Development of a skin burn predictive model adapted to laser irradiation

Submitted by Marie-Françoise... on Tue, 02/07/2017 - 16:23

Titre	Development of a skin burn predictive model adapted to laser irradiation
Type de publication	Article de revue
Auteur	Sonneck-Museux, Nathanaëlle [1], Scheer, Emmanuel [2], Perez, Laetitia [3], Agay, Diane [4], Autrique, Laurent [5]
Editeur	Springer Verlag
Type	Article scientifique dans une revue à comité de lecture
Année	2016
Langue	Anglais
Date	Décembre 2016
Numéro	112
Pagination	1-23
Volume	37
Titre de la revue	International Journal of Thermophysics
ISSN	0195-928X
Mots-clés	Experimentation in vivo [6], laser irradiation [7], Skin burn [8], Thermal modeling [9]
Résumé en anglais	Laser technology is increasingly used, and it is crucial for both safety and medical reasons that the impact of laser irradiation on human skin can be accurately predicted. This study is mainly focused on laser–skin interactions and potential lesions (burns). A mathematical model dedicated to heat transfers in skin exposed to infrared laser radiations has been developed. The model is validated by studying heat transfers in human skin and simultaneously performing experimentations an animal model (pig). For all experimental tests, pig's skin surface temperature is recorded. Three laser wavelengths have been tested: 808 nm, 1940 nm and 10 600 nm. The first is a diode laser producing radiation absorbed deep within the skin. The second wavelength has a more superficial effect. For the third wavelength, skin is an opaque material. The validity of the developed models is verified by comparison with experimental results (in vivo tests) and the results of previous studies reported in the literature. The comparison shows that the models accurately predict the burn degree caused by laser radiation over a wide range of conditions. The results show that the important parameter for burn prediction is the extinction coefficient. For the 1940 nm wavelength especially, significant differences between modeling results and literature have been observed, mainly due to this coefficient's value. This new model can be used as a predictive tool in order to estimate the amount of injury induced by several types (couple power-time) of laser aggressions on the arm, the face and on the palm of the hand.
URL de la notice	http://okina.univ-angers.fr/publications/ua15590 [10]
DOI	10.1007/s10765-016-2106-5 [11]
Lien vers le document	http://link.springer.com/article/10.1007/s10765-016-2106-5 [12]

Liens
[1] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=26069
[2] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=1863
[3] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=1862
[4] http://okina.univ-angers.fr/publications?f%5Bauthor%5D=2134
[5] http://okina.univ-angers.fr/l.autrique/publications
[6] http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=22308
[7] http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=10755
[8] http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=22309
[9] http://okina.univ-angers.fr/publications?f%5Bkeyword%5D=22310
[10] http://okina.univ-angers.fr/publications/ua15590
[11] http://dx.doi.org/10.1007/s10765-016-2106-5
[12] http://link.springer.com/article/10.1007/s10765-016-2106-5