

AbstractID: 7748 Title: Tomotherapy patient-specific quality assurance

Purpose: To verify the patient-specific dosimetric accuracy of the helical tomotherapy system.

Methods and Materials: Tomotherapy is a new and complex delivery system. Varying parameters such as pitch and modulating the beam at various angles during fan-beam delivery can produce highly conformal dose distributions. Patient-specific dosimetric verification is thus critical. This study uses a custom-designed 18X18X18 cm³ phantom made from water-equivalent plastic and Exradin A1SL ionization chambers to perform patient-specific quality assurance (QA) procedures. During treatment, proper positioning of the patient is critical to avoid compromising treatment delivery. Tomotherapy allows roll correction to compensate for patient positioning errors. The roll correction was tested for 5°, 10°, 20°, and 30° using radiographic film dosimetry, the “cheese” phantom and the custom-designed cuboid phantom.

Results: Average ionization chamber correction factors for all patients treated on Tomotherapy were within 1.2%. Film dosimetry for every patient was also performed prior to treatment. Gamma and isodose overlay profiles were analyzed using commercial film analysis software. Results showed no significant dose delivery errors, and all patients passed within 5%. Gamma analysis was performed and showed excellent agreement by comparison with plans without phantom rotation.. Gamma values were within 3.3% at 3mm and 5% distance to agreement. A custom leaf-control file, or sinogram, is created for each patient’s plan, and replicated each time the patient plan is to be delivered. Dosimetric verification for three patient plans was performed to verify the integrity of the sinogram replication process. Results for each tested plan agreement within 1% for each patient fraction.

Conclusion: Tomotherapy allows for accurate delivery, and accurately applies the roll correction as shown by direct dose distribution measurements.

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