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Magnetohemodynamic of Blood Flow Having Impact of Radiative Flux Due to Infrared Magnetic Hyperthermia: Spectral Relaxation Approach

Authors : Ebenezer O. Ige, Funmilayo H. Oyelami, Joshua Olutayo-Irheren, Joseph T. Okunlola

Abstract : Hyperthermia therapy is an adjuvant procedure during which perfused body tissues is subjected to elevated range of temperature in bid to achieve improved drug potency and efficacy of cancer treatment. While a selected class of hyperthermia techniques is shouldered on the thermal radiations derived from single-sourced electro-radiation measures, there are deliberations on conjugating dual radiation field sources in an attempt to improve the delivery of therapy procedure. This paper numerically explores the thermal effectiveness of combined infrared hyperemia having nanoparticle recirculation in the vicinity of imposed magnetic field on subcutaneous strata of a model lesion as ablation scheme. An elaborate Spectral relaxation method (SRM) was formulated to handle equation of coupled momentum and thermal equilibrium in the blood-perfused tissue domain of a spongy fibrous tissue. Thermal diffusion regimes in the presence of external magnetic field imposition were described leveraging on the renowned Roseland diffusion approximation to delineate the impact of radiative flux within the computational domain. The contribution of tissue sponginess was examined using mechanics of pore-scale porosity over a selected of clinical informed scenarios. Our observations showed for a substantial depth of spongy lesion, magnetic field architecture constitute the control regimes of hemodynamics in the blood-tissue interface while facilitating thermal transport across the depth of the model lesion. This parameter-indicator could be utilized to control the dispensing of hyperthermia treatment in intravenous perfused tissue.

Keywords : spectra relaxation scheme, thermal equilibrium, Roseland diffusion approximation, hyperthermia therapy
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