

عنوان مقاله:

Treatment of Cancer by Radiotherapy and Nanoparticles Coupled With Methotrexate

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خلاصه مقاله:

Introduction: Cancer patients receive radiation therapy (RT) as part of their treatment as monotherapy or as part of a combination treatment. Radiation therapy uses high-energy radiation such as photons and strong ions. Nanoparticles (NPs) are used for magnetic hyperthermia, which increases the efficacy of RT and generates heat to kill cancer cells by destroying their DNA.

Material and Methods: Nanoparticles were prepared using the co-precipitation method and characterized using transmission electron microscopy (TEM), scanning electron microscopy (SEM), and X-ray diffractometer. Fifty-six male mice were housed under similar environmental conditions. The animals were injected into the right flank with 0.25 mL of 10⁶ cells/mL Ehrlich tumor suspension. When tumors reached 5-10 mm in diameter, the mice were randomly divided into eight groups as follows: 1st group: used as the control group injected with 25 μL of phosphate buffer saline without treatment, 2nd group: injected with Fe₃O₄-NPs, 3rd group: injected with Fe₂O₃-NPs, 4th group: injected with methotrexate (MTX), 5th group: injected with MTX, Fe₃O₄, and Fe₂O₃-NPs, 6th group: as the 5th group with microwave hyperthermia, 7th group: as the 5th group then treated with high-energy photons, and 8th group: as the 5th group and exposed to electron beam therapy. Tumor volume and weight were measured after 15 days. Tumor apoptosis was studied using histopathology, and the tumor's side effects on the biological systems were investigated. Results: The results indicated that magnetic hyperthermia with microwave and linear accelerator treatment coupled with drugs was suitable for cancer treatment. A significant decrease in tumor size, tumor necrosis, and fibrosis was observed. Conclusion: It was found that Fe₃O₄ and Fe₂O₃-NPs coupled with MTX and exposure to photon and electron beam therapy and microwave radiation are the best methods for cancer treatment

کلمات کلیدی:

SEM, Microwave hyperthermia, Biological systems, Linear Accelerator, Histopathology

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