

AbstractID: 5496 Title: IMRT Film QA in a heterogeneous anthropomorphic phantom

Purpose: To study the agreement of heterogeneous IMRT treatment planning dose calculations with radiochromic film (RCF) and radiographic film (RGF) measured in anthropomorphic heterogeneous phantoms. We intend to use heterogeneous-phantom film dosimetry to improve IMRT quality assurance (QA).

Method and Materials: A commercial heterogeneous anthropomorphic head-and-neck phantom, with equivalent tissue bone, soft tissue and air regions was employed for dosimetry verification (CIRS, inc.). High sensitivity EBT radiochromic film (ISP, Inc.) and EDR2 radiographic film (Kodak) were employed simultaneously for film dosimetry. The phantom had 12 axial sections, each 25mm thick, with alignment pins and a compression plate. We selected a plane containing bone, soft tissue and an air gap for IMRT verification. The RCF and RGF were cut to match the selected plane, inserted between the sections and light sealed. A 6MV IMRT head & neck treatment plan with 7 beams was delivered using a commercial linac (Varian Clinac 2100/CD). The RCF was scanned avoiding artifact described in a companion work using a CCD film scanner (Epson 1680 scanner). The dose distributions were compared with the treatment plan.

Results: Both RCF and RGF disagree with the treatment plan dose near the air cavities by 15%. Away the air cavities 5% agreement was obtained with RCF. Pronounced artifacts were observed in the RGF that were not observed in the RCF.

Conclusion: IMRT dosimetry and quality assurance can be improved by using anthropomorphic phantoms that incorporate realistic heterogeneities such as bone, soft tissue and air gaps, and corrections to dose calculations can be applied. We hypothesize that RGF suffers from Cerenkov in air cavities and in less opaque phantom materials, and this will be investigated in further studies.

This work was supported in part by NCI grants R01-CA-100636 and N43-CM-52214