AbstractID: 4968 Title: 3D Target Localization Using Cone-Beam CT for Head and Neck IMRT Patients

Purpose:
To evaluate clinical effectiveness of target localization using cone-beam CT (CBCT) for H&N IMRT treatment.

Method and Materials:
All H&N patients treated with an IRB approved protocol were imaged on the first day of treatment and weekly thereafter with Varian On-Board Imager. After the patient was aligned with skin markers, 2D kilovoltage portal images were acquired and compared to the planning DRRs for set-up corrections (2D-based correction). Then, CBCT images were acquired and registered with the planning CT by matching both soft tissue and bony landmarks, which generated the 3D-based corrections. The difference between two correction measurements yielded the treatment isocenter variation using the 3D/3D matching method. Dose distributions with different isocenter deviations were re-constructed on the planning CT. The treatment DVHs of PTVs and critical structures were compared with those in the original plan.

Results:
A total of 12 CBCT were analyzed for 3 patients during their first 4-weeks of treatment. Compared to set-up variations, anatomical shrinkage/deformation was negligible. The mean isocenter deviations after 2D-based corrections were 1.1mm in AP direction (max 3.0mm), 2.6mm in lateral direction (max 5.0mm), and 3.8mm in SI direction (max 6.0mm). For the worst isocenter deviation, the reconstructed mean PTV dose was reduced by 3.6% from the planned mean value. For two patients, the mean brainstem dose increased from 33% to 49.5% and from 36.9% to 66.8%, respectively, in worst cases after 2D-based correction. Other critical structures that received significantly higher doses were cord (max dose changed from 41.8% to 64%), eye (mean dose changed from 37.5% to 83.9%) and parotid (mean dose changed from 58% to 72.5%).

Conclusion:
For H&N IMRT treatment, CBCT image-guidance improves localization accuracy compared to 2D-based technique and should be the method of choice for target localization when tight margins are applied.

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