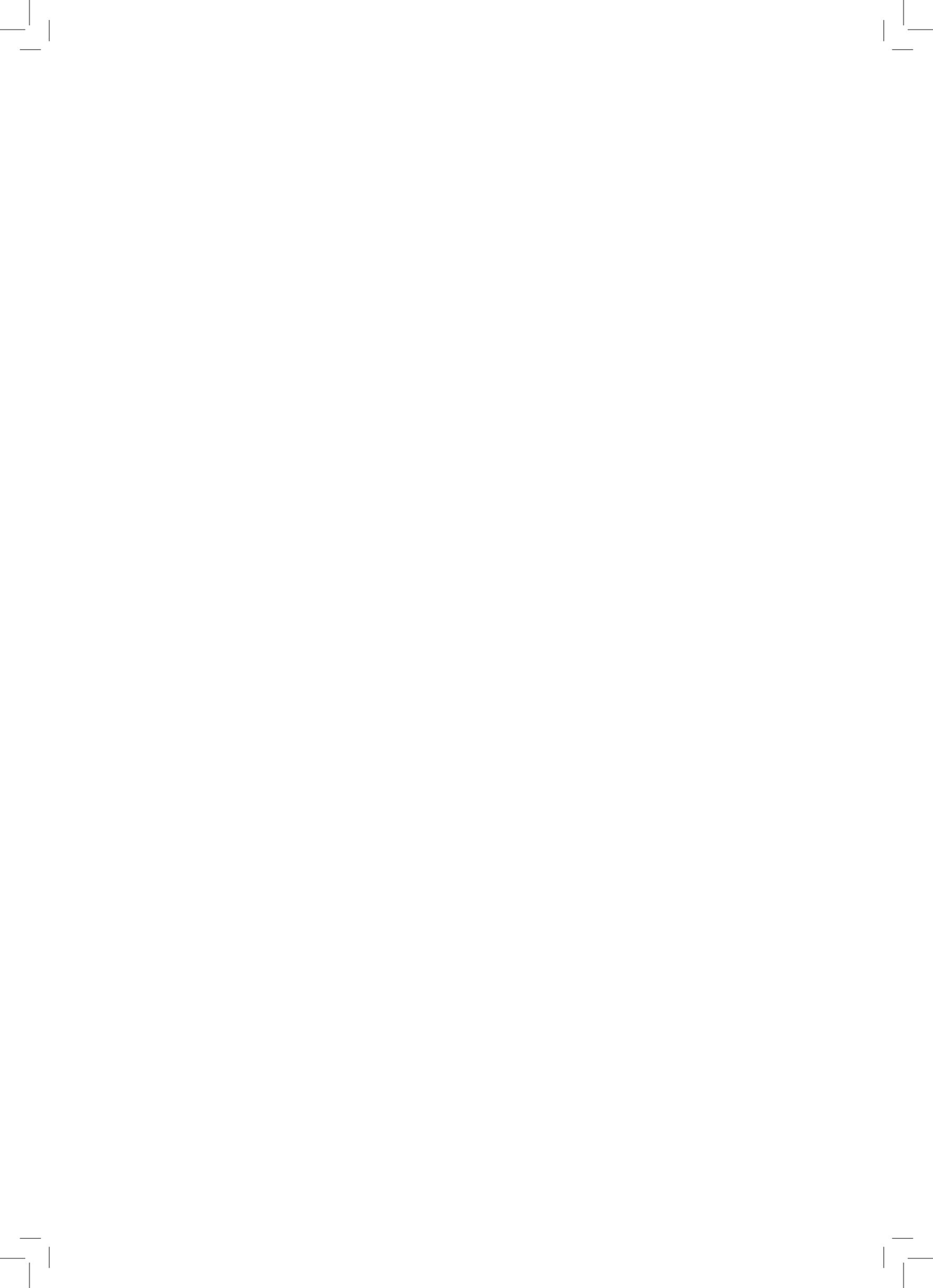


geneO[™]₊
by Pollogen

*A Novel Platform for Skin Revitalization Based on Unique
OxyGeneo Technology*

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Abstract

Introduction: Aesthetic skin treatments are a common practice among women and men throughout the globe, crossing borders of culture and socio-economic status. Facials and skin treatments on various body areas have been popular throughout the ages and documented as early as ancient Egypt and Greece. A variety of treatments are currently available for exfoliation and infusion of skin enhancement products and there is a growing demand for skin oxygenation treatments.

The innovative geneO+ Skin Care Platform enables a variety of skin treatments for a wide range of skin characteristics. OxyGeneo treatment, provided by the geneO+ platform enables a unique sophisticated skin enhancement, utilizing the body's natural mechanism for skin oxygenation from within. Skin oxygenation combined with light exfoliation and infusion of essential active ingredients, optimizes the effect of the treatment improving the overall feel and appearance of the skin.

Methods: Evaluation of blood perfusion and tissue CO₂ and O₂ levels was conducted on 11 healthy subjects on different anatomical areas. Measurements were performed at baseline (before treatment), immediately after and 15 minutes post a 10 minute OxyGeneo treatment. In addition 14 subjects underwent 1-6 OxyGeneo treatments. Photo assessments of treatment results were performed using regular digital photography in addition to 3D Primos imaging evaluation, Skin Visio Meter microscopic photography and Delfin skin glossiness evaluation. Subjects were asked to fill in a treatment satisfaction questionnaire addressing their satisfaction from various effects of the treatment.

Results: Measurements demonstrated an increase in transcutaneous O₂ levels in the treatment area 15 minutes after OxyGeneo treatment. Photographic images of the treated subjects demonstrated an improvement in various skin traits such as smoothness, pore appearance, brightness and reduction of fine lines. 3D Primos imaging enhanced the findings demonstrating reduction in wrinkle depth up to 102 microns. Delfin skin glossiness evaluation revealed various degrees of increased skin glossiness in 67% of the clients. Visio Meter microscopic imaging further strengthened proof of smoother less scaly looking skin. All subjects rated satisfaction from successful treatment effects on all various assessment categories.

Summary: The OxyGeneo treatment provided by the innovative geneO+ Skin Care Platform offers an effective new skin rejuvenation treatment inducing enhanced oxygenation along with effective infusion of therapeutic ingredients. Treatments can be tailored to individual skin characteristics as treatment parameters can easily be adjusted and the practitioner can select the optimal treatment gel.

Introduction

Standards of physical beauty have changed over the decades, influenced by changes in culture and fashion, however, the importance of healthy, clear and smooth looking skin has remained throughout history. Humans have been seeking treatments to enhance quality and appearance of their skin for decades. In ancient Egypt and Greece, skin treatments were popular among both genders and even included exfoliation techniques. In recent years, many new methods have been developed for improvement of skin appearance and maintaining a healthy looking complexion, these include a daily use of cosmetic skin care products in addition to regular visits to an aesthetician for treatments of the face and body. A visit with an aesthetician normally includes a form of skin exfoliation followed by steps of infusions of variable skin enhancing products and masks or treatments that are meant to address specific skin ailments such as acne or uneven skin tone. In addition, many treatments have been introduced that claim to increase oxygen levels of the skin, hence improving skin quality, health and smoothness.

Effectiveness of direct skin oxygenation has not been clinically proven but demand for skin oxygenation treatments and products are on the rise. In addition to the well-established aesthetic treatments, the therapeutic effects of hot springs (Balneotherapy) have been documented and researched [1, 2, 3]. Various studies have demonstrated that exposing the skin to CO₂ rich spa gas has a local effect of improved circulation and increased tissue perfusion.

These studies also mention a positive long term effect following a series of treatments [2]. Exposure of the skin to CO₂ induces a flushing of the skin which is an indicator of increased capillaries blood flow in the exposed area. In addition, these studies demonstrated an increase of transcutaneous oxygen tension (tcPO₂). Bathing in mineral baths has been an established skin enhancer treatment for decades addressing skin improvement, allowing natural minerals to be effectively absorbed through the skin, revitalizing the skin surface and improving various skin conditions. Similar to the natural hot springs effect, OxyGeneo is a novel new treatment that significantly accelerates the absorption and optimal utilization of natural nutrients by the skin. The OxyGeneo harnesses the well-established science behind the Bohr Effect [4, 5], where hemoglobin's oxygen binding affinity is inversely related both to acidity and to the concentration of carbon dioxide. Hence, a decrease in blood pH or an increase in CO₂ levels will induce a release of oxygen from the hemoglobin proteins and a decrease in carbon dioxide levels.

The purpose of this pilot study was to investigate the OxyGeneo treatment by evaluating its effects on blood perfusion, tissue CO₂ and O₂ levels and the thermal effect of the treatment. Another goal of this pilot study was to evaluate treatment efficacy on various customers and to obtain customer satisfaction assessing various skin traits post treatment.

Methods

OxyGeneo Technology

OxyGeneo technology uses the patented Capsugen™ in combination with specialized treatment gels. The disposable Capsugen is attached to the tip of a uniquely controlled vibrating applicator that is moved over the treated area where a special treatment gel is first applied. A reaction occurs between the effervescent Capsugen and the gel, generating countless minute CO₂ bubbles on the skin, that optimally penetrate into the epidermis.

The increased levels of CO₂ on the skin trigger a natural mechanism in the body (the Bohr Effect) which drives oxygen rich blood to the skin and increases levels of oxygen in the treated area. In addition, the Capsugen's special texture causes a slight superficial skin exfoliation. The combination of skin exfoliation with oxygenation from within creates the optimal condition for infusion of the valuable nourishing components in the gel.

The geneO+ platform (Figure 1) is operated via a user-friendly touch screen enabling easy control of treatment parameters.

Evaluation of blood perfusion and tissue CO₂ and O₂ levels

11 healthy human male and female subjects, ages 30-60, were randomly selected to participate in the study. The parameters that were evaluated are blood perfusion, tissue gases and thermal imaging. The treatment was performed on different anatomical areas, one area for every subject. The anatomical areas were the lower back, abdomen, hands, legs, and upper pectorals major.

Baseline physiological parameters were evaluated immediately before the treatment and after a 10 minute treatment on the selected anatomical area performed by the same operator. Measurements were recorded immediately and 10-15 min after treatment. The O₂ values require ~7 min of probe stabilization therefore no O₂ values were available immediately after the treatment. Measurements were conducted with the following equipment:

TcPO₂/TcPCO₂ measurement conducted using TCM4 Tina Radiometer, Denmark.

Blood perfusion was measured using DRT 4 moor instruments with DP1T/7-V2 probe.

The data was digitally stored on PowerLab hardware (Adinstuments, Australia) and analyzed offline using LabChart software.

Temperature was measured using FLIR 320A 9Hz thermal camera and analyzed at Research IR software.



Figure 1: *The geneO+ platform with the OxyGeneo applicator*

Clinical treatment results and subject satisfaction

14 healthy subjects consented to undergo several OxyGeneo treatments with the geneO+ platform device. 12 subjects underwent 3-6 weekly treatments while 2 subjects received 1 single treatment due to time constraints. Treatments were performed using 2 types of skin rejuvenating treatment gels: NeoRevive® for skin revitalization and NeoBright® for skin brightening, following observation of each subject's skin characteristics and condition. Subjects were photographed at baseline, after the first treatment and before treatment 2 and 6 using standardized photo conditions. Treatment effects were evaluated in selected subjects, with a three dimensional (3-D) micro-topography imaging system (PRIMOS, GFM, Teltow, Germany). Skin glossiness of various treated facial areas was measured before and after treatments using the Delfin Skin Gloss Meter device (Delfin Technologies LTD, Finland).

Microscopic imaging was obtained using the Skin Visiometer SV 600 and a X500 microscope imaging camera. Subjects were requested to fill in a feedback questionnaire after the first, fourth and last treatment.

Results

Evaluation of blood perfusion and tissue CO₂ and O₂ levels

Treatment results on all different body areas demonstrated that the anatomical location does not alter the general trend. Study data of all subjects from all body areas, summarized in Table 1 and Figures 2-3 show that immediately after the treatment the transcutaneous CO₂ was statistically significant higher than the control values (P<0.005 n=11), while 10-15 minutes after the treatment, the levels returned to baseline control levels. The transcutaneous O₂ levels were statistically significant higher than baseline levels 15 minutes after the treatment (P<0.005 n=11). The perfusion is statistically significant higher immediately after the treatment (P<0.005) while 15 minutes after the treatment the values are still higher than the baseline (P=0.01) but not statistically significant. Thermal monitoring of all body areas showed no significant temperature fluctuations at the treatment area post treatment. The skin temperature declines about 2°C (due to evaporation cooling), while 15 min after treatment the temperature restores toward baseline.

N=11	TCpCO ₂ average (mmHg)	TCpO ₂ average (mmHg)	perfusion p-p average (arbitrary units)	perfusion max average (arbitrary units)	Temperature average °C
control	*37.3 ± 1.0	*61.7 ± 2.7	*12.7 ± 1.9	*40.5 ± 6.1	33.4
immediate	42.0 ± 1.4		28.1 ± 5.3	92.2 ± 17.9	31.4
15 minutes after	37.8 ± 1.6	73.0 ± 3.0	22.9 ± 4.4	70.9 ± 13.4	32.8

Table 1. Summary of all the data including anatomical areas treated. *The baseline control values of TCpCO₂ and TCpO₂ were compared to the immediate and 15 min after respectively, and increase was found to be statistically significant. The perfusion results also show a difference between the values of the control group and values of immediate and 15 min after treatment. All the values are average ± S.E.

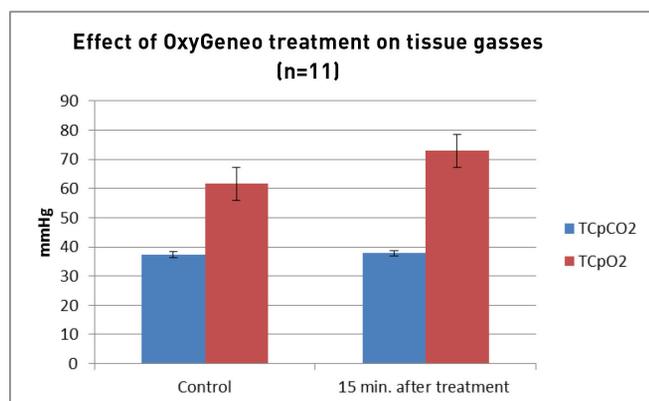


Figure 2: The graph demonstrates a return of CO₂ levels to baseline values 15 minutes after treatment while the O₂ levels rise above baseline levels. (The values presented as average ± S.E.).

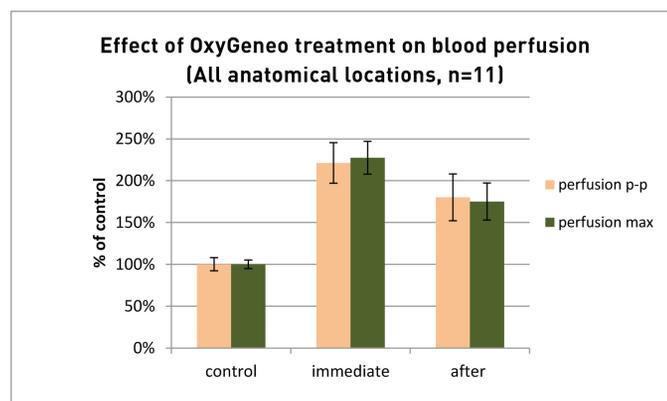


Figure 3: Skin blood perfusion increases immediately after the treatment and gradually returns to base line levels. 15 min after treatment the values are higher than the baseline. The values are presented as average percent of control ± S.E.

Clinical results and subject satisfaction

Digital photographs of subjects demonstrated an overall improvement in skin appearance immediately after treatment and following last treatments. Treatment effects included a general improvement of skin texture, indication for reduction of pore size and general brightening of skin tone. In some cases a visible improvement of periorbital wrinkles was noticed.

Primos 3D imaging assessment further strengthened skin improvement findings demonstrating reduction in depth of fine lines, an overall improvement of skin texture and significant volume reduction of periorbital fine lines (up to 71% improvement).

Delfin skin glossiness evaluation was calculated using the difference (delta) between the average skin glossiness measured at base line and before the last treatment. 67% of subjects that completed 3-6 treatments experienced an improvement of skin glossiness mostly in the cheek area.

Figures 4-9 demonstrate immediate and long term clinical results after NeoRevive, NeoBright or combination treatments.

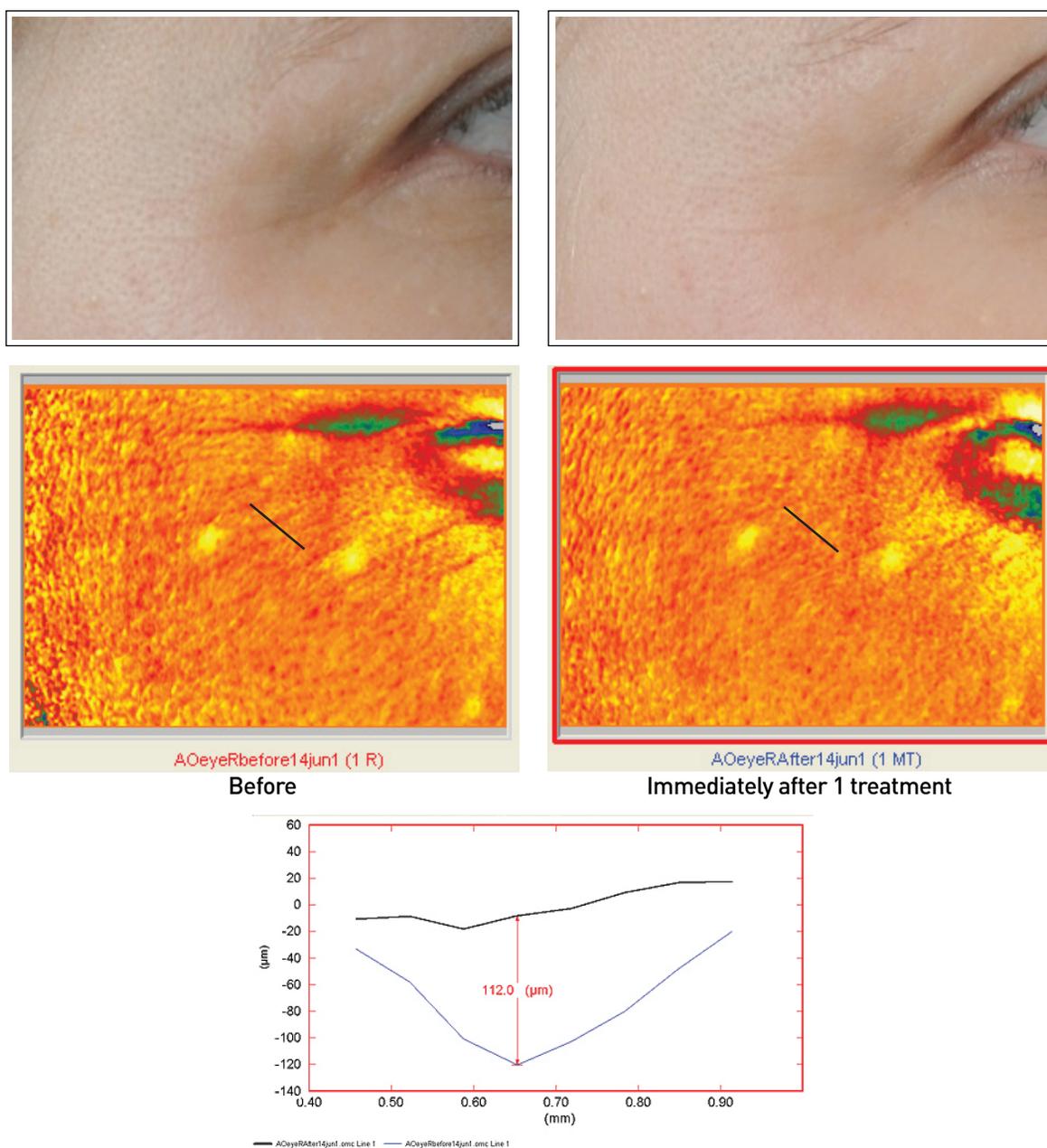


Figure 4: Results immediately after a NeoRevive treatment demonstrate an improvement in peri-orbital fine lines. Primos 3D images analysis of the treatment demonstrate a reduction of 112 Micron in depth of fine lines in measured area (marked with line).

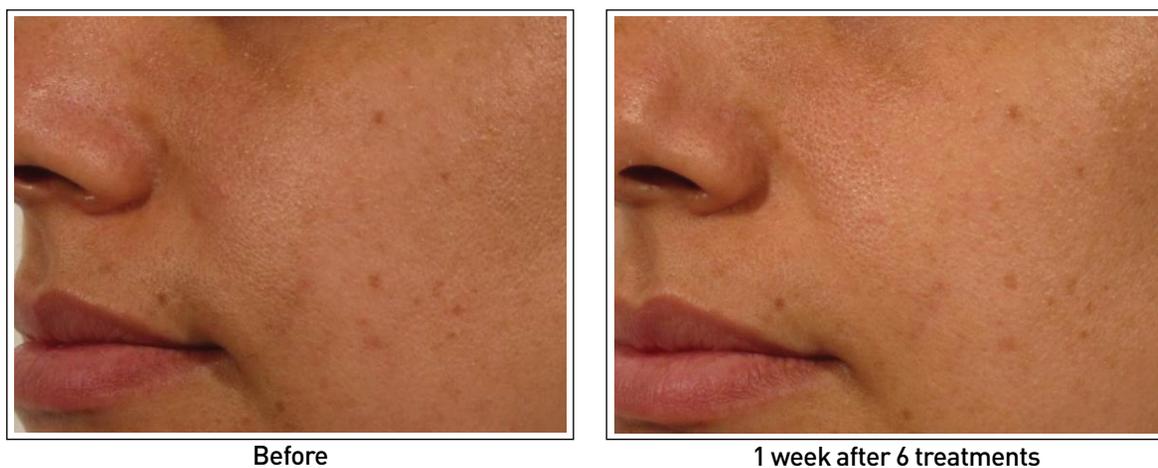


Figure 5: Results after 6 NeoBright treatments demonstrate improvement in skin tone and texture.



Figure 6: Results immediately after one NeoRevive treatment. An improvement in skin texture and wrinkles is noticed. Microscope images (x500) demonstrate smoothness and improvement of skin texture.



Figure 7: Results of 6 treatments demonstrate an improvement in skin texture and an indication of reduction in pore size.

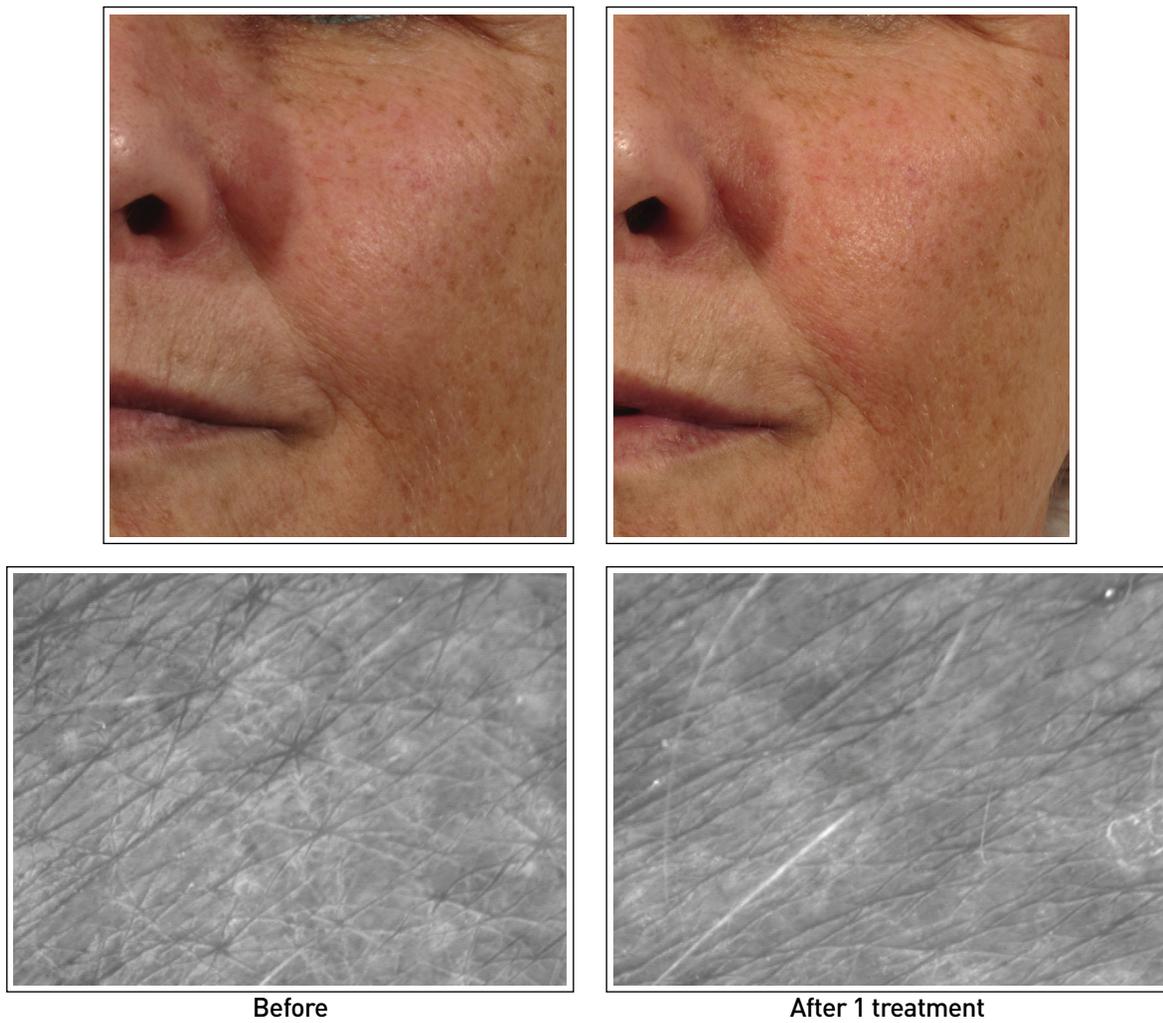


Figure 8: Results after 1 NeoBright treatment using digital photography and Visiometer SV600. Results demonstrate an overall improvement of skin texture. Visiometer images demonstrate a smoother better looking skin.

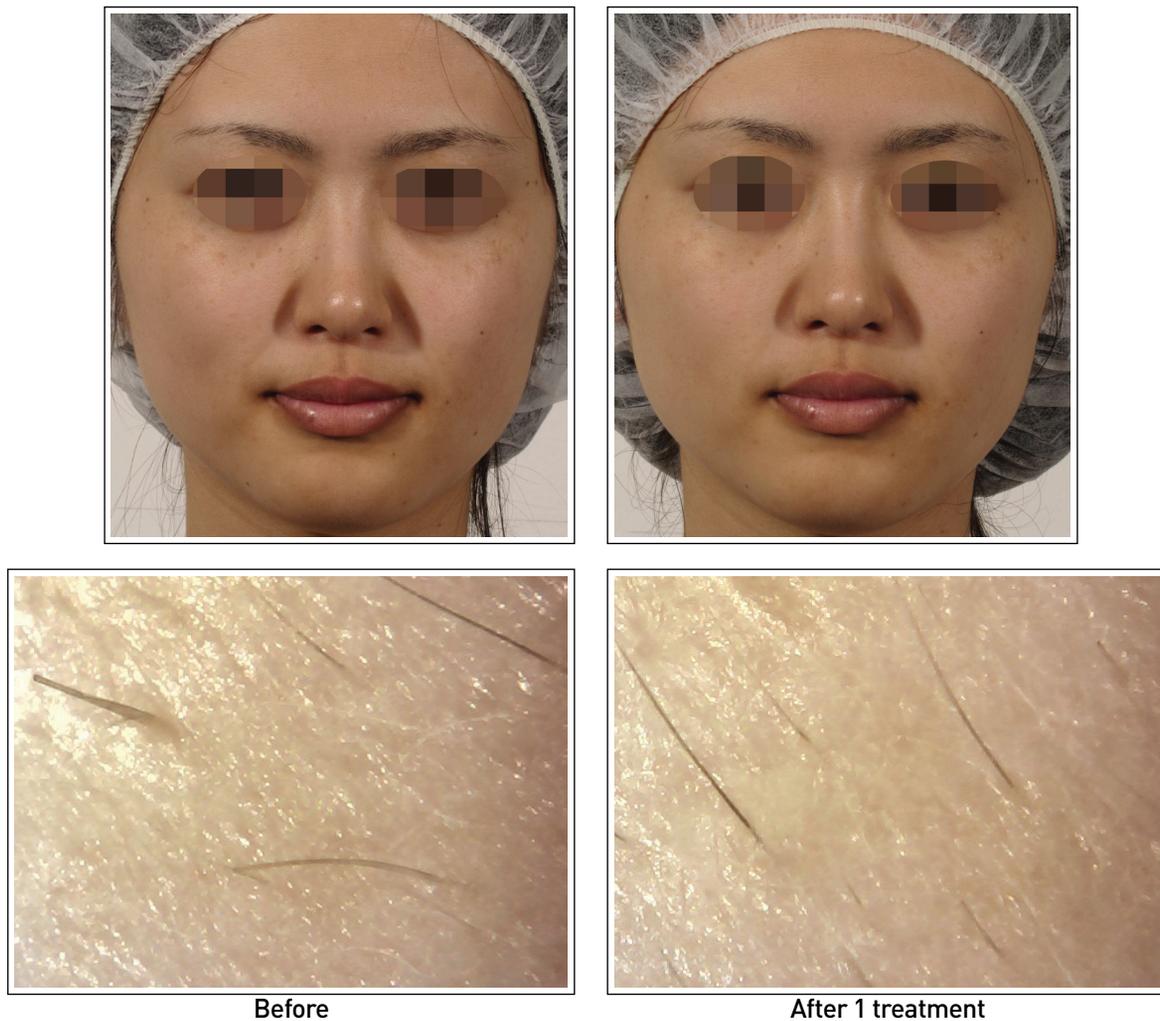


Figure 9: Results after 1 NeoBright treatment. Overall, skin looks smoother; lighter and with a more even texture. Microscope imaging demonstrates smoother skin.

Reports of subject satisfaction from treatment results evaluating skin condition of smoothness, reduction in pore size, improvement of pigmentation and overall improvement of skin after the first session and after last session showed a trend of increased satisfaction from first to last treatment (Figure 10).

After the last treatment, all subjects noted an improvement in skin smoothness, immediate results and an overall improvement of skin feeling. 67% of subjects noted a decrease in pore size. 58% reported an improvement in skin pigmentation and 84% noticed an improvement in fine lines and wrinkles.

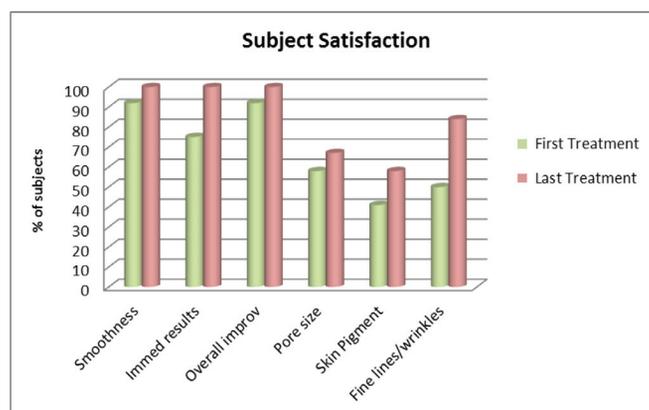


Figure 10: Subject satisfaction graph of variable skin conditions following first and last OxyGeneo treatment. Results demonstrate a rated improvement in subject satisfaction of variable skin conditions. An obvious trend of improvement is noticed between first and last treatment in all evaluated parameters.

Discussion

When massaging skin tissue the effect is usually an increase in blood perfusion and a decrease in transcutaneous CO₂ (TCpCO₂) due to higher evacuation rate and increase in transcutaneous O₂ (TCpO₂) due to increase in oxygenated blood supply. Usually this process is accompanied by an increase of skin temperature. However, Pollogen’s OxyGeneo treatment resulted in an increase of about 12% in TCpCO₂ immediately after the treatment with concomitant increase in blood flow and lowered skin temperature. Furthermore, 15 minutes after the treatment, the TCpO₂ level rose about 18% above control levels (both statistically significant P<0.05). This phenomenon can be explained by the high content of carbonated micro bubbles released to the skin surface following contact with the treatment gel on the treatment area.

The chemical reaction is demonstrated in Figure 11.

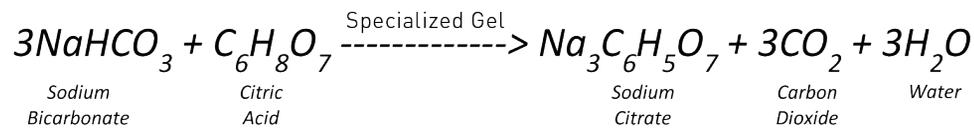


Figure 11: Chemical reaction of Capsugen upon contact with treatment gels.

The relatively high carbonate content introduced to the tissue induced a release of O₂ from the red blood cell hemoglobin, thus increasing the tissue oxygen content in the treatment area while returning CO₂ content in the area to normal. Blood flow is increased in the surrounding tissue inducing dilatation of blood vessels and capillaries while supplying the area with O₂ rich blood. This process increases skin oxygenation from within using the body’s natural increased metabolism.

This process tightly follows the Bohr Effect that constitutes a rightward shift of the O₂-hemoglobin (HbO₂) dissociation curve with an increase in pCO₂ or decrease in pH. This phenomenon was observed with a similar pattern in various body areas as back, abdomen, hand and leg. Thus the treatment is effective irrespectively to adipose tissue thickness or skin texture.

Transcutaneous CO₂ delivery has been well documented and studied. CO₂ is water soluble and therefore is an ideal gas for transcutaneous delivery. The graphs below (Figure 12) demonstrate the solubility of CO₂ compared with solubility of O₂ in water. Note that

at room temperature of 20°C ±, solubility of CO₂ is about 1.5 g/kg water and solubility of O₂ is only 0.04 g/kg water. Therefore CO₂ transcutaneous delivery is quite effective in room temperature using water base solvent such as the OxyGeneo treatment gels.

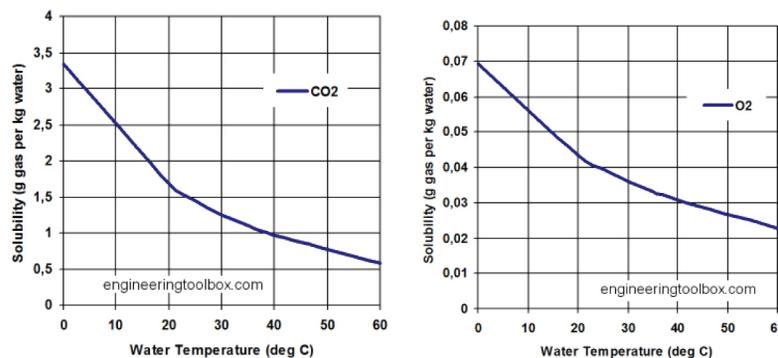


Figure 12: Graphs displaying solubility of CO₂ and O₂ in water. CO₂ is significantly more soluble than O₂.

Microdermabrasion, which is widely used in the aesthetic industry for skin exfoliation [6, 7] is also claimed to increase skin permeability for enhancing infusion of therapeutic ingredients. Gill et al [7] performed a study using Microdermabrasion followed by infusion of sodium fluorescein. The study was performed on healthy human volunteers and on monkeys. In both cases an increase in skin permeability was noticed after a Microdermabrasion treatment.

Similarly, the unique texture of the Capsugen induces a light peeling of the skin’s outer layer enabling better infusion of the active ingredients deep into the epidermis. The increased circulation in the treated area enhances homogeneous absorption of the active ingredients and the OxyGeneo technology exponentially increases the effectiveness of the active ingredients. The increased oxygenation in the cells and increased metabolism aid in enhanced absorption of the active ingredients. An illustration of the process is demonstrated in Figure 13.

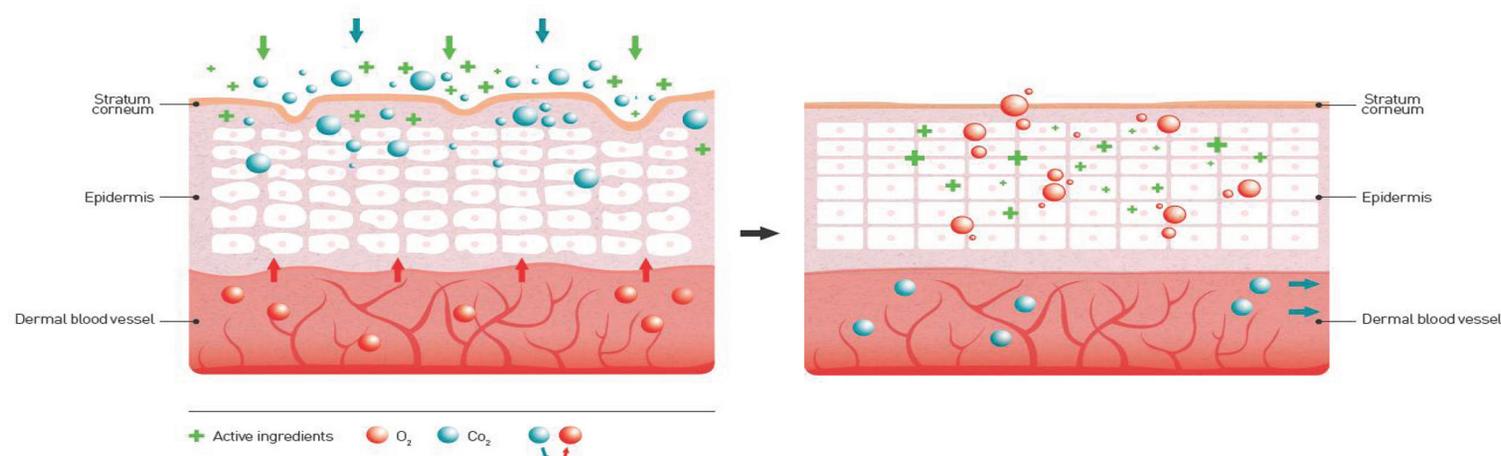


Figure 13: Illustration of the infusion process and skin oxygenation during an OxyGeneo treatment.

The positive effects of OxyGeneo treatment was noticed by all subjects participating in the clinical evaluation. The positive subject feedback confirms the study results of increased oxygenation and enhanced infusion of therapeutic gels. The unique combination of light peeling of the skin's outer layer with oxygenation and infusion of beneficial skin enriching components, enable an efficient time saving treatment with remarkable visible immediate results.

Summary

The current pilot clinical study along with the measurement results of gases and perfusion following OxyGeneo treatments using the Geneo+ Skin Care Platform, demonstrates the efficacy of this new innovative treatment. The geneO+ platform provides a powerful option as a stand-alone, fast and effective skin treatment or it can be combined with traditional cosmetic treatments popular in spas.

The OxyGeneo provides a unique skin oxygenation option by utilizing the body's natural mechanism of increasing tissue oxygen from within. In an era when skin oxygenation treatments are growing in popularity, the most effective method of oxygenation is by utilizing the body's own oxygen generation mechanism and enriching the cells from within.

Combining oxygenation from within, together with infusion of essential nutrients to the skin, enhances the overall effect while enabling treatment of a wide range of skin conditions tailored specifically to each client's skin type. The geneO+ platform is the first device that provides OxyGeneo skin treatment enhancing the body's natural skin oxygenation from within in a non-invasive safe manner. Following the promising results of this pilot study a further investigation is recommended on a larger subject group with additional measurements.

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