AbstractID: 3468 Title: Verification of Whole-Body Dosimetry in an IMRT Treatment Planning System

Purpose: IMRT has been widely used in radiation therapy, since this technique shows potential for further improving the therapeutic ratio and reducing complications. On the other hand, it has been suggested that IMRT presents a potential impact on the induction of second malignancies, because it can result in a higher whole-body dose due to leakage radiation. In the routine treatment planning process, complete information on the whole-body dose-volume histogram is not available due to the limited patient body volume imaged in the CT treatment planning process. In addition, for IMRT, larger volumes of normal tissues are being exposed to low doses, and the dosimetric uncertainties of a treatment planning system at these doses are relatively large. In this study, whole-body dosimetry calculated from the Eclipse-Helios planning system was verified using a whole-body anthropomorphic phantom and MOSFET detectors, as well as polymer gels.

Method and Materials: The "ATOM" whole-body anthropomorphic phantom was CT-scanned into the Eclipse-Helios system. An IMRT prostate plan was designed for the ATOM phantom. Each MOSFET detector was calibrated at various angles based on ion chamber dosimetry. The MOSFET detectors were precisely placed in relocatable dosimeter positions corresponding to various internal organs, allowing point-dose measurements and comparison. BANG® polymer gel, prepared in a cylindrical container, was placed at the phantom head position to measure the 3D dose distribution. The DVH in the gel cylinder, analyzed with an optical CT scanner, was compared with that from the planning system.

Results: Preliminary results show that the agreement between the MOSFET measurements and the calculated results is within 5% for points within the target. At low-dose regions (0.1-60%), discrepancies are larger but reasonable. DVH comparison between gels and the treatment planning will be presented.

Conclusion: Anthropomorphic phantom with MOSFET detectors and polymer gels can provide whole-body dosimetry verification for IMRT.