AbstractID: 8572 Title: A dosimetric validation of RapidArc treatment plans for 5 treatment sites

Purpose: To compare calculated and delivered dose distributions from RapidArc™ (a form of volumetric modulated arc therapy, Varian Medical Systems). RapidArc is a novel approach for delivering single arc therapy in less than 2 minutes, while achieving dose distributions comparable to current IMRT. We report the first detailed dosimetric validation for 5 different tumour sites with RapidArc plans.

Method and Materials: Clinical RapidArc plans were generated with a pre-clinical version for single cases with glioblastoma multiforme, multiple brain metastases, nasopharynx-, oropharynx- and pancreas carcinoma. All five plans were delivered with a Varian Linac and measured in a solid water phantom for 5 coronal planes, 2 cm separated, using double Gafchromic®EBT films. Plans were also measured using ionisation chamber arrays (MatriXX). Measured and calculated dose distributions were compared using 2D gamma evaluation with limits of 2mm and 3.5% (of typical PTV dose in phantom).

Results: All 25 film measurements showed high agreement with calculations, with a mean gamma of 0.29 and on average 1% (maximum 3%) of the film surface exceeding a gamma of 1.0. Relatively strong spatial dose modulations could be measured, within 95-107% dose range in the PTV, which were not completely predicted by calculations. This could lead to local dose changes >3% when changing a plane by 2mm. MatriXX measurements corresponded better with dose calculations than film measurements, which may be due to the limited resolution of 7.6mm of MatriXX.

Conclusion: RapidArc accurately delivers the planned dose distributions. Film measurements may be preferred for dosimetric verification as more dose modulation is detectable than with ionisation array measurements. A “2.5D” gamma evaluation taking into account multiple adjacent dose planes would show better agreement for film dosimetry. Our results indicate that RapidArc can be introduced into clinical practice.

Conflict of Interest: Research was a collaboration with Varian Medical Systems