

Effect of Total Body Irradiation for Metastatic Lymph Node and Lung Metastasis in Early Stage

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Abstract : Lymph node (LN) metastasis accounts for 20 - 30 % of all deaths in patients with head and neck cancer. Therefore, the control of metastatic lymph nodes (MLNs) is necessary to improve the life prognosis of patients with cancer. In a classical metastatic theory, tumor cells are thought to metastasize hematogenously through a bead-like network of lymph nodes. Recently, a lymph node-mediated hematogenous metastasis theory has been proposed, in which sentinel LNs are regarded as a source of distant metastasis. Therefore, the treatment of MLNs at the early stage is essential to prevent distant metastasis. Radiation therapy is one of the primary therapeutic modalities in cancer treatment. In addition, total body irradiation (TBI) has been reported to act as activation of natural killer cells and increase of infiltration of CD4+ T-cells to tumor tissues. However, the treatment effect of TBI for MLNs remains unclear. This study evaluated the possibilities of low-dose total body irradiation (L-TBI) and middle-dose total body irradiation (M-TBI) for the treatment of MLNs. Mouse breast cancer FM3A-Luc cells were injected into subiliac lymph node (SiLN) of MXH10/Mo/LPR mice to induce the metastasis to the proper axillary lymph node (PALN) and lung. Mice were irradiated for the whole body on 4 days after tumor injection. The L-TBI and M-TBI were defined as irradiations to the whole body at 0.2 Gy and 1.0 Gy, respectively. Tumor growth was evaluated by in vivo bioluminescence imaging system. In the non-irradiated group, tumor activities on SiLN and PALN significantly increased over time, and the metastasis to the lung from LNs was confirmed 28 days after tumor injection. The L-TBI led to a tumor growth delay in PALN but did not control tumor growth in SiLN and metastasis to the lung. In contrast, it was found that the M-TBI significantly delayed the tumor growth of both SiLN and PALN and controlled the distant metastasis to the lung compared with non-irradiated and L-TBI groups. These results suggest that the M-TBI is an effective treatment method for MLNs in the early stage and distant metastasis from lymph nodes via blood vessels connected with LNs.

Keywords : metastatic lymph node, lung metastasis, radiation therapy, total body irradiation, lymphatic system

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