AbstractID: 13323 Title: A new method to compensate angular dependency of MapCheck device in intensity modulated arc therapy

Purpose: To evaluate the performance of a new method to compensate angular dependency of QA devices in intensity modulated arc therapy.

Methods and Materials: The QA phantom consisted of a MapCheck device sitting in an acrylic base, which is inserted between two 5-cm solid water pieces. Two-dimensional dose planes were measured by delivering one 10x10cm 6MV X-ray beam for per 15 degree beam angle. Two-dimensional doses at the diode detector plane were calculated in Eclipse using the AAA algorithm with inhomogeneity correction. Two types of halfpipe-shape boluses were added to the planning CT image. Bolus A has uniform thickness to attenuate the TPS dose to match the measured dose at the 180 degree beam angle. Bolus B has variable thickness to match the doses at every 15 degree beam angle. TPS doses were re-calculated using the modified CT images. Angular dependences were evaluated for the original phantom and with bolus A and B individually. Six patient QAs were performed to compare gamma analysis results.

Results:

Without compensation, the TPS dose was about 5% higher than the measured dose for most posterior angles (105 degree to 180 degree). It is probably due to angular dependence of diode detectors and CT metal artifacts. Bolus A slightly reduced the angular dependence for the posterior angles (RMS decreased from 4.0% to 3.4%). Bolus B reduced the dependence significantly (RMS=1.4%). The failure rate of gamma analysis was reduced by 39% and 41% in average.

Conclusion:

The new method has been shown to be able to compensate angular dependency for the MapCheck device.