Lasers and Microdermabrasion Enhance and Control Topical Delivery of Vitamin C.

沈杏娟
Lee WR;Shen SC;Wang KH;Hu CH;Fangz JY

Abstract

The objective of this study was to evaluate the ability of lasers and microdermabrasion, both of which are skin resurfacing modalities, to enhance and control the in vitro skin permeation and deposition of vitamin C. The topical delivery of magnesium ascorbyl phosphate, the prodrug of vitamin C, was also examined in this study. All resurfacing techniques evaluated produced significant increases in the topical delivery of vitamin C across and/or into the skin. The erbium:yttrium-aluminum-garnet (Er:YAG) laser showed the greatest enhancement of skin permeation of vitamin C among the modalities tested. The laser fluence and spot size were found to play important parts in controlling drug absorption. An excellent correlation was observed in the Er:YAG laser fluence and transepidermal water loss, which is an estimation of skin disruption. Permeation of magnesium ascorbyl phosphate was not enhanced by the Er:YAG laser. The CO2 laser at a lower fluence promoted vitamin C permeation with no ablation of the stratum corneum or epidermal layers. Further enhancement was observed with the CO2 laser at higher fluences, which was accompanied by a prominent ablation effect. Microdermabrasion ablated the stratum corneum layers with minimal disruption of the skin barrier properties according to transepidermal water loss levels. The flux and skin deposition of vitamin C across microdermabrasion-treated skin was approximately 20-fold higher than that across intact skin. The techniques used in this study may be useful for basic and clinical investigations of enhancement of topical vitamin C delivery.