

Comparative Study of Dose Calculation Accuracy in Bone Marrow Using Monte Carlo Method

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Abstract : Introduction: The effect of ionizing radiation on human health can be effective for genomic integrity and cell viability. It also increases the risk of cancer and malignancy. Therefore, X-ray behavior and absorption dose calculation are considered. One of the applicable tools for calculating and evaluating the absorption dose in human tissues is Monte Carlo simulation. Monte Carlo offers a straightforward way to simulate and integrate, and because it is simple and straightforward, Monte Carlo is easy to use. The Monte Carlo BEAMnrc code is one of the most common diagnostic X-ray simulation codes used in this study. Method: In one of the understudy hospitals, a certain number of CT scan images of patients who had previously been imaged were extracted from the hospital database. BEAMnrc software was used for simulation. The simulation of the head of the device with the energy of 0.09 MeV with 500 million particles was performed, and the output data obtained from the simulation was applied for phantom construction using CT CREATE software. The percentage of depth dose (PDD) was calculated using STATE DOSE was then compared with international standard values. Results and Discussion: The ratio of surface dose to depth dose (D/Ds) in the measured energy was estimated to be about 4% to 8% for bone and 3% to 7% for bone marrow. Conclusion: MC simulation is an efficient and accurate method for simulating bone marrow and calculating the absorbed dose.

Keywords : Monte Carlo, absorption dose, BEAMnrc, bone marrow

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