AbstractID: 8651 Title: An online correction method for interfractional variations in head and neck cancer

Purpose:
Daily setup for head and neck (HN) radiotherapy (RT) can vary randomly due partially to neck rotation. This variation along with anatomy change can not be totally corrected by the current rigid translation. A full-scope re-optimization based on the daily CT takes too long to be practical with the current planning techniques. A novel rapid correction scheme that can be used online to correct for both inter-fractional setup variation and anatomy change for HN RT is presented.

Material and Method:
The scheme consists of two major steps after transferring planning contours to the CT of the day by means of deformable registration (MIMVISTA): (1)beam/segment apertures morphing (SAM) based on differences between planning contours and new contours, and (2) segment weight optimization (SWO) for the new apertures. SAM is accomplished by applying the spatial relationship between the planning target contour and the apertures to the new target contour. Dose distribution for each new aperture was generated using a planning system with a fast dose engine and hardware (Prowess), and was input into a newly-developed SWO package using a fast sequential quadratic programming. The entire scheme was tested based on the daily kVCT images acquired for representative HN IMRT cases treated with a linac and CT-on-Rails combo (CTVision, Siemens).

Results:
The target coverage and/or OAR sparing degradation, arising from the current standard repositioning from rigid registration with the CT of the day, can be corrected by the present SAM/SWO scheme. The target coverage and OAR sparing for the SAM/SWO plans were found to be equivalent to the original plan. The SAM/SWO process took 5-8 min for the head and neck cases studied.

Conclusion:
The proposed aperture morphing with weight optimization is an effective approach for correcting inter-fractional patient setup and anatomic changes for head and neck cancer radiotherapy.