

AbstractID: 13212 Title: Investigation of kV imaging doses in the radiotherapy of pediatric cancer patients

Purpose: To investigate kVCBCT-induced doses to pediatric cancer patients undergoing radiotherapy and strategies for optimal dose reduction. **Method and Materials:** Four pediatric cases were selected with patient CTs and contours exported from Eclipse TPS via DICOM and converted into EGS4 patient phantoms. An EGS4 Monte Carlo code was employed to calculate dose distributions on four patients scanned by kVCBCT. 3D dose distributions and DVHs were analyzed. In addition, distance from organ-at-risk (OAR) to CBCT field border, kilo-voltage peak energy and testicular shielding have been studied for strategies to reduce doses to OARs. **Results:** Due to circular gantry rotations of CBCT and smaller dimensions in pediatric patients compared to adults, kVCBCT-induced doses were quite symmetrically deposited around patient anatomy, with much higher doses to bony structures due to enhanced photoelectric effect. DVH analyses indicated mean doses induced by kVCBCT ranged from 2.9 cGy to testes to 10.5 cGy to femur heads. Increasing distances from OARs to CBCT field border would greatly cut doses to OARs, ranging from 50% reduction for spinal cord to 2300% reduction for testes. Reducing beam energy from 125 to 60 kV generally increased doses to OARs, but further reduction would yield more doses to lens and testes while less doses to other OARs. The dose reduction via a testicular shielding made of lead would be more efficient in lower energy when testes lied within CBCT field. **Conclusions:** kVCBCT deposits considerably large doses to critical structures in children. Increasing the distances from OARs to CBCT field border and use of a testicular shielding are effective ways to minimize the doses to testes and other critical structures. It is essential to evaluate the doses induced by kilo-voltage beams as a part of treatment planning and choose an appropriate scanning protocol when kVCBCT is applied frequently, especially in young patients.