

AbstractID: 5717 Title: A Dose-Guided Adaptive Therapy Process for Treatment Evaluation and Correction

Purpose:

To develop an adaptive therapy process for off-line radiotherapy evaluation and modification

Method and Materials:

An adaptive therapy process was developed to analyze and adjust a patient treatment. This included:

Daily Online Processes

- Daily CT imaging
- Patient repositioning

Weekly Offline Processes

- Automatic dose recalculation on each daily image
- Automatic deformable registration of each image with the planning image
- Automatic deformation-based recontouring of each image
- Automatic deformation-based dose accumulation
- Cumulative plan evaluation
- Replanning, as needed

The on-line imaging and repositioning was performed with the TomoTherapy MVCT system and integrated registration software. The off-line processes were performed on a standalone workstation.

Head and neck cases were studied with this process. Cumulated doses were typically analyzed at the end of each week, and modifications were performed mid-course. Remaining treatments were then performed with the adapted plan.

Results:

It was found that CT-guided soft-tissue positioning alone did not protect against dosimetric changes due to patient weight loss. Without plan adaptation, the right parotid gland would have received a dose of 10 Gy above the plan, due to its medial motion towards the target region. However, since mid-course adaptive replanning was used, the dose was only 2.5 Gy above the original plan. The use of an additional plan adaptation could have further reduced this discrepancy.

Conclusion:

An adaptive therapy process was developed for off-line contouring, dose recalculation, dose accumulation, and replanning. This process was applied to clinical head and neck patients to evaluate on-going treatments, adjust plans, and retrospectively assess the results. This process reduced unexpected parotid dose for these patients. This process also indicated that ability to recalculate to accumulate doses on daily CT images is important for addressing systematic errors, such as anatomical changes, that may arise during a treatment.

Supported by TomoTherapy, Inc.