

AbstractID: 6814 Title: Dosimetric comparison of three different treatment techniques for extensive scalp lesion irradiation

Purpose: Homogeneous scalp irradiation poses technical and dosimetric challenges due to the complex shape of the target. The purpose of this study is to compare conventional electron/photon therapy, photon IMRT, and HDR brachytherapy for treatment of extensive scalp lesions.

Method and Materials: A 73-year-old man presented with extensive squamous cell carcinoma of the scalp. A custom helmet-shaped mold was made and the target area delineated. The following three treatment methods were evaluated: a 3D plan using lateral photon/electron fields with moving junctions, an IMRT plan using seven coplanar beams, and a brachytherapy plan with catheters placed on the outer side of the mold. All plans were created for the same biological effective doses of 60 Gy. TLDs were used to verify the accuracy of the analyzed techniques. Coverage factors, dose conformity indexes, global conformity indexes, minimum, maximum and mean doses were presented for the scalp and critical structures including the brain and eyes.

Results: Dosimetry parameters were normalized to 95% of prescription dose. Clinical target volume coverage factors in electron/photon, IMRT and HDR techniques were 0.976, 0.998, 0.957, and target conformity indexes were 1.98, 1.67, and 1.38, respectively. The dose gradient across the target was 59-136%, 91-129%, and 58-242% for electron/photon, IMRT, and HDR techniques, respectively. The lowest maximum dose to the eyes was achieved with external beam techniques. HDR produced the lowest maximum dose to brain, while IMRT irradiated the least amount of brain above 45 Gy. The measurements agreed within 5% of the calculated doses.

Conclusion: IMRT provided better dose homogeneity and target coverage, and delivered lower doses to normal structures than the other techniques. While dose inhomogeneity in the target region was higher in HDR, this technique produced the most conformal plan. Therefore, our department selected IMRT and HDR for extensive scalp lesion treatment.