

AbstractID: 13733 Title: Implementation of a comprehensive quality assurance regime for the deliverance of electron conformal radiotherapy using custom bolus compensators

Purpose: Quality Assurance (QA) practices for bolus conformal electron radiotherapy have not been well-established. This study proposes a three-step QA program for patient-specific electron bolus radiotherapy encompassing planning, imaging, compensator design, dosimetry verification, and patient alignment. **Method and Materials:** First, to evaluate patient-specific compensator design, a re-CT of the patient was taken with the manufactured bolus to compare dose calculation results with the initial planned virtual bolus. However, the standard visual dose inspection was extended to include a gamma analysis of the exported fluence plane of the virtual and real compensator. Next, to evaluate absolute skin dosimetry at treatment delivery, optically-stimulated luminescent (OSL) dosimeters were placed on the patient surface below the compensator, and dose measurements were compared to the treatment planning system calculation. Finally, accurate treatment delivery is most dependent on the ability to position the compensator with each fraction. To aid this, imaged-guided cone-beam CT radiotherapy was incorporated with fiducial markers adhered onto the compensator and skin for patient alignment. Relative three-dimensional adjustment was carried out and evaluated prior to treatment using image-to-image fiducial alignment. **Results:** Dose fluence planes were compared using a three-millimeter distance-to-agreement and three-percent gamma calculation representing the percentage of pixels with gamma factors greater than unity. Retrospective patient fluence comparisons showed high correlation between ineligible compensator placements and reportable gamma results. OSL dosimeters were found to be a reliable and convenient means of first-fraction dose verification. Additionally, surface fiducial markers may indicate better positioning via image alignment. **Conclusions:** Additional QA steps beyond current practice are needed for the clinical implementation of bolus electron radiotherapy. These steps represent an end-to-end test which may be used to design patient eligibility criteria while maintaining quality of care for these patients.

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