

Quality Assurance Comparison of Map Check 2, Epid, and Gafchromic® EBT3 Film for IMRT Treatment Planning

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Abstract : Objective: Verification of patient-specific intensity modulated radiation therapy (IMRT) plans using different 2-D detectors has become increasingly popular due to their ease of use and immediate readout of the results. The purpose of this study was to test and compare various 2-D detectors for dosimetric quality assurance (QA) of intensity-modulated radiotherapy (IMRT) with the vision to find alternative QA methods. Material and Methods: Twenty IMRT patients (12 of brain and 8 of the prostate) were planned on Eclipse treatment planning system using Varian Clinac DHX on both energies 6MV and 15MV. Verification plans of all such patients were also made and delivered to Map check2, EPID (Electronic portal imaging device) and Gafchromic EBT3. Gamma index analyses were performed using different criteria to evaluate and compare the dosimetric results. Results: Statistical analysis shows the passing rate of 99.55%, 97.23% and 92.9% for 6MV and 99.53%, 98.3% and 94.85% for 15 MV energy using a criteria of $\pm 5\%$ of 3mm, $\pm 3\%$ of 3mm and $\pm 3\%$ of 2mm respectively for brain, whereas using $\pm 5\%$ of 3mm and $\pm 3\%$ of 3mm gamma evaluation criteria, the passing rate is 94.55% and 90.45% for 6MV and 95.25% and 95% for 15 MV energy for the case of prostate using EBT3 film. Map check 2 results shows the passing rates of 98.17%, 97.68% and 86.78% for 6MV energy and 94.87%, 97.46% and 88.31% for 15 MV energy respectively for brain using a criteria of $\pm 5\%$ of 3mm, $\pm 3\%$ of 3mm and $\pm 3\%$ of 2mm, whereas using $\pm 5\%$ of 3mm and $\pm 3\%$ of 3mm gamma evaluation criteria gives the passing rate of 97.7% and 96.4% for 6MV and 98.75% and 98.05% for 15 MV energy for the case of prostate. EPID 6 MV and gamma analysis shows the passing rate of 99.56%, 98.63% and 98.4% for the brain, 100% and 99.9% for prostate using the same criteria as for map check 2 and EBT 3 film. Conclusion: The results demonstrate excellent passing rates were obtained for all dosimeter when compared with the planar dose distributions for 6 MV IMRT fields as well as for 15 MV. EPID results are better than EBT3 films and map check 2 because it is likely that part of this difference is real, and part is due to manhandling and different treatment set up verification which contributes dose distribution difference. Overall all three dosimeter exhibits results within limits according to AAPM report.120.

Keywords : gafchromic EBT3, radiochromic film dosimetry, IMRT verification, EPID

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