

**Purpose:** To assess the effectiveness of adaptive IMRT plan modification using Direct Aperture Deformation (DAD) scheme for head and neck cancer patients using repeated CT scans.

**Method and Materials:** 15 patients underwent repeated CT scans during IG-IMRT treatment courses are studied. The plans use 7 to 9 coplanar beams to deliver the prescribed dose to the PTV which includes tumor/tumor bed and bilateral lymph nodes. All contours are delineated by the same physician. A deformable image registration is performed to align the new image set with the original planning one. The resultant 3D deformation vectors are projected to all beam directions and used to deform the segment apertures of the original plan to the new CT (DAD plan). For comparison, a plan is re-optimized with the new CT for each patient (Re-Op plan) and used as the “gold standard”. To simulate IMRT treatment with the CT image guidance but without re-planning, the original plan is copied to the new image set with its isocenter shifted to the new PTV centroid (SHIFT plan). The plans are compared with measures of  $V_{95}$  and Conformity Index(CI) for PTV,  $D_{0.1cc}$  for spinal cord and  $V_{30}$  for parotid glands. Student t-test is used for the statistical analysis.

**Results:** DAD improves  $V_{95\%}$  by 6% and CI by 0.04 with statistical significance as compared with SHIFT. On average,  $V_{95}$  and CI of DAD are a little less than in Re-Op. No statistical significance is found in comparing of DAD vs. Re-Op for both PTV and avoidance structures.

**Conclusion:** For head-and-neck patients with obvious anatomical changes during their IMRT treatment courses, image-guided repositioning is far from optimal and re-planning is needed. The DAD adaptation scheme can achieve similar plan quality as the Re-Op scheme without the lengthy re-planning process. It offers an alternative solution for adaptive IMRT planning.