AbstractID: 11353 Title: Prostate Treatment with CyberKnife: Comparison of Virtual HDR and Homogeneous Dose Plans and the Effect of Tissue Inhomogeneity

Purpose: To compare between two national protocols, the Virtual HDR and homogeneous plans for prostate treatment using the CyberKnife® Robotic Radiosurgery System and the MultiPlan® Treatment Planning System, effect of dose homogeneity on organs at risk (OAR) and to evaluate the effect of tissue inhomogeneity on the dose using Monte Carlo calculations. **Method and Materials:** The unique robotic delivery capability of CyberKnife makes it possible to treat prostates with HDR-like dose plans as well as with homogeneous dose plans. At the CyberKnife Centers of San Diego, low risk and select intermediate risk prostate cancer patients are treated with Virtual HDR dose protocol. Fifteen patients were selected randomly and were replanned following the guidelines of the homogeneous prostate protocol. The introduction of Iris variable aperture collimators together with Sequential Optimization algorithm enables both the Virtual HDR and homogeneous planning with excellent OAR sparring and treatment delivery in reasonably short time. The PTV DVHs as well as those for OARs such as bladder, urethra and rectum are compared. Plans, calculated with Ray Trace algorithm, were later recalculated using Monte Carlo algorithm to evaluate the effect of tissue inhomogeneities on dose. **Results:** 1) Virtual HDR dose distribution spares the OARs better than the homogeneous dose distributions. 2) The number of beams for heterogeneous plans was 190-200 with the total monitor units around 80000 in 4 fractions. In comparison, the homogeneous plans required 130-180 beams with the total monitor units around 45000 in 5 fractions. 3) A typical Virtual HDR plan takes about an hour to deliver using Iris collimator. A typical homogeneous plan is estimated to take about 40 minutes. 4) The Monte Carlo calculations show no significant effect on the dose in the PTV, however in the OARs, Monte Carlo predicts lower or equivalent dose compared to the Ray Trace calculations.