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In Vivo Dosimetry in Total Body Irradiation

Total Body Irradiation (TBI) is a radiotherapy technique that consists of irradiating homogeneously the whole patients body and it is characterized by extended source to surface distances and the use of large irradiation fields. The limitations of the available input data and inherent problems with the calculation procedures make it very difficult to accurately determine the dose distributions in TBI. For these reasons, it is highly recommended to use In Vivo Dosimetry (IVD), to guarantee the quality of TBI treatments as a direct measurement of the delivered dose. An IVD QA system was implemented based on semiconductor diodes and radiochromic films. For the commissioning of the system, both detector types were calibrated independently, using as reference an ionization chamber with a valid certificate in terms of absorbed dose to water (Dw). This guarantees the traceability of the measurements. An assessment was made on the sources of uncertainties. A tolerance level of $\pm 10\%$ was established for the combined contribution of both computational and experimental uncertainties. An experiment was carried out to simulate a clinical TBI procedure to a phantom. In this way, the calibration of the dosimetry system was corroborated. Finally, the IVD system was applied in TBI of three real patients. The discrepancies obtained between the prescribed and measured doses were below the established tolerance level of $\pm 10\%$.

Authors: LLANES VEIGA, Eilen (Instituto Nacional de Oncología y Radiobiología (INOR), Cuba.); ALFONSO LAGUARDIA, Rodolfo (Instituto Superior de Tecnologías y Ciencias Aplicadas (InSTEC), Cuba.); CABALLERO PINELO, Roberto (Hospital Clínico Quirúrgico "Hermanos Ameijeiras", Cuba.)

Presenter: LLANES VEIGA, Eilen (Instituto Nacional de Oncología y Radiobiología (INOR), Cuba.)

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