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Laser Penetration through different skin phototypes

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Abstract content
   (Max 300 words)

Numerous laser treatments are done with lasers in the visible to near infrared wavelength bands. Human skin is considered a turbid medium for these wavelength bands. As light travels through the skin it gets scattered and absorbed. These two processes reduce the fluence rate (or power density). Computer modeling can be a valuable tool to determine the reduction in fluence rate of laser light as a function of depth into the skin. A computer model has been developed in a commercial raytracing software package. For this study, two skin layers (epidermis and dermis) were modeled with a skin cancer tumor (squamous cell carcinoma) embedded in the dermal layer of skin. The absorption of light in the epidermis is dependent on the skin phototype. The epidermal thickness differs from position to position on the skin and had to be accounted for. In the model three different skin phototypes (from very light to very dark) and three epidermal thicknesses were modeled. The epidermal layer thickness was varied between 0.04 mm and 0.09 mm. The model required the geometrical dimensions of each layer as well as the absorption and scatterings coefficients.
The major advantage of the computer model was that the extent of the absorption effect could be quantified. Use of the model allows the clinician to compensate for the absorption and establish safe and effective treatment power and times before treatment commences. When comparing treatment time between skin of phototype I and V and keeping the fluence rate constant at 44.2 mW/cm2, the treatment time is increased from 235 s (phototype I) to 374 s (phototype V), an increase of more than 50 %.

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