An Independent Dose Verification Method for Dynamic

Intensity Modulated Radiation Therapy

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Purpose: Dosimetry verification is particularly important especially for intensity modulated radiotherapy where the dose delivery technique is complex.. The dosimetry verification is usually conducted with measurements and independent dose calculations. However, currently available independent dose calculation methods were developed for step and shoot beam delivery method, and their uses for dynamic MLC delivery method are not clear. In this study, a dose calculation method was developed to perform independent dose verifications for dynamic MLC-based IMRT technique.

Method and Materials: This method extracts the machine delivery parameters from the dynamic MLC(dMLC) files generated by the IMRT treatment planning system. Based on the machine delivery parameters, a monitor unit (MU) matrix, including both primary and leakage contributions, was generated. The MU matrix was used to compute the primary dose matrix and scattered dose matrix. The scattered dose was derived based on the Modified Clarkson technique.

Results: The doses computed using this method were compared with both measurement (14) and treatment plans (25). The doses calculated using this method, on average, agreed with the measured doses to within 1% with a standard deviation of 1.9%. The computed and planned doses agreed to within 2% with a standard deviation of 1.5%.

Conclusions: An independent dose calculation algorithm has been developed to perform independent dose verifications for dynamic IMRT plans. The algorithm independently computed doses that were in excellent agreement with the doses from from commercial treatment planning system. This independent dose calculation method may potentially be used for routine IMRT plan verifications.