AbstractID: 10353 Title: Dose verification for IMRT DMLC delivery using an EPID imager

Purpose

To reconstruct dose distributions using EPID images acquired during treatment.

Method and Materials

This study used a Varian aS500 EPID imager located at SDD = 150 cm and operated in integration mode. The absolute dose of non-uniformity corrected EPID images was cross-calibrated with ion chamber measurements in the slab phantom for experiments. A method based on Monte Carlo simulation was developed to estimate dose spread within the imager and scatter radiation from the phantom/patient to EPID. The scatter calculation accounts for imager composition, treatment fluence, patient anatomy and air gap using convolution/superposition algorithm. The primary radiation reaching EPID was extracted by removing the scatter part from the measurement. The fluence without patient was then obtained by correcting for the patient attenuation estimated from the CT images. The dose distribution was calculated by convolution of the reconstructed fluence with the dose deposition kernel from Monte Carlo simulation. For verification we compared our reconstructed results with TPS (Varian Eclipse^{TM}) calculation and EDR2 film measurements for different IMRT beams and gantry angles. A polyethylene slab phantom (25x25x15 cm^3) was used for measurements with SSD = 93.7 cm and film insert depth of 5.30 cm. Comparison using profiles, isodoses as well as the gamma evaluation (criteria: 3%/3 mm) was presented.

Results

Our results indicate that the isodose curves of reconstructed dose overlap well with film measurement. The agreement is better than that between TPS calculation and film measurement. The 2D gamma evaluation between EPID reconstructed doses and film measurements shows a maximum γ of 1.70, a mean of 0.42 and 97.6% points with $\gamma < 1$. Close comparisons of their profiles reconfirm the results.

Conclusion

We reconstructed the dose distributions using EPID images acquired during treatment and it was verified with film dose measurements. The proposed method provides a reliable tool for IMRT verification.