AbstractID: 13563 Title: First clinical results of 3D verification of volumetric-modulated arc therapy (VMAT) of prostate and lung cancer patients using EPID dosimetry

Purpose: To evaluate the first clinical results of 3D verification of volumetric-modulated arc therapy (VMAT) of prostate and lung cancer patients using EPID dosimetry, both pre-treatment and *in vivo*.

Method and Materials: EPID images obtained during VMAT delivery using gantry-angle resolved data acquisition are converted to 3D dose distributions inside a phantom or patient using a back-projection model. In addition to verification of the dose at the isocentre, 3D gamma analysis is performed to compare planned and EPID-reconstructed 3D VMAT dose distributions. Gamma evaluation parameters are mean and maximum (1%) gamma and % gamma < 1.

Results: VMAT plans of 10 prostate and 10 lung cancer patients, verified by means of 3D EPID dosimetry, have been analysed. The average difference of the dose at the isocentre was for prostate cancer VMAT (-0.2±1.6)% and (+0.4±1.6)% , pre-treatment and *in vivo*, respectively, and for the hypofractionated lung cancer VMAT plans (+2.0±1.2)% and (-0.7±2.3)%. 3D gamma evaluation showed almost the same results for pre-treatment and *in vivo* verification of the 3D dose distribution for prostate cancer VMAT. For instance, the average of the mean gamma values of all patients is (0.42±0.12)% and (0.48±0.06)% for the pre-treatment and *in vivo* results, respectively. Larger deviations have been observed for lung cancer VMAT verification; e.g. the average of the mean gamma values of all patients is (0.41±0.03)% for pre-treatment verification, and (0.68±0.27)% for the *in vivo* results.

Conclusion: The results of this study show that EPID dosimetry is a valuable tool for 3D verification of VMAT delivery, both pre-treatment and *in vivo*. More clinical data are needed to assess acceptance criteria for 3D gamma evaluation of VMAT verification.

Conflict of Interest (only if applicable): Research sponsored by Elekta Oncology Systems Corporation.