Design and optimization of neutron beam for the treatment of deep brain tumors by BNCT with reducing damage to the skin

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Abstract
In many of the studies in which the possibility of the treatment of deep brain tumors have been examined by Boron Neutron Capture Therapy (BNCT), the skin has been considered as a healthy tissue. Since the compound biological effectiveness of skin is approximately two times greater than the normal tissue, the dose in the skin will exceeded that of critical value. As the skin is the first radiated tissue, redesigning the beam shaping assembly (BSA) is required for the least possible effect on the skin. In this paper, the treatment of deep brain tumors by BNCT is investigated based on $^7\text{Li}(p,n)^7\text{Be}$ reaction for neutron producing. The BSA is designed in such a way that in addition to having proper epithermal neutron flux, the fast and thermal neutron fluxes are reduced as much as possible for decreasing the skin damage. Finally, the suitability of the designed beam for BNCT treatment has been shown by dose calculations on deep brain tumor in SNYDER phantom.

Keywords: BNCT, $^7\text{Li}(p,n)^7\text{Be}$ Reaction, deep-seated tumors, Skin, Dose evaluation

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