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Evaluation of cutaneous pH after chemical peel and its correction with amphoteric solutions

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Summary

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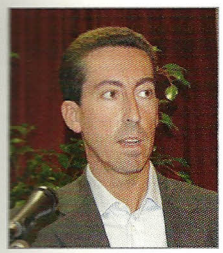
Human cutaneous pH is the result of a fine regulation, in fact several mechanisms provide for the maintainment of the physiological value of 5.5. Considerable oscillations in cutaneous pH could hesitate in damages to the skin barrier. In this article we analyze the effect of products employed in chemical peels on cutaneous pH and the results on pH correction with amphoteric solutions that are tested in association with water and alone. We conclude that amphoteric solutions alone are more effective in correcting cutaneous pH after chemical peel and that those solutions are preferable to basic solutions that could damage the skin barrier overcorrecting the pH.

KEY WORDS: *Chemical peel, Cutaneous pH, Amphoteric solution, Sodium bicarbonate*


Maurizio Cavallini

Introduction

Several mechanisms cooperate in maintaining cutaneous pH at 5.5. The use of cosmetic products that alter this value are potentially harmful for skin health.
Unfortunately this problem is often underestimated among the operators in aesthetic medicine. During the 13th national meeting of SIES (Italian society of aesthetic medicine and surgery) a questionnaire was administerd to the 450 partecipants. In a multiple-choice question, the doctors were asked to point the cutaneous pH after chemical peel.
Just 41.1% of partecipants answered correctly (pH ≈ 2), while the majority indicated higher pHs wrongly.
In this study we evaluate the influence of products, employed chemical peel, on cutaneous pH. Finally we analyze the effectiveness of water and products based on amphoteric solution (*Diphoterine®, Prevor-France*) in correcting extremely low pHs.
The physiologic cutaneous low permeability to water is provided by the corneal layer [1] of the skin. This stratum maintains a constant pH of 7.4, thanks to an acidification process deriving from the phospholipids hydrolysis by a secretory phospholipase and a Na/H antiporter (NHE1) [2]. In this mechanism a considerable role is played by the trans-urocanic acid that acts as proton donor [3]. Also bacterial lipases are involved in this mechanisms, generating free fatty acids [4].
In some studies the correlation between melanosome secretion and pH (relatively to skin type IV-V) have been demonstrated [5].

Materials and Methods

In this study we performed chemical peels on 25 patients. The formulation of the product that we used to acidify the skin consists of a 70% glycolic acid solution. The glycolic acid solution was applied on both the forearm for 5 minutes. The measurements were divided in two groups: in group A were included the measurements performed on the left forearm, while the measurements on the right forearm

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were considered belonging to group B. In the group A the product was washed with water for 1 minute and then amphoteric solution was employed with the suggested modalities. In the group B amphoteric solution was used directly without washing with water.
The measurements were obtained with litmus paper before any treatment, after the application of the glycolic acid-solution and after correction of pH (with water plus amphoteric solution or with amphoteric solution alone) (Figure 1).

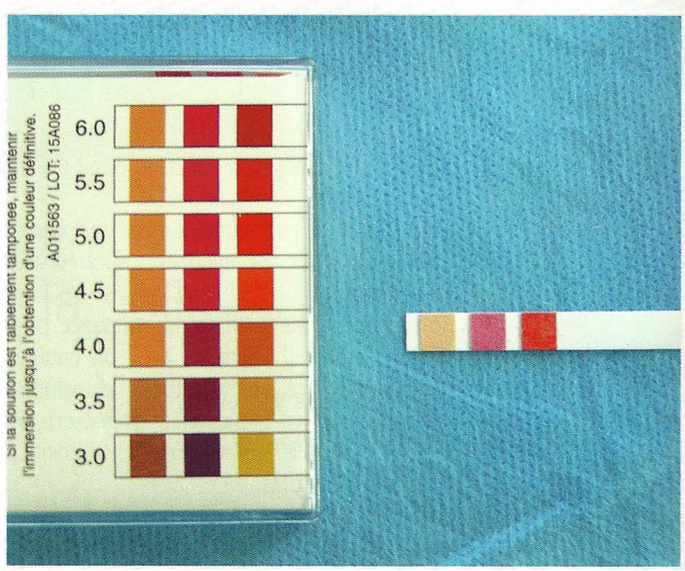
Results and discussion

The average pH of the skin before any treatment was 4.88, after the application of glycolic acid was 0.7. In the group A, after washing with water, the pH was 3.4, while in the group B, after washing with amphoteric solution, the pH was 4.03.
The average increase of pH was respectively 2.7 and 3.33. One-sample T test was performed to compare the mean of group A with the values of group B. The results show a mean difference of 4.025 with a p value < 0.001.
These results confirm the effectiveness of an amphoteric solution in increasing the cutaneous pH and its superiority in comparison with water washings.
Alteration of cutaneous pH is the base for a further damage. The activity of NHE1 has been demonstrated to be strictly dependent on pH, having effects on the maturation of the lamellar membranes. More over in aged mice, changes of cutaneous pH affect the correct maturation of the skin, and restoring the physiological pH can correct the defect [6].
In chemical peels, pH fluctuations are huge and cutaneous stress is high. In fact, after applying of glycolic acid, skin pH decreases of 4.08. The correction of this value should have two aims: first, the physiological pH should be restored as soon as possible, on the other hand overcorrection should be absolutely avoided. *Kim et al.* demonstrated skin damage, concerning skin barrier and function of the stratum corneum with basic pH values [7].
For this reason we suggest the employment of amphoteric solutions which are effective in restoring physiological values without causing basic pH, contrary to sodium bicarbonate.

Conclusion

Among the substances employed for chemical peel, glycolic acid is widely popular. In our study, the pH of the skin has been demonstrated to decrease of 4.08 points after the procedure described earlier.
The employment of pH-correcting substances aims to avoid alteration of skin permeability and abnormalities in the stratum corneum. An amphoteric solution has been demonstrated to be an useful product in correcting low pH, thus avoiding damages to the skin by glycolic acid. Moreover amphoteric solution has been demonstrated to be more effective than water in raising cutaneous pH [8].
Adjusting of cutaneous pH after chemical peel is of primary importance. In our opinion the neutralization of acidity with water and/or amphoteric solution is advisable, while pH correction through alcaline solution (e.g. sodium bicarbonate) is to avoid. In fact basic products could overcorrect the cutaneous acidity, leading to alkaline pH and thus providing further chemical stress and damages.

Figura 1.
Litmus paper is employed to measure cutaneou pH.
The combination of the three colours indicates the pH-value.



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