

EVALUATE THE ACCURACY OF VMAT FOR CLINICAL USE- THE INITIAL EXPERIENCE OF SMARTARC APPLICATION

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Purpose : The goal of this study was to investigate the accuracy of VMAT with different calculation parameters in SmartArc. Dosimetric comparisons of various gantry spacings with and without couch (WC/WOC) insert simulation were evaluated based on statistics.

Materials and Methods : Twenty-eight VMAT cases were selected in this study, including 8 abdomen/pelvis, 6 one-side HN, 8 two-side HN and 6 prostate. A commercial Elekta Synergy linear accelerator and SmartArc algorithm in Pinnacle³ 9.0 was used. The patients were treated clinically with VMAT using 3° gantry spacing and reoptimized using 2°, 4° and 6°. An 8 mm thick water equivalent contour couch was added under the phantom. The phantom was irradiated with 0.125 cm³ Semiflex chamber and Gafchromic EBT2 film simultaneously.

Results : 99.1% and 94.6% of WC and WOC passed the 3% point dose difference criteria. In absolute dosimetric agreement of EBT2 film, the gamma passing rate of 3%/3 mm for all 224 plans separately were 5.4% for WC and 11.6% for WOC below 95% tolerance level. While using clinical parameters (3° gantry spacing, WC), the 3%/3 mm gamma average passing rate was 98.3 ± 2.3%, 99.5 ± 0.5%, 97.6 ± 2.8% and 99.5 ± 0.5% for abdomen/pelvis, one-side HN, two-side HN and prostate respectively. Considered with the 2-6° gantry spacing, the Kruskal-Wallis H test shows very similar results and failures situations occurred randomly on any gantry spacing. The results of with/without couch insert simulation shows the Mann-Whitney U test *p*-value lower than or close to, the significant level expected for prostate cases. Spearman's correlation coefficient indicates that delivery MU may influence the accuracy (*p*-value < 0.05) but it's independent of PTV volume.

Conclusions : Composite dose measurements performed with EBT2 film are a practicable approach for patient-specific QA of VMAT plans. Film dosimetry in this study has shown good agreement in various parameter settings.

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Key words: VMAT, Gantry spacing, Gafchromic EBT2 film, Gamma passing rate