AbstractID: 13286 Title: In-vivo Dosimetry Using a MOSFET Detector in an Anthropomorphic Phantom for Therapeutic Proton Beam

Propose: In-vivo proton dosimetry can be used to identify major deviations in a delivery of treatment. We challenged in-vivo measurements with a MOSFET detector for an anthropomorphic phantom with tissue inhomogeneities. Here, The MOSFET response depends strongly on the linear energy transfer (LET) for proton beam. Therefore, we developed a method to correct the MOSFET response for the LET dependence by using a simplified Monte Carlo dose calculation method (SMC).

Method and Materials: A depth-output curve in polyethylene for mono-energetic proton beam was measured with the MOSFET detector. To calculate MOSFET output distributions, the SMC (SMC_{MOSFET}) used the depth-output curve. Then, the MOSFET output value at an arbitrary point obtained by the SMC_{MOSFET} were compared with a dose value obtained by a conventional SMC, which calculates proton dose distributions by using the depth-dose curve measured with an ionization chamber. From the ratio of both values, we can calculate the correction factor of the MOSFET response at the arbitrary point. Finally, the dose obtained by the MOSFET detector is given by the product of the correction factor and the MOSFET raw dose without the above correction. We performed in-vivo proton dosimetry with the MOSFET detector in head and neck regions of an anthropomorphic phantom.

Results: The results measured by the MOSFET without the correction at each measurement condition indicate a remarkable deviation from those of the SMC. On the other hand, the corrected MOSFET doses agreed with the results of the SMC within the measurement error.

Conclusion: For dose measurements in the anthropomorphic phantom with tissue inhomogeneities, the corrected MOSFET dose agreed well with the SMC results within the measurement error. Using the correction method for the MOSFET response, we could succeed in-vivo proton dosimetry with the MOSFET detectors for the first time.