Purpose: Dose accuracy in junction regions of breast-tangential therapy is a challenge, and inaccurate dose predictions may lead to unreal hot/cold spots. Availability of the novel deterministic radiation transport method Acuros XB (AXB) provides a potential for more accurate dose predictions. This study assesses relative dose accuracies of this and the widely used other algorithms: collapsed cone convolution (CCC) and anisotropic analytical algorithm (AAA) against film measurements.

Methods: A typical tangential and superclav fileld combination was planned for an anthropomorphic body phantom using Pinnacle-9.0 treatment-planning system (TPS). The created plan employing 6MV beam was delivered to the phantom on a Varian linac. In region of the field junction of tangentials & superclav, films (EBT2) were placed in coronal planes at two depths (~ 2 and 4 cm). Optical density was measured along and ± 5mm away from the field-match line, and converted to dose using film-calibration curve specific to the batch of film. The same plan was also imported to Eclipse TPS using an import filter written in MATLAB. Algorithms Pinnacle CCC 9.0, Eclipse AAA 10.0.24 and AXB 11.0.3 were used for calculations. Comparison of the measured doses (assumed as gold standard) against doses calculated from planning-systems were preformed in a MATLAB platform.

Results: In general, dose distributions from all three TPS algorithms are found to agree closely with film data. Agreements between AXB and CCC dose calculations were found to be reasonable. AXB appears to be better in modeling the backscatter effects in the heterogeneous regions. AAA calculations gives acceptable results, but with less accuracy compared to CCC and AXB.

Conclusions: The novel deterministic algorithm AXB in Eclipse is found to provide better agreement with measured data in breast-tangential therapy. Benefits of using Acuros XB algorithm in tangential fields planning requires further investigation.

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