Dosimetry of Total Body Irradiation with human phantom

Total Body Irradiation (TBI) is used to prepare patients for Bone Marrow Transplantation (BMT) for the treatment of some diseases such as leukemia, lymphoma and etc. there is no standard technique, as departments adopt their own treatment aims and also influenced by the type of treatment machine available. The purposes of this study were (1) to measure some basic dosimetric data in TBI condition in order to check accuracy in dose delivery to the prescribed point (ambilicus). (2) To develop an algorithm for midplane dose determination in TBI techniques. (3) To investigate dose homogeneity through whole body in TBI condition. Materials and methods: in our study some basic dosimetric data was measured with a water phantom (3×3×3 cm3) and a Farmer ionization chamber (6.0 cc) which connected to a UNIDOSE electrometer. To check accuracy in midplane dose determination through proposed algorithm and to investigate dose homogeneity through whole body a human phantom and four silicon diodes type-p which were connected to the MULTIDOS electrometer were used. A proper lung shield was made to reduce lung’s dose. In addition a TBI stand with dimensions of 70×100×210 cm3 was built for supporting shields and patients. Results: the results based on the measurement of basic dosimetric data showed that the accuracy in dose delivery to the prescribed point was 9.3%. From diode measurements it can be seen that the accuracy of the proposed algorithm for midplane dose determination was within 7.0%. The results of measured surface doses for human phantom implied that dose homogeneity at anterior surface was ±6% and at posterior surface was ±0% of the prescribed dose. The delivered dose to the lung was 14.4 Gy and it was reduced to 8.14 Gy by applying the proper lung shield. Discussion: the obtained accuracy and variation of the delivered dose to the prescribed point was within 3% which is considered to be clinically acceptable. The proposed algorithm by this work appears to be useful in TBI treatment. The obtained homogeneity through whole body was within ±6%. In our opinion this level of homogeneity is acceptable. By the notice of achieved accuracy and dose homogeneity it is recommended that TBI
treatment can be implemented in our center treatment cancer (Imam Khomeiny Hospital

کلمات کلیدی:
Total Body Irradiation, dosimetry, human phantom

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