The effect of laser treatment on skin to enhance and control transdermal delivery of 5-fluorouracil

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摘要

Abstract

The effect of three lasers (i.e., the ruby, erbium:YAG, and CO2) on the ability to enhance and control skin permeation of 5-fluorouracil (5-FU) was studied in vitro. Light microscopic and ultrastructural (scanning electron microscopic) changes in the nude mouse skin were also compared for these lasers. The histological observations and permeation profiles of each laser differed because the three lasers produce different physical and physiologic effects when striking the skin. The skin permeation of 5-FU could be moderately promoted by a single photomechanical wave generated by the ruby laser (at 4.0 and 7.0 J/cm(2)) without adversely affecting the viability or structure of the skin. The stratum corneum (SC) layer in the skin was partly ablated by an erbium:YAG laser, resulting in a greater enhancement effect on skin permeation of 5-FU. The flux of 5-FU across erbium:YAG laser-treated skin was 53-133-fold higher than that across intact skin. Both SC ablation and a thermal effect may contribute to the effect of the CO2 laser on skin structure. Lower energies of the CO2 laser did not modulate 5-FU permeation. A 36-41-fold increase in 5-FU flux was observed after exposure to higher fluences (4.0 and 7.0 J/cm(2)) of the CO2 laser. Histological changes induced by both the erbium:YAG and CO2 lasers had completely recovered within 4 days. J Pharm Sci 91:1613-1626, 2002