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Radiation Dose to the Embryo/Fetus in Treatment of a Pregnant Patient with Brain Tumors

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Purpose: To estimate the dose to the embryo/fetus of a pregnant patient with brain tumors, and to design an shielding device to keep the embryo/fetus dose under acceptable levels. Materials and Methods: A shielding wall with the dimension of 3meter height, 2 meter width, and 30mm thickness is fabri-cated with 4 trolleys under the wall. It is placed between a patient and the treatment head of a linear accelerator to at-tenuate the leakage radiation effectively from the treatment head, and is placed 1cm below the lower margin of the treat-ment field in order to minimize the dose to a patient from the treatment head. A anti-patient scattering neck supporters with 2cm thick Lipowitz metal is designed to minimize the scattered radiation from the treatment fields, and it is divided into 2 section. They are installed around the patient neck by attach from right and left sides. A shielding bridge for anti-room scattered radiation is utilized to place 2 sheets of 2mm lead plates above the abdomen to setup three detectors under the lead sheets. Humanoid phantom is irradiated with the same treatment parameters, and with and without shielding devices using TLD, and ionization chambers with and without a build-up cap. Results: The dose to the embryo/fetus without shielding was 3.20, 3.21, 1.44, 0.90 cGy at off-field distances of 30, 40, 50, and 60 cm. With shielding, the dose to embryo/fetus was reduced to 0.88, 0.60, 0.35, 0.25 cGy, and the ratio of the shielding effect varied from 70% to 80 %. TLD results were 1.8, 1.2, 0.8, 1.2, and 0.8 cGy. The dose measured by the survey meter was 10.9 mR/ h at the patient's surface of abdomen. The dose to the embryo/fetus was estimated to be about 1 cGy during the entire treatment. Conclusion: According to the AAPM report 50 regarding the dose limit of the embryo/fetus during the pregnancy, the dose to the embryo/fetus with little risk is less than 5 cGy. Our measurements satisfy the recommended values. Our shielding technique was proven to be acceptable.

Keywords : Embryo/Fetus Dose, Pregnant Patient, Radiation Shielding