AbstractID: 5670 Title: Cervical cancer treatment: 3D dose determination based on low energy and high energy CT image

Purpose: To employ megavoltage CT (MVCT) to (a) generate an artifact-free image and compared with the kilovoltage CT (kVCT) image set in presence of Fletcher-Suit applicators, and (b) calculate precise three-dimensional anatomical dose distribution for low dose rate (LDR) treatment which can be combined with external treatment (based on kVCT) planning. **Method and Materials:** Consented patients undergoing radiotherapy treatment for cervical cancer were simulated using orthogonal films and kVCT for external treatment planning and low dose rate brachytherapy. Fletcher-Suit applicators with shielding were used for pretreatment image scans. Additionally, MVCT images were acquired using the Tomotherapy machine. These image sets (kVCT and MVCT) were fused in a Brachyvision planning system using a pixel registration method. MVCT images were then used for volumetric dose calculations using TG43 model. The MVCT image set and orthogonal film were then used to explore Monte Carlo-based 3D dose calculations. **Results:** Artifact-free images were obtained from MVCT scans using the Fletcher-Suit applicators. kVCT images were not useful for LDR treatment planning due to the presence of substantial artifacts. The MVCT image set was used in delineating the rectal and bladder tissue margins. However, soft tissue visualization was sub-optimal for clinical purposes. The MVCT image-based dose calculation generated three-dimensional dose distribution for rectum (max. dose of 56 cGy) and bladder (max. dose of 25 cGy) for single fraction prescribed dose of 600 cGy. Maximum rectum and bladder dose calculated using the MVCT image and orthogonal film based plan were very similar. **Conclusions:** We have showed that the artifact-free MVCT image offers accurate three-dimensional LDR treatment planning. In addition, the impact of dose heterogeneity will be calculated using image based Monte Carlo simulation technique. Ideally, truly individualized external beam and intracavitary radiotherapy may lead to higher cure rates and lower complication probabilities.