TO PROTECT AND REGENERATE THE SKIN AFTER LASER TREATMENTS

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Summary

As it is known laser treatments can cause a partial or total destruction of the epitelia and sometime part of the dermis. The cutaneous regeneration is not always fast, and often a not pleasant scarring can appear. 

The aim of this study was to evaluate the property of a new “green” cosmetic product containing both an innovative chitosan derivative known as glyco-chitosan and a sugar derivative named Bisabolol®, to increase hydration and elasticity, to restore surface skin lipids and to decrease inflammation alleviating symptoms of dry skin during a 8 weeks treatment course.

The two-months trial was a randomized double-blind-placebo-controlled study carried out on 30 dry skinned female volunteers aged 22-35 with a moderate xerosis of grade 5 according to Dahl, and with some grade of inflamed skin after laser and/or peeling treatment.

Surface lipids, skin hydration and TEWL were detected by the 3C System (Dermotech, Italy); erythema was detected by a Chromameter® C200 before and after laser treatment. Skin elasticity and softness were evaluated by the Dermaflex A (Cortex Technology, Denmark).

The treatment with this “green” cosmetic induced a significant and progressive improvement in skin hydration (+58%, p<0.005), surface lipids (+65%, p<0.005), skin elasticity (+17%, p<0.05) and a contemporary decrease of TEWL (-41%, p<0.005) and inflammation (-62%, p<0.005) compared to vehicle and to non treated areas. No side effects were observed during the study period.

The antinflammatory improvement, comparable to corticosteroid compounds and that starts to be evident from the first week of treatment, shows how these cosmetic products could be considered as useful means to improve skin hydration and elasticity and to reduce side effects of laser treatments.

Riassunto

Come è noto, i trattamenti laser possono causare una parziale o totale distruzione dell’epitelio cutaneo assieme a parte del derma.
La rigenerazione del tessuto non sempre è rapida e spesso può verificarsi una cicatrizazione non esteticamente gradevole.

Scopo di questo studio è stata la valutazione di un nuovo cosmetico eco e biocompatibile basato su un derivato del chitosano contenente come attivo un nuovo principio attivo derivato dallo zucchero (sucrabolol®) che ha dimostrato, con studi precedenti, di possedere una intensa attività antinfiammatoria reidrattante contribuendo anche a migliorare l’assetto lipidico della barriera e l’elasticità cutanea.

E' stato condotto per due mesi uno studio a doppio ceco su 30 donne volontarie di età compresa tra i 22 ed i 35 anni, che presentavano una moderata xerosi di grado 5 secondo Dahl, unitamente ad una cute infiammata a causa di trattamenti laser e/o di peeling chimici.

L'idratazione cutanea, i lipidi di superficie e la TEWL sono stati controllati con il 3C System, il grado di eritema è stato valutato mediante l’uso del Chromameter C200®, mentre l’elasticità cutanea è stata verificata con il Dermaflex®.

Il trattamento con questo nuovo cosmetico “verde” ha incrementato l’idratazione cutanea del 58% (p.<0,005), i lipidi di superficie del 65% (p.<0,005), l’elasticità del +17% (p<0,005), riducendo la TEWL del 41% (p. <0,005) e il processo infiammatorio del 62% (p. <0,005) in confronto al veicolo ed alle aree non trattate.

Quello che è interessante sottolineare è che l’azione antinfiammatoria è risultata simile al corticosteroido utilizzato come confronto.
INTRODUCTION

Laser or peeling treatments, purposed to improving or removing skin surface defects, cause a facial burn that results in the partial destruction of the epidermis and dermis, followed by replacement with rejuvenated epidermal and dermal tissues. There is no peeling or laser treatment that will produce ideal results in all individuals, and therefore no treatments that will not produce complications (1-21). For these reasons a right post-operative skin care regimen may eliminate or mitigate complications by the use of an appropriate cosmetic treatment (22-27).

AIM

The aim of this study was to evaluate the property of a new “green” cosmetic product (28) containing both an innovative chitosan derivative known as glyco-chitosan, and a sugar compound named Bisabolol® to increase hydration, elasticity and antioxidant potential of the skin, to restore surface skin lipids, to decrease inflammation and to accelerate the cutaneous regeneration during a 8 week treatment course.

MATERIAL AND METHODS

For this study was used a glyco-chitosan gel as base, and a patented sugar derivative (Sucrabilol®) as active anti-inflammatory compound. The two-months trial was a randomized double-blind-placebo-controlled study carried out on 30 dry skinned female volunteers aged 22-35 with a moderate xerosis of grade 5 according to Dahl, and with some grade of inflamed skin after a laser and/or peeling treatment.

Surface lipids, skin hydration and TEWL were detected by the 3C System (Dermotech, Italy) (29-30); erythema was detected by a Chromameter® C200 before and after laser treatment evaluating also the intensity of skin redness by pyrexal erythema test (31). Skin elasticity and softness were evaluated by the Dermaflex A (Cortex Technology, Denmark) (32).

EXPERIMENTAL DESIGN

PRE-TEST

Before starting the experiment, the erythema test was done in a dermatological office in order to check if the gel would perform also an eventual anti-inflammatory activity. This experimentation was tested on the volunteers’ back of 15 patients only, a week before starting the study, according to the methods reported.

SCREENING PHASE

During the screening phase, baseline values of transepidermal water loss (TEWL) (fig.1) and of skin color (parameter a*) (fig.2) were obtained by Chromameter® from a skin area (2 cm2) treated by laser or by chemical peeling. The same area was controlled after a 30 and 60 days of treatment by the carrier B and/or the active cream A.

SUPERFICIAL SKIN LIPIDS AFTER A TWO MONTH TOPICAL TREATMENT WITH A POST-LASER GLYCO-CHITOSAN GEL

TEST PROCEDURE

The study was a 8-week, randomized double-blind vehicle-controlled study. Each patient, pretreated by CO₂ laser or by chemical peeling, supplied with two identical tubes containing the testing creams (A and B) was instructed to apply them on their cleansed face twice a day for
all the study period, and was not allowed to use any other skin care product. Each subject was used as her own control the testing creams (A and B), being applied on a randomized basis, on the right or left area of the face. Moreover they were instructed to apply the same cream always to the designed site after washing first in the morning and just before retiring in the evening. Subjects were also instructed that only the cleansing cream supplied (Alfa 4 Micospuma) at the beginning of the study should have been used to cleanse the test area. Other instructions included not to apply the testing creams the day of evaluation and to wash their face at least 4 hours before the control. All patients were strongly encouraged to use also the sunscreen (MAVISAN Total) supplied.

**BIOPHYSICAL NON-INVASIVE MEASUREMENTS**

Measurements were performed, on the 1st day (baseline), after 2, 4, 6, and 8 weeks, (end of the treatment), by means of the computerized 3C System (Dermotech, Rome, Italy) (29,30). This instrument measures the surface skin lipids having absorbed them by a special frosted plastic foil. The determinations were always carried out on four sites of right or left areas (forehead, cheek, chin and nose) before evaluating the patients for the calculation of inflammatory lesions.

To achieve a higher degree of assurance, all evaluations were performed after a 30 minutes acclimatization period in a room at 21°C to 22°C and 45% to 50% humidity, even if the 3C System automatically adjusts environmental conditions to 22°C and 50% relative humidity.

**MEASUREMENT EQUIPMENT**

**Skin surface lipids**

Determination is based on photometric measurement of light transmission through a skin surface imprint obtained applying to the designed skin area a frosted plastic foil. It allows adherence of skin lipids in a 1 cm² area.

The obtained mean readings are automatically converted into mg/cm² and are reported on Fig. 1.

**Skin Hydration**

The hydration of the horny layer was assessed by measuring electrical capacitance of the skin surface.

When the probe was applied to the skin (recording time 0.5 s), the capacitance is displayed digitally in arbitrary 3C units. The results reported on Fig. 2 are expressed as mean values of the measurements performed on four different right or left sites (cheek, forehead, chin and nose).

**Transepidermal Water Loss (TEWL)**

All evaluations were performed after a 30-minute acclimatization period in a room at 22±2°C and 50% humidity.

Water evaporating from the skin surface was measured quantitatively with the 3C System® methodology.

The 3C System® probe consists of a cylindrical open chamber measuring system, (diameter 14 mm, height 10 mm) and two sensor units, containing thin capacitative film transducer, placed at 3 and 7 mm distance from the skin surface area of 0.95 cm². TEWL is calculated digitally
in g/m² h.
The obtained results are shown in Fig. 3.

![TEWL (difference to baseline) of laser treated skin areas after 60 days application of the Glyco-chitosan gel](image)

**FIG. 3**
All *p* values are highly significant (*p*<0.005) as control and as to groups

## SKIN ELASTICITY

Skin elevation (elasticity) (32) was evaluated electronically (according to G. Gniadeck and Serup) by measuring electric capacitance between skin surface and the electrode placed on the top of the suction chamber on the left or right forearms of the treated volunteers (suction 300 mbar, suction period 20 s, number of cycles 5).

Measurements were performed on 1st day (baseline) and at 10th, 24, 6 and 8 weeks (end of treatment) always in the morning between 8 and 11 a.m.

The obtained results are reported on Fig. 4.

![SKIN ELASTICITY - AFTER A TWO MONTH TOPICAL TREATMENT WITH A POST-LASER GLYCO-CHITOSAN GEL](image)

**FIG. 4**

## ERYTHEMA TEST

This inflammation is obtained injecting intracutaneously 0.1 ml Pyrexal (lipo-polysaccharide from salmonella abortus equii) into dorsal skin of the volunteer subjects, according to Heilmeyer and Hiemejer (31).

These bacterial pyrogens induce an inflammation. The morphologic signs take the form of a sharply defined erythema whose surface area is measured over time. Simultaneous application of an anti-inflammatory cream inhibits its spread. By this injection 8 vials were induced in each subject. These were then topically treated in randomized succession with 0.2 ml of the 6 different preparations and covered with transparent film.

One of these areas remained untreated to serve as a control and another was treated by 0.2 ml of betamethasone valerate 0.1% and covered also with transparent film.

In this way the erythema is visible at all times and can be measured through the film. The extent of the erythema was determined 6, 8, 10 and 12 hours after application, the maximum (a) and minimum (b) diameter being measured and the surface area calculated by the elliptic formula:

\[ F = \frac{ab\pi}{4} \]

The efficacy was classified by determining the sum of the erythema surface areas from the 4th to the 12th hour. A small area means that the preparation is highly effective. The intensity of hydration was assessed also by Chromameter® measurements.

The comparative evaluation was performed with the aid of bifactorial analysis of variance.

The obtained results are reported on Fig. 5 and 6.

## STATISTICAL ANALYSIS

Student's test was used in evaluation of all the data before and after the treatment period. All
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the analyses were produced using the SAS statistical package, version 5.18 (SAS Institute Inc., Cary, N.C.). Probabilities less than 0.05 were considered significant.

RESULTS

As clearly shown on figures 3, 5 and 6 the gel used proved to have an interesting anti-inflammatory activity. As a matter of fact, it can be observed a TEWL reduction of 41% (p<0.005) by the sole vehicle, and a TEWL reduction of 55.9% (p<0.005) by the active cream. As it is known, the erythema provoked by the laser treatment, or by any other destructive treatment, causes the alteration of the skin barrier and a consequent augmentation of the TEWL (Fig.3).

Also the color value “a” shows a similar decrease of 17% (p<0.005) on the areas treated by the sole vehicle, and a decrease of 29.7% if the same areas are treated by the active cream. If these data are compared with the ones obtained by Erythema Test methodology, it is clear how active is the cream. It should be underlined also that it seems to perform an activity comparable to corticosteroid compounds, even if the active compound used, Sucrabolol®, is a sugar derivative so that it is not classified as drug (Fig.6).

The glycochitosan carrier used, as previously demonstrated by our equipe (28), showed to have an anti-inflammatory activity strengthened by the sucrabolol used as active compound. As clearly showed in Fig. 1, 2 and 4, this innovative gel is able to rehydrate remarkably (+58%, p<0.005) the skin treated (Fig.2), improving also the surface lipids (+65%, p<0.005) (Fig.1) and the skin elasticity (+17%, p<0.005) (Fig.4).

CONCLUSION

We deem interesting to underline that, stated the remarkable anti-inflammatory activity that is able to rebalance the dry and dehydrated skin, this new gel could be useful both to reduce the side effects of peeling and laser treatments, and to improve the skin of subjects affected by different types of xerosis and erythema.
References

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