- Abstract

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Modelling fluorescence in clinical photodynamic therapy.

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Abstract

Understanding the interactions of non-ionizing radiation with living organisms has been the focus of much research over recent decades. The complex nature of these interactions warrants development of theoretical and experimental studies to gain an insight into predicting and monitoring the success of photodynamic therapy (PDT) protocols. There is a major impetus towards evidence-based recommendations for patient diagnosis, treatment and management. Knowledge of the biophysical aspects of PDT is important for improving dosimetry protocols. Fluorescence in clinical PDT may be used to detect and diagnose pre-malignant and malignant conditions, while photobleaching can monitor changes in fluorescence during treatment. Combining empirical fluorescence photobleaching clinical data with computational modelling enables clinical PDT dosimetry protocols to be investigated with a view to optimising treatment regimes. We will discuss how Monte Carlo radiation transfer (MCRT) modelling has been intercalated in the field of fluorescence detection and PDT. In this paper we highlight important aspects of basic research in PDT by reporting on the current utilisation of fluorescence in clinical PDT from both a clinical and theoretical perspective. Understanding and knowledge of light propagation in biological tissue from these perspectives should have a positive impact on treatment planning.

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