- Abstract

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5-ALA for photodynamic photorejuvenation--optimization of treatment regime based on normal-skin fluorescence measurements.

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Abstract

BACKGROUND AND OBJECTIVES:

Photodynamic therapy using 20% 5 aminolevulinic acid (5-ALA) has recently been introduced as a new tool in optical skin rejuvenation. The primary objective of this study was to optimize incubation time, the topical delivery mechanism (vehicle) and the concentration of 5-ALA by detecting the dynamic changes of normal skin after 5-ALA application. The secondary objective was to develop a treatment regime which minimizes post-treatment photosensitivity.

STUDY DESIGN/MATERIALS AND METHODS:

Skin fluorescence distribution patterns after topical application of low concentrations of 5-ALA (0.5% and 1% preparations encapsulated in liposomes), were investigated. Twenty percent 5-ALA in moisturizing cream was used as a control. Ten healthy volunteers participated, and skin fluorescence was documented by fluorescent photography. The fluorescent intensity was measured in % of maximum obtained fluorescence after 3 hours 5-ALA application.

RESULTS:

Skin fluorescence intensity after topical application of 0.5% and 1% non-occluded liposome-encapsulated 5-ALA application was heterogeneous distributed and reached saturation level after approximate 2 hours. The maximal fluorescence for 0.5% and 1% 5-ALA treated areas was 4.2% (SD: 3.5%) and 2.4% (SD: 2%), respectively, and this difference was statistically significant (P = 0.036). The fluorescence decayed linearly shortly (within 15 minutes) after end of application and was back to baseline within 8 hours. In contrast, the fluorescence of areas treated more than 1 hour with 20% 5-ALA was very uniform and a linear relationship (r2 = 0.998) to the incubation time (0-3 hours) was registered. Furthermore, fluorescence intensity (15.2-57.9%) continued to increase after the end of 5-ALA application. The maximum fluorescence reach a level of 1.6-9 times the fluorescence measured by end of the 5-ALA application and occurred 8:13 hours (SD: 0:49 hours) after the end of 20% 5-ALA application. The average skin surface fluorescence induced by the liposome-encapsulated 0.5% 5-ALA applied for longer than 2 hours, was found to be statistically equal (P = 0.47) to the average measured skin surface fluorescence (4.2%) obtained after 30 minutes exposure to 20% 5-ALA cream (4.3%).

CONCLUSION:

Changing the 5-ALA vehicle from a moisturizing cream to liposome encapsulation, the 5-ALA concentration can be lowered by a factor of 40, and still induce the same skin fluorescence and at the same time eliminates the need for occlusion. The low post-treatment fluorescence also suggests a significantly reduced risk of post-treatment phototoxicity.

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