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Characteristic Comparison of MicroMOSFET and Standard MOSFET for Clinical Dosimetry Application

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Purpose: To evaluate dosimetric properties of a standard MOSFET in comparison with a microMOSFET. **Method and Materials:** We developed the phantoms to perform a calibration and to analyze characteristics of standard MOSFET and microMOSFET dosimeters. The phantoms are made of polystyrene ($\rho=1.05$), which have the shape of semi-sphere with 10 cm diameters and flat slab of 30 cm×30 cm with 1 cm thickness. The slab phantom was used for calibration and characterization measurements such as reproducibility, linearity and dose rate dependency. The semi-sphere phantom was used for angular and directional dependence on the types of MOSFETs. The measurements were conducted at a depth of 1.5 cm under 10 cm×10 cm fields at 100 cm SSD for reproducibility, linearity, and dose rate dependence. For calibration and reproducibility, five standard MOSFETs and microMOSFETs were repeatedly irradiated by 200 cGy three times. Dose linearity was evaluated in the range of 10 to 600 cGy. The effect of dose rate was also investigated by 200 cGy from 100 to 600 MU/min. For angular and direction dependence, the measurements were performed between 0° and 90° gantry angles, while MOSFETs were placed at the center of semi-sphere phantom. The 50 cGy was irradiated repeatedly three times under same setup. **Results:** The average calibration factor was 1.1 ± 0.95 for standard MOSFETs and 1.09 ± 0.50 for microMOSFETs. The response of reproducibility in the two types of MOSFETs was found to be maximum 0.5% variation. In linearity, the results showed good linear response with R2 value of 0.997 and 0.999. The directional dependence was found to be within $\pm 2\%$ and $\pm 8\%$. Angular dependence was also found to be within $\pm 5\%$ and $\pm 8\%$. **Conclusion:** Standard MOSFET and microMOSFET were compared by the dosimetric characteristics with the developed phantom. For linearity, reproducibility and calibration factor, two types of MOSFETs showed similar results. On the other hand, standard MOSFET and microMOSFET were found to be remarkable difference of its detection area size in angular and directional dependence.

Keywords : MOSFET Dosimeter, Angular Dependence, Dosimetry