RBE estimation of BNCT based on MK model with optimized parameters

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Background: The radiation field of BNCT (Boron Neutron Capture therapy, BNCT) is a mixed radiation field, which mainly contains the following particles, neutron, proton, photon, alpha particle, and 7Li particle. In order to facilitate the calculation of the physical dose, the particle dose of the mixed radiation field is divided into boron dose, nitrogen dose, hydrogen dose and photon dose. In the clinical treatment of BNCT, the accuracy of dose calculation is very important. In order to obtain an accurate biological dose, we need to accurately calculate the relative biological effectiveness (RBE) at different depths, which is related to biological endpoints and experimental conditions. **Methods:** The MK model is a biophysical model for calculating ion beam RBE and biologically effective dose based on microdosimetry, and there are many existing ion beam clinical experiences based on this model. In this study, the MK model was used to calculate the RBEs of BNCT, and the cell experimental data reported in the paper were selected. In addition, an algorithm was designed to optimize the model parameters to ensure the accuracy of the MK model. **Results**: The lineal energy spectrum and dose distribution corresponding to the four doses were obtained, and the RBEs at different depths were obtained when the biological endpoint was 10% of the cell survival fraction. **Conclusions**: In this study, MK model was used to calculate RBEs, and the algorithm was designed to optimize the parameters of the MK model, which ensured the accuracy of the calculation results. This study contributes valuable insights to the field, serving as a reference for optimizing clinical treatment in BNCT.