

AbstractID: 13748 Title: MLC-Based CyberKnife Radiotherapy for Prostate Cancer

Purpose: The Cyberknife system allows for real-time organ motion correction and it enables delivery of a large number of non-isocentric, non-coplanar beams. A CyberKnife using multi-leaf collimators (MLC) may achieve an improved dose advantage while maintaining a short delivery time. The purpose of this study is to evaluate the plan quality of MLC-based prostate robotic radiotherapy.

Method and Materials: Treatment plans were compared between regular IMRT, CyberKnife using the IRIS collimator (CK IRIS) and CyberKnife using a MLC (CK MLC). The IMRT plan and the CK MLC plan were generated using the Eclipse inverse planning system. Various numbers of non-coplanar fields have been tried for CK MLC plans. With the CK IRIS plan, all 12 possible collimator sizes were included in the optimization process to achieve the best performance.

Results: Isodoses for the IMRT plan, the CK MLC plan and the CK IRIS plan are compared in the same mid-axial plane. All plans provide very conformal and complete converge of the target. However, the 50% isodose clearly demonstrates that the CK MLC plan provides much sharper dose fall off than the IMRT and the CK IRIS plans. The CK IRIS plan shows the worst rectal sparing with the 50% isodose line covering more than half of the rectum. A further comparison of DVHs shows significantly improved sparing of rectum and bladder with the CK MLC plan, when compared to the IMRT plan and the CK IRIS plan.

Conclusions: The CyberKnife with MLC can produce superior dose distributions for sparing rectum and bladder and excellent DVHs for the target compared with IMRT and CyberKnife IRIS plans, and produces similar dose heterogeneities as IMRT plans. With significantly less beams, it can deliver a 2Gy/fx treatment in 10 minutes.