Skin burns after laser exposure: Histological analysis and predictive simulation

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Résumé en anglais	Thermal effects of laser irradiation on skin are investigated in this paper. The main purpose is to determine the damage level induced by a laser exposure. Potential burns induced by two lasers (wavelength 808 nm and 1940 nm) are studied and animal experimentations are performed. Several exposure durations and laser powers are tested. Based on previous works, a mathematical model dedicated to temperature prediction is proposed and finite-element method is implemented. This numerical predictive tool based on the bioheat equation takes into account heat losses due to the convection on skin surface, blood circulatory and also evaporation. Thermal behavior of each skin layer is also described considering distinct thermal and optical properties. Since the mathematical model is able to estimate damage levels, histological analyses were also carried through. It is confirmed that the mathematical model is an efficient predictive tool for estimation of damage caused by lasers and that thermal effects sharply depend on laser wavelength.
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