Advances in Stereotactic Quality Assurance Using Advanced CMOS Detectors: A Comparative Study Versus Film/Point Dose

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Objectives: Historically, film and point dose measurements have been the gold standard in radiotherapy patient-specific dosimetry due to sub-millimeter spatial resolution and high dosimetric accuracy. However, maintaining a film program has always been cumbersome, lacking real-time analysis. IBA's MyQA SRS detector array, utilizing advanced CMOS technology, claims film-level spatial resolution with superior dosimetric accuracy and no processing delays. This comparative study aims to validate this claim.

Methods: An IBA MyQA SRS system was utilized to measure anonymized actual patient plans treated at our facility. Measurements were also acquired using radiochromic EBT3 film and A16 ion chamber point dose and compared to the results using the MyQA SRS. Gamma analysis was conducted using the MyQA and radiochromic.com software platforms. Qualitative analysis was also conducted using beam profile overlays.

Results: Various stereotactic patient plans were calculated on a MyQA SRS phantom image in Varian's Eclipse treatment planning system (TPS), and an expected dose plane was exported. Patient plans were measured using the MyQA SRS, and gamma analysis was performed in the MyQA software against the expected doses from the TPS. Gamma analysis was also conducted for film plans against the expected doses from the TPS and compared with the results obtained with the MyQA SRS.

Conclusion(s): The comparison between MyQA SRS and TPS gamma results showed exceptionally high passing rates (>99%) for both cohorts. Full-field qualitative analysis for film and MyQA SRS planar measurements demonstrated similar response between the two QA modalities (i.e., high spots are high, low spots are low). Both modalities showed excellent agreement with expected dose planes from the treatment planning system, particularly in high-gradient regions. It was concluded that the MyQA SRS is a comparable alternative to film/point dose, with the added advantages of real-time analysis and repeatability.