AbstractID: 11533 Title: A simple method for dosimetric assessment in H&N radiotherapy with rotational setup errors

Purpose: Rotational setup error for H&N patients is detected using cone-beam CT. Fusion with 3D image can determine a sequence of three Euler angles for the best matching with the planned patient position. Currently, correction for rotational errors is not available except with the use of a 6-degree-of-freedom treatment couch. However, it is possible to compensate an arbitrary rigid-body rotation by just a simple couch rotation in addition to gantry and collimator angle changes. We introduce a formulation for compensating a rotational error with respect to a given planned beam position for adaptive treatment or easy dosimetric evaluation for no correction.

Method: For each planned beam position, the beam axis in patient coordinates upon rotational error is calculated, pointing out of the beam source plane. A couch rotation is first applied to move the planned beam axis back to the source plane. The adapted gantry and collimator angles are then calculated to align with the planned beam axis and radiation portal. The inverse transformation determines the effective beam position in planning CT for dosimetric evaluation with no correction.

Results: Our method was validated by phantom experiments. Light fields were compared for various beam positions before and after phantom rotations. The delivered dose distribution for two patients with 2~3 degrees of rotations were calculated and compared with the planned distribution, showing marginal deterioration with 1.5% target dose reduction and 2% parotid dose increase.

Conclusions: A simple “theoretical” solution is available for handling rotational setup error when rigid-body approximation applies. Its practical application is to evaluate the dosimetry for no correction, and our data showed that rotational error was less of a concern compared to as large as over 5% dose variation with patient anatomy change due to weight loss or tumor shrinkage.