereotactic treatments. The Novalis Tx treatment unit incorporates both fiducial marker-based, and volume-based localization for reproducible and accurate SRS/SBRT patient treatments.