AbstractID: 10474 Title: Deciphering electron dose distributions in ophthalmologic radiation therapy

Purpose: To decipher dose distributions of electron beams used in ophthalmologic treatments.

Method and Materials: Eye region RT associates all the different ingredients that perturb electron fluence: surface irregularities (nose and eyeball), inhomogeneities (sinus air and orbital bone), small beam sizes. Two TPS were used (Eclipse-Varian & Isogray-Dosisoft) with 2 different algorithms: Pencil Beam (PB) and Monte Carlo (MC). Gafchromic film dosimetry was performed on an anthropomorphic head phantom. Adult and children size voxelized phantoms modeled the nose and eye contours with an intraorbital target bordered by structures of air on the medial side and bone on the lateral side (Fig.1). Dose distributions for an oblique anterior electron field, normalized at the geometric center of the target, were calculated at all energies, incorporating one or several of the complex ingredients. Their effect was quantified by the relative dose at the medial border (D_{med}) and the lateral border (D_{lat}) of the virtual target, the 90% isodose volume and the target V90.

Results: Gafchromic dosimetry showed a better accuracy of the MC model as seen on gamma index maps and profile analysis (Fig.2). The nose and eye external contours caused a peak dose of more than 110% at the eye and nose junction that was found in both PB and MC calculations (Fig.3b). MC model showed more dramatic changes in the dose distributions when air or bone was involved than the PB model: at 12MeV, D_{med} decreased by 4% for MC and 1% for PB, whereas D_{lat} increased by 7% and 2% for MC and PB respectively (Fig.3c). The shape and size of the 90% isodose were affected by all factors.

Conclusion: The phantom study quantifies the variations in electron dose distributions due to surface irregularities and inhomogeneities in ophthalmologic targets. Film dosimetry showed a better accuracy of MC dose calculations.