

Calculated vs. Measured Dose Distributions For Clinically Relevant Electron-Photon Field Matching

The match region between photon and electron fields can have hot and cold dose areas and may be poorly represented by the treatment planning system. The accuracy of dose distributions of matched electron and photon fields generated by a commercial treatment planning system was determined by film dosimetry in a polystyrene phantom for clinically relevant situations. Dose distributions were generated for 9 MeV and 12 MeV electron fields matched with 6 MV photon fields, and with gaps at the skin surface of 0 mm, 5 mm, and 10 mm. Areas encompassed by specific isodose lines in the match region were determined for both treatment plans and film measured dose using computerized region-of-interest analysis. Differences in the areas indicate how well the planning system represents the measured data. Isodose areas in the match region show differences of less than or equal to 1.0 cm^2 for most isodose lines and matching geometries. The largest differences occurred primarily within $\pm 10\%$ of the planned dose. In general, the treatment planning system overestimated the areas of both hot and cold spots within the match region, indicating that the dose distributions provided by the treatment planning system are conservative where they are not accurate. Quantitative film dosimetry and area analysis suggest that this commercial treatment planning system calculates dose distributions in electron-photon field matching to an acceptable accuracy.