

Transdermal drug delivery enhanced and controlled by Erbium:YAG laser: a comparative study of lipophilic and hydrophilic drugs

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摘要

Abstract

The influence of an erbium:YAG laser on the transdermal delivery of drugs across skin was studied in vitro. Indomethacin and nalbuphine, which have the same molecular weight, were selected as model lipophilic and hydrophilic drugs, respectively, to compare skin permeation by laser treatment. The results indicate a significant increase in the permeation of indomethacin and nalbuphine across skin pretreated with an erbium:YAG laser. The laser had a greater effect on the permeation of hydrophilic molecules which usually possess low permeability. The laser intensity and its spot size were found to play an important role in controlling transdermal delivery of drugs. Permeation of the hydrophilic drug increased following an increase of laser energy. On the other hand, a different result was observed for the lipophilic drug transported across laser-treated skin. The stratum corneum (SC) layer in skin could be partly ablated by the erbium:YAG laser. The barrier function of the SC may also be modulated by a lower intensity of the laser without affecting the viability and structure of the epidermis/dermis as determined by histological observations. However, ultrastructural alteration of the epidermis/dermis may be caused by laser treatment. Use of an erbium:YAG laser is a good method for enhancing transdermal absorption of both lipophilic and hydrophilic drugs, because it allows precise control of SC removal, and this ablation of SC can be reversible to the original normal status.