AbstractID: 5673 Title: Setup error analysis of HN-IMRT patients using electronic portal images and cone-beam CTs

Purpose: It is important to monitor and correct patient setup during treatment course for head and neck IMRT because highly conformal dose distribution is sensitive to setup uncertainties. Setup for HN region is unstable because patient is usually uncomfortable under the mask and the flexible bony structures in the neck region. The purpose of this study is to analyze the setup errors during entire treatment course. These findings will help make appropriate corrective decisions.

Method and Materials: Patients enrolled in our IMRT protocol are immobilized with a large thermoplastic mask attached to the MedTec IPPS. 2D analysis is accomplished by comparing electronic portal images to DRRs using in-house software. Systematic setup error exceeding 3mm is corrected. 3D analysis is performed by registering cone-beam CT to planning CT. Data from 21 patients with total 185 sessions were used. Correlation between 2D and 3D were analyzed. Time trend was analyzed for patients with daily CBCTs (4 patients with 131 scans total).

Results: Good correlations were observed between 2D and 3D analyses with mean difference less than 1mm. Both methods showed that the mean of setup errors is under 1mm in all directions. The systematic and random errors were about 2mm. Margin of 5mm used in the planning seemed to be adequate based on empirical recipes. Time trend analysis shows that changes occurring during treatment course are significant for 3 (out of 4) patients.

Conclusion: 2D and 3D analyses agree with each other, but 3D should be used whenever possible because it has the advantage of better image quality, lower imaging dose, and better software to interpret information. The difference is caused mainly from image quality and non-rigid bony motion. It may be necessary to redo the mask in the middle of treatment course to reduce overall setup error.