

AbstractID: 2871 Title: IMRT vs. 3D-CRT for oropharyngeal cancer: relative sensitivity to set-up uncertainty

**Purpose:** To compare the impact of set-up uncertainty on compliance with the objectives and constraints of the RTOG H-0022 protocol using an IMRT plan versus a conventional 3D-CRT plan.

**Method and Materials:** Two treatment plans (7 beam IMRT and 4 beam 3D-CRT) were created using Pinnacle® for the same volumetric data set based on the objectives and constraints defined in the RTOG H0022 protocol. Dose volume constraints for the targets and organs at risk (OARs) were met and matched as closely as possible in both plans. Monte-Carlo based simulations of set-up uncertainty were performed in three orthogonal directions for “simulated courses” incorporating systematic and random uncertainties. A population based approach was used to compare the IMRT and 3D-CRT plans in terms of Dose-Volume Histograms (DVHs) and Equivalent Uniform Doses (EUDs)

**Results:** Based on DVH and EUD data, the compliance of the delivered treatment with the objectives defined for the CTV66 and CTV54 shows considerably greater sensitivity to set-up uncertainty for the IMRT plan than for the 3D-CRT. Three of the OARs defined in this study (larynx, spinal cord, and brainstem) continue to meet the criteria in the presence of set-up uncertainties for both plans. Dose constraints for the mandible were not met for the 3D-CRT and neither was parotid sparing possible. The static IMRT plan was able to meet the criteria for parotid sparing. However, even at relatively low levels of set-up uncertainty, parotid sparing was compromised in the IMRT protocol.

**Conclusion:** The IMRT plan target doses are more sensitive to set-up uncertainty than the 3D-CRT when looking at both the DVHs and EUDs. In the presence of reported levels of set-up uncertainty, parotid sparing is compromised in the IMRT plan. However, parotid doses always remain lower than those seen with the 3D-CRT plan.