

DOSIMETRY VERIFICATION OF RAPIDARC VOLUMETRIC MODULATED ARC THERAPY WITH ELECTRONIC PORTAL IMAGING DEVICE

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Purpose : Verification of dose distributions for RapidArc Volumetric Modulated Arc Therapy (VMAT) treatment plans with Electronic Portal Imaging Device (EPID) and its associated software.

Materials and Methods : Epiqa is software to convert the EPID images into dose map based on the GLAaS theory. It can be used to verify the dose distributions for RapidArc therapy. To convert images into dose map, we need to have calibration factors for each pixel to convert the pixel values into d_{\max} dose in water. For the purpose of calibration, a set of integrated images for open and transmission fields of different field sizes are acquired and consequently imported into Epiqa together with the output factor table to establish basic algorithm configuration data. A calibration factor can then be determined for every pixel of EPID images by weighting the contribution of primary and transmitted radiation. The pixel based calibration relates the readout of a pixel to a dose at the depth of d_{\max} in water equivalent homogenous medium. By applying the conversion factors to all pixels of the EPID images, a planar dose distribution at the d_{\max} in water is obtained. A total of 20 patients (70 arcs in total) were included in this study, 7 with prostate cancers, 2 with breast cancer, 4 with rectal cancer, 4 with NPC, and 4 with other sites.

Results : The Distance to Agreement (DTA) and the Dose Difference (ΔD) for The Gamma Agreement Index (GAI) of dosimetry parameters with EPID were set as 3 mm and less than 3% respectively. The average GAI (%) of patients in our study is 94.32 ± 3.19 (99.06-81.31). GAI (%) for prostate cancer, breast cancer, rectal cancer, NPC, and other sites is 93.62 ± 4.03 (99.06-81.31), 97.43 ± 1.14 (98.86-96.24), 92.96 ± 2.51 (97.19-89.01), 94.98 ± 2.31 (97.64-89.09), and 94.95 ± 2.48 (98.9-90.76), respectively. The GAI (%) for breast cancer had a better result, with a lowest value of 96.24. For one of the prostate cancer patient treated with 3 arcs, there are two arcs had a GAI value below 90%.

Conclusions : It is an easy and feasible way to apply the EPID with Epiqa software as dosimetry verification tool for VMAT. We will gather more clinical data to come out a better dosimetry verification procedure for VMAT in the near future.

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Key words: Electronic Portal Imaging Device (EPID), Gamma Agreement Index (GAI), Volumetric Modulated Arc Therapy (VMAT), Dosimetry Verification