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Clinical Validation of Solid IMRT with the Pinnacle3 Radiation Treatment Planning System

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In this work, we investigate a new "Solid IMRT" solution that works with the Pinnacle3 treatment planning system. The .decimal Solid IMRT solution involves exporting the ideal Open Density Matrices (ODM) from the Pinnacle^3 treatment planning system, optimizing the transformation of each ODM into an array of solid modulator thicknesses with a special software package, and importing these thicknesses and necessary supporting information to Pinnacle^3 for the final dose calculation. In order to validate the process and the accuracy of the IMRT dose delivery, three Solid IMRT plans (a prostate, a head and neck, and a breast) were created in Pinnacle^3. The plans had the following number of beams/gantry angles: prostate plan, 5; head & neck plan, 7; and the breast plan, 2. Solid IMRT modulators were designed, built, and verified for individual beams. In order to conduct QA on the fabricated solid modulators, both film and diode array dose measurements were collected. The measured dose distributions were analyzed vs. calculated QA planar doses from the TPS. The process yielded high-quality dose distributions and excellent agreement between the calculated and measured dose values. This study presents a valuable solution that enables Pinnacle users to upgrade to Solid IMRT delivery.

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