AbstractID: 6974 Title: Non-rigid setup errors in HN-IMRT patients and their dosimetric effect

Purpose: Dose distribution in head and neck IMRT plan is highly conformal and therefore sensitive to setup error. Rigid setup error measurements and its dosimetric effects have been reported previously. In this study, we investigate the non-rigid component caused by the flexible bony structures in the neck region. The purposes are to define and measure the non-rigid setup errors throughout the treatment course and to study its dosimetric effect and margin implications.

Method and Materials: Daily cone beam CT (CBCT) was acquired for patients receiving HN-IMRT treatment. For each CBCT three regions (head, neck and shoulder) were rigidly registered to their corresponding part in planning CT individually. We define the non-rigid setup error as the difference between the maximum and minimum of the translation/rotation variables among three registrations. A zero value indicates a non-existent non-rigid setup error. To model the dosimetric effect, we mathematically transformed helical planning CT by keeping shoulder still, rigidly rotating head by ±10 degrees in three directions and deforming neck regions to match head and shoulder. The original plan was applied to these deforming CTs.

Results: The non-rigid setup error is larger in last week than first week, also larger in second half than first half of treatment course, probably due to the weight loss and the mask getting loose. The rotations in L-R axis (4°) and translations in S-I direction (5 mm) are larger than others. Margins of 5 mm used in treatment planning are adequate for most organs to account for the non-rigid setup errors.

Conclusion: We have measured non-rigid setup errors in HN-IMRT patients using daily CBCTs. We found that rotations in L-R axis and translations in S-I direction are dominant and they increase during the treatment course. We also developed a technique to study its dosimetric effect by transforming/deforming planning CT image.