

AbstractID: 10074 Title: Evaluation of rotational and translational setup variations for brain tumor patients with mask for immobilization

Purpose:

Rotational setup errors for brain tumor patients undergoing external beam radiotherapy with a thermoplastic mask system were not well investigated and often ignored during the planning and treatment process. In this study, both translational and rotational setup variations are evaluated for brain tumor patients undergoing external beam radiotherapy, using daily helical tomotherapy megavoltage computed tomography (MVCT) scans.

Method and Materials:

15 primary brain tumor patients who finished fractionated helical tomotherapy treatment were retrospectively selected. The number of fractions ranged from 29 to 34. Prior to each treatment fraction, an MVCT scan was performed over the brain volume. The MVCT images were registered with the planning CT images based on bony structure using rigid translations in three dimensions and rotations in pitch, roll, and yaw.

Results:

The standard deviations (SD) for translations ranged 0.78 to 2.32 mm, 1.11 to 2.65 mm, and 0.52 to 6.65 mm in the RL, SI, and AP directions, respectively. The SD's ranged 0.28° to 0.83°, 0.35° to 1.04°, and 0.41° to 2.41° in pitch, roll, and yaw, respectively. 20.2%, 20.9%, and 38.9% of all the daily setups had more than 1° setup errors in pitch, roll, and yaw, respectively; and 58.4% had more than 1° errors in at least one rotational directions. 2.2%, 3.1%, and 20.9% had more than 2° setup errors in pitch, roll, and yaw, respectively, and 24.3% had more than 2° setup errors in at least one rotational directions. Residual translational setup errors in the absence of rotational setup corrections were also evaluated.

Conclusion:

Rotational setup variations can be significant for brain tumor patients immobilized with masks, and setup corrections without rotations could lead to significant overall setup errors. Margins for treatment planning should take rotational setup variations into account. Daily image-guided setup can be used to position the target volume.