AbstractID: 11409 Title: Commissioning a new frameless intracranial stereotactic positioning system (ISPS): the real-time 3D stereo-vision surface imaging system

Purpose:Commission a real-time 3D surface imaging system using CBCT and optical tracking systems as references.

Method and Materials:Localization accuracy of a 3D surface imaging system (AlignRT (ART)) was investigated using a phantom and ten volunteers. Results for CT contours and optically recorded surfaces are reported. Accuracy was validated by comparison to an Elekta kV CBCT system and to a Frameless Sonarray (FSA) optical tracking system, which were reported as ISPSs with 2 mm accuracy. Accuracy was tested using a Rando phantom with a bite frame.Phantom movements were performed using an attached device. Images were acquired at over 70 positions within ±2cm and/or ±3° for couch angles from +90° to -90° over a range of gantry angles. Ten volunteers were used to evaluate inter and intra-fractional motion for ART and FSA. Each was immobilized ten times and tracked for over 2 minutes each time.

Results:Based on phantom imaging, the coincidence of the linac coordinate system for ART was within 0.9 mm and 0.8° of that of the CBCT system due to different calibration methods/uncertainties of the two systems.For gantry and table angles of 0°, the maximum mean displacement vectors were within 1mm and 0.5° of those of the CBCT system. The maximum discrepancy was 3.5 mm between ART and CBCT and 0.9 mm between ART and FSA for a displacement of up to 2cm and 3°. The maximum difference between ART and FSA for couch rotations of up to ±90° is less than 2mm and 1°. The inter and intra-fraction accuracy of ART for real-time detection agrees with FSA to within 1 mm and 1°.

Conclusion:A systematic isocenter difference was observed between ART and CBCT. ART can be used for frameless fractionated SRS treatments with accuracy comparable to current image/marker based ISPSs, provided that intra-fraction motion is prevented during real-time tracking.