PRECLINICAL EVALUATION OF RED LASER COMBINED WITH RADIOACTIVE GOLD NANOPARTICLES IN BREAST CANCER

Mayara S. Pinto. [1], Wilmer A. A. Rosero [2], Maria Elisa M. C. Rostelato [2] and Martha S. Ribeiro [1]
mayarasp@usp.br
[1]Center for Lasers and Applications – Nuclear and Energy Research Institute, IPEN-CNEN, São Paulo, SP
[2]Radiation Technology Center – Nuclear and Energy Research Institute, IPEN-CNEN, São Paulo, SP

Breast cancer remains a leading cause of mortality among women worldwide, underscoring the urgent need for innovative therapeutic strategies to improve both quality of life and survival rates. Nanobrachytherapy (NB) and photobiomodulation therapy (PBM) have emerged as promising, less invasive approaches to breast cancer treatment. NB offers the potential to deliver high doses of ionizing radiation more precisely and rapidly compared to conventional radiotherapy. Meanwhile, PBM has shown promise in sensitizing cells, particularly when administered prior to NB. In this study, we aimed to assess the efficacy of combining PBM with NB utilizing radioactive gold nanoparticles (AuNPs) in treating breast cancer in a murine model. Murine 4T1 cells were cultured in RPMI medium and subsequently injected into the lower-left mammary fat pad of the animals. Once the tumor reached approximately 0.1 cm^3, AuNPs (approximately 200 µCi) were introduced into the mouse breast. The tumor was then exposed to red LED irradiation (660 nm, 40 mW, 150 s, 6 J) either once or twice. Animals were monitored for three weeks until euthanasia. Our findings revealed a significant inhibition of tumor growth in the NB group compared to the control, as well as the PBM + NB groups after one or two sessions. These results suggest that a single PBM session alone did not augment the effectiveness of NB in treating breast cancer. In conclusion, while our study underscores the potential of NB in restraining breast cancer progression, further investigation is warranted to elucidate the optimal combination and timing of PBM therapy to maximize its synergistic effects with NB.

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