AbstractID: 8459 Title: A new technique to prevent target underdosage in anal cancer IMRT

Purpose: Target coverage is of outmost importance for curative radiation treatment of anal cancers. When the tumor is close to the skin surface, inferior patient displacements could cause significant dosimetric losses. Moreover, the PTV may extend beyond the skin surface, which could cause target underdosage when using IMRT planning.

Method and Materials: First, we created artificial structures (AS), including artificial PTV (aPTV) and artificial buildup (AB) which was assigned a density of $1 g/cm^3$. Then, we prescribed the same dose to the artificial PTV as the prescription dose to the corresponding PTV. The aPTV forces the MLC leaves to open more inferiorly, creating appropriate "flash" dose to the CTV. After IMRT optimization, the AB was removed, and the plan was recomputed using the same field configuration to obtain the realistic delivered dose. The IMRT plans using two different planning techniques (with/without AS) evaluated the CTV dose coverage with the patient shifted 0.5, 1.0 and 1.5 cm inferiorly. We used 10 patient-data sets for this study.

Results: The CTV doses showed that the AS-plan improved the dosimetric coverage of the CTV when large inferior displacements were introduced for all patients. The average CTV doses of 10 patients indicated that, compared to the No-AS plans, the improvement of CTV coverage by AS plans were 6%, 15%, and 31% for patient target shifts of 0.5, 1.0 and 1.5 cm, respectively. Without any shift, the CTV received at least 98.7±1.8% of the prescribed dose with AS-plan and 96.4±3.6% of the prescribed dose by using no AS-plan. No dose increases to the critical structures resulted from AS-plan.

Conclusion: The AS planning technique improves the target dosimetric coverage while not significantly increasing doses to critical structures in IMRT for anal cancer. However, the improvement with the AS planning technique is small when the patient displacement is small.