

AbstractID: 12916 Title: Phantom Study of Dose Verification for Prostate Cancer Radiation Therapy in Presence of Hip Prosthesis Using kVCT and MVCT For Treatment Planning on Helical Tomotherapy, IMRT and Rapid ARC

Purpose: Prostate cancer patients with bilateral prosthetic titanium hips present a unique challenge for external beam radiotherapy. Titanium prostheses cause kVCT streak artifacts resulting in inaccurate CT numbers. Megavoltage x-ray attenuation through prostheses can be as high as 64%. Task group report #63 of the AAPM recommends prostheses avoidance for accurate dose calculations. In this study, we will compare Tomotherapy, IMRT and Rapid Arc treatment plans using kVCT and MVCT data sets, passing through and avoiding the prostheses. **Method and Materials:** An acrylic wall water phantom with interchangeable prosthetic and bone hips was constructed. Kilovoltage and a megavoltage CT scans were done with each hip insert. One set of prostate, rectum and bladder structures was created. Kilovoltage streaks were corrected. Four plans were created in each system: (i) kVCT dataset, beams avoiding prostheses; (ii) kVCT dataset, beams passing through prostheses; (iii) MVCT dataset, beams passing through prostheses; (iv) kVCT dataset, beams passing through bone. Two Gy fractions were delivered to the PTV using our clinical DVH constraints criteria. Dosimetry was performed with gafchromic film in axial and saggital planes, and with TLDs inside the PTV. **Preliminary Results for Tomotherapy:** Percentage of points passing the 3mm/3% gamma index criteria were (i) 92.3 % for kVCT plan avoiding prostheses, (ii) 90.6% for kVCT plan passing through prostheses, (iii) 94.8 % for MVCT plan passing through the prostheses. The TLD measurements agreed with plan to within (i) 1.07 % for kVCT based plan avoiding prosthesis, (ii) 1.99% for MVCT plan passing through the prostheses. **Preliminary Conclusions:** The Tomotherapy planning system accurately models beams passing through titanium hip prostheses. Prostate, bladder and rectum DVHs satisfied our clinical constraints criteria.