

AbstractID: 1124 Title: A novel method to correct for rotational patient setup errors in helical tomotherapy

While in clinical practice it may be straightforward to correct for translational patient setup errors detected prior to treatment, rotational adjustments can be difficult to implement with accuracy. A novel automated method to approximately correct for rotational setup errors in the sagittal or coronal plane is proposed for helical tomotherapy. Since tomotherapy involves translating the patient in the superior/inferior (S/I) direction across a narrow radiation field, local correction of small rotational offsets may be accomplished by introducing a low-velocity motion in the left/right (L/R) or anterior/posterior (A/P) direction to center the section of the target instantaneously in the beam. Mathematically, this is equivalent to decomposing the transformation matrix for a rotational correction into a product of shearing and scaling terms, then neglecting all terms except for shear in the L/R or A/P directions. To test the effectiveness of the method for correcting rotational offsets in the coronal plane, phantoms are placed on a motorized L/R slider on the tomotherapy couch. Film exposure of a treatment plan delivered to a cylindrical water phantom will be used to compare delivery patterns in the case of uncorrected versus corrected rotational offsets to the phantom. Megavoltage images of an anthropomorphic head phantom with uncorrected and corrected rotational offsets were also acquired in scanning mode. Automatic registration of MVCT and planning images indicates that offsets of 1 to 5 deg can be corrected to within better than 0.5 deg.

This work was partially supported by a grant from the NIH and by TomoTherapy, Inc.