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Lighting the Path: Evaluating Light-Emitting Diode Therapy Versus Salicylic Acid Peel for Inflammatory Acne- A Case Series Analysis

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Authors' contributions

This work was carried out in collaboration among all authors. Author DMLG conceptualized the study, performed the methodology, did data curation, formal analysis, wrote original draft, reviewed and edited the manuscript. Author CFGM performed the methodology, did software analysis, data curation, formal analysis and wrote original draft. Authors SRCS, MSP and DLF collected the data and did documentation. Author FKPS performed methodology, sis formal analysis, data curation, wrote, reviewed and edited the manuscript. Author PC did conceptualization, data validation and wrote original draft. Author MLJ did conceptualization, performed methodology, did data curation formal analysis, wrote, reviewed and edited the manuscript and supervised the study. All authors read and approved the final manuscript.

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ABSTRACT

Aims: This study aims to assess the efficacy of red, blue, and combined red-blue light therapy versus 20% salicylic acid peel in treating Grades 2 and 3 inflammatory acne.
Study Design: Cases studies.
Place and Duration of Study: Universidade Nove de Julho, Universidade Adventista de São Paulo, São Paulo Brazil. Between March 2022 from April 2024.
Introduction: Acne is an inflammatory disorder that occurs in the pilosebaceous follicles and deeply affects the self-esteem and quality of life of individuals. Conventional treatments usually produce side effects and promote antibiotic resistance. Light therapy has emerged as a promising modality in clinical and scientific realms for acne management. This study aims to evaluate the effectiveness of red, blue and combined red-blue light therapy versus 20% salicylic acid peeling in the treatment of inflammatory acne grade 2 and 3.
Methodology: We divided 20 participants into four groups who used a mask of LEDs. Group 1 used a mask with blue light (470nm), group 2 used a mask with red light (660nm), group 3 used a mask with red (660nm) and blue (470nm) lights combined in the same device. The groups that used the LED masks received the treatment 3 times a week for 30 days, totaling 12 sessions. Group 4 was submitted to two sessions of salicylic acid peeling at 20%, every 15 days.
Results: Blue light (group 1) showed an improvement of 28.40% in the general skin condition. Group 4 of salicylic acid peeling had an improvement of 28.37%. The combined red and blue light group had an improvement of 26.43%, while the red light showed an improvement of 10.97%.
Conclusion: Based on the series of cases presented, all groups showed improvement, but blue light showed higher results than red light and salicylic acid. However, studies with a larger number of participants should be performed and the ideal parameters for Led use in inflammatory acne should be discussed.

Keywords: Inflammatory acne; photo biomodulation; LLLT; LED.

1. INTRODUCTION

Acne is a dermatosis that affects the Pilosebaceous unit of the face and back, presenting inflammatory and non-inflammatory lesions [1,2].

The impacts that acne causes in the lives of patients, adolescents, especially, such as disfigurement, unsightly scars, post-inflammatory hyperpigmentation, erythema, and often a feeling of rejection by others, may cause serious problems such as low self-esteem, depression, and even suicide [3]. Acne treatment is done with medications, including antibiotics, topical and oral.

However, the use of topical and oral antibiotics in the treatment of acne has been further analyzed in recent years due to global concerns regarding microbial resistance.

Alternatives have been studied by researchers and scientists so that other treatments are offered as alternatives to minimize this impact and avoid the unnecessary use of antibiotics. A safe alternative with few or no side effects are light therapies, lasers (Light Amplification by Stimulated Emission of Radiation, and LEDs (light-emitting diodes).

1.1 Pathophysiology of Acne

Acne has inflammatory and non-inflammatory lesions. Inflammatory lesions are papules, pustules, nodules, and cysts, which occur by inflammation, excess sebum, formation of a keratin plug in the Pilosebaceous follicle, and bacterial colonization by Cutibacterium acnes. Non-inflammatory lesions of acne are called closed comedones (white papules smaller than 0.5 cm in diameter) and open comedones (blackhead spots, pigmented by melanin), which are also formed by excessive secretion of androgens, excess of free fatty acids, and also the deficiency of linoleic acid [4,5].

Studies have shown that hormones, especially androgens, produced by the adrenal glands, gonodals, and also skin, directly influence the formation of acne by regulating the growth, development, and activity of the sebaceous glands [5,6]. Other hormones also influence the activity of sebaceous glands such as estrogens, growth hormone, insulin, insulin growth factor 1 (IGF-1), corticotropin-releasing

(CRF), adrenocorticotropic hormone (ACTH), and glucocorticoids [6,7].

Another factor that contributes to the worsening of acne is the overpopulation of the bacterium Cutibacterium acnes, in an environment with excessive sebaceous production. This important commensal, which is present in the skin Microbiota, is still treated as the main cause of dermatosis. However, recent studies show that the problem is much more complex [8,9].

The diagnosis of acne is made through clinical analysis by the dermatologist [10] and the treatment is made according to your degree determined by the doctor.

Acne treatment is done through topical and oral products and medications. The topical products used are retinoids, which are derived from vitamin A, such as adapalene, tazarotene, tretinoin, and isotretinoin. Its function is to regulate the proliferation of keratinocytes, preventing the formation of comedones, in addition to being anti-inflammatory [11]. On the other hand, retinoids have adverse side effects such as redness, dryness, burning, and skin irritation, causing individuals to stop using them. Another widely used topical product, benzoyl peroxide (BPO), has antibacterial and comedolytic action. However, it also causes some adverse effects such as skin irritation, spots on clothes, etc. BPO is usually used in combination with a topical antibiotic such as clindamycin, or erythromycin [11,12].

Chemical peels, or chemical exfoliation, are treatments consecrated by dermatology. They remove the upper layers of the skin, that is, they make controlled destruction of the epidermis and part of the dermis. This deliberate destruction causes a regeneration of the skin and an improvement of the texture of its surface. Chemical peels are classified into Superficial (basal layer of keratinocytes), medium (papillary dermis), and deep (reticular dermis). The functions of peelings are exfoliative, antibacterial, anti-inflammatory, keratolytic, and comedolytic, in addition to reducing skin oil [13].

Salicylic acid (SA) is a beta-hydroxy acid extracted from natural botanical sources and can be synthesized in the laboratory. It is one of the most used peels in dermatology, especially for acne. It is used at concentrations of 0.5% to 30%, up to 50%, having the functions of cleansing (decreasing seborrhea), anti-inflammatory (decreasing erythema), keratolytic (can soften the stratum corneum, acting on desmosomes, decreasing the adhesion of corneocytes) and chemical peeling, depending on the concentrations used [13].

Topical and oral antibiotics are also used to treat acne. Tetracyclines are considered first-line therapies for oral acne antibiotic therapy for their antimicrobial, anti-inflammatory, safety, and low-cost efficacy. Macrolides, such as erythromycin, have higher microbial resistance and are more commonly used in cases of allergy or the impossibility of use of tetracyclines [14,15].

The use of topical and oral antibiotics in acne treatment has been further analyzed in recent years due to global concerns regarding microbial resistance. Another important and worrying consequence associated with the clinical use of antibiotics is that they have been associated with changes in the human microbiome, since topical antibiotics alter the cutaneous microbiota, leading to resistance patterns, even in anatomical sites distant from the application site [15,16].

1.2 The use of Light in the Treatment of Acne

According to the literature, phototherapy and photobiomodulation are synonymous, but there is a preference for the terminology photobiomodulation and the reason is understandable as biomodular can mean biostimulate or bioinhibit, depending on the conditions of the target tissue and the optical radiation dosimetric parameters [17,18]. The most used light sources for photobiomodulation are lasers (Light Amplification by Stimulated Emission of Radiation) and LEDs (Light Emitting Diode).

Blue and red lights are widely used in health areas. In the case of acne, they have the largest number of scientific studies. We know that red light (630 -700 nm) can penetrate deeper tissues (up to 6mm), in this case, throughout the dermis. Studies show that it has anti-inflammatory action, activating cellular signaling pathways that modulate the function of skin cells, stimulating the production of fibroblasts, increasing tissue repair, and aiding wound healing through stimulation of oxidative phosphorylation. Therefore, we believe that red light can play an auxiliary role in the treatment of inflammatory acne [19,20].

It is known that Cutibacterium acnes produces, during its normal life cycle, as part of its normal metabolism, porphyrins, mainly coproporphyrins. Light in the wavelength range of 407 to 420 nm (blue light), promotes the excitation of porphyrins (coproporphyrin III and protoporphyrin IX) leading to the release of singlet oxygen and the formation of active free radicals that exert bactericidal effects [21,22,23].

With the advancement of technology lasers and LEDs, many devices have been made in the industry area, including to be used at home. We then verified the need to study the ideal parameters that should be used in these devices, to achieve the goal of correct and safe treatment.

Our study compares the effect of combined blue/violet, red and blue, and red LED lights on inflammatory acne in Grades II and III.

2. MATERIALS AND METHODS

This series of cases report the treatment of 20 participants, who were divided into 4 groups: Group 1 used blue LED (470 nm), group 2 used red LED (660 nm), group 3 used blue and red LED combined (470 and 660 nm), and group 4, comparative group, used 20% salicylic acid peeling.

The device chosen for the treatment with LEDs was a mask, whose parameters are in Table 1.

The masks (Photo 1) were applied 3 times a week for 4 weeks, totaling 12 sessions. In the case of group 4, we apply 2 sessions of salicylic acid peeling to 20% gel base, every 15 days.

Photo 1. Personal file – application mode and LED masks, red, blue and mixed

The blinding of the participants was impossible because the coloring of the lights of the masks could be seen even with blindfolded eyes. The same happens with salicylic acid peeling, which would be impossible for the participant not to know that he was doing such a procedure. The same question occurred with the applicators because there would be no way to blind them.

The randomization of the groups was done through a distribution to one of the four groups in an allocation ratio of 1:1:1 by simple randomization. An array of random numbers was generated in Excel for allocation in the four groups at a 1:1:1 ratio.

Inclusion criteria were patients with inflammatory acne, grades II and III, skin color scale, from Fitzpatrick I to IV, of both sexes, from 12 to 25 years.

The exclusion criteria were some reports of salicylic acid allergy; Fitzpatrick V and VI degrees, due to the risk of hyperpigmentation; treatments performed for acne in the last 6 months, such as lasers and deep peelings; use of drugs for acne treatment, as isotretinoin, or contraceptive; pregnant and lactating women and/or at medical discretion.

2.1 Application of LED Masks

The masks were applied by a nurse specialized in dermatology and by students of scientific initiation of the universities involved, under the supervision of the same. The application was made with the patient in dorsal decubitus on a stretcher, where the patient's skin was sanitized with physiological ph soap. Then the eyes were blindfolded, and a disposable protective film was applied before applying the mask. Each mask worked automatically for 7 minutes. Sunscreen protection factor, of at least 30, was applied in the end of the session.

2.2 Salicylic Acid Peeling

Group 4, the control group, received the peeling of salicylic acid 20%, gel-based, applied to the patient's skin, and sanitized with physiological ph soap. After, the skin is clean, we used 70% alcohol to remove all the fat residues, and the peeling was applied on the entire face until a "Frost", that is, a whitish film on the skin [24]. Then we removed it with gauze moistened in water. Sunscreen protection factor was applied at least 30, after the end of the session.

Table 1. Parameters of the device chosen was a mask with LEDs

Technical parameters	Blue	Red	Blue and Red
Light Source	LED	LED	LED
Wavelength	470 nm	660 nm	470 nm e 660 nm
Banda Spectral	20 nm	20 nm	20 nm
Target beam area	1 cm2	1 cm2	$1cm^2$
The average power of each LED	5 mW	5mW	5 mW
Irradiance	5mW/cm2	5mW/cm2	5mW/cm2
Application Time	7 minutes	7 minutes	7 minutes
Energy	2,1 J	2,1 J	2,1 J
Radiant exposure	2,1J/cm2	2,1 J/cm2	2,1 J/cm2
The angle of emission of light	120 °	120^0	120^0
Number of LEDs	36	36	36 (18 blue/18 red)
Energy per session	25,71 J	25,71 J	12,85 J blue/12,85 J red
Total Energy	308,57 J	308,57J	154,28J blue/154,28 J red

Patients signed an informed consent (ICF) for authorization to participate in the research and another term for the use of image and voice. In the case of minors, the parents signed an authorization for their children to participate.

During the research period, the participants could not use any cosmetic product or medication that treated acne.

2.3 Criteria for Evaluation

To analyze the results, we took photos of participants from the front, chin, right, and left sides on days 1/15 and 30. (Annex 1).

The photos were analyzed by a dermatologist, who evaluated the improvement through a script, according to Annex 2, without knowing which groups the participants were from. In these scripts, we made scores in the answers. The higher the score obtained, the more severe the acne was.

According to previous studies, we evaluated the improvement of the inflammatory condition, through the clinical analysis of the lesions and skin aspect: Reduction of the number of comedones: Reduction of redness of lesions; 2-Reduction of the number of papules - decrease or increase in the number of papules; 3- Reduction of the number of pustules - decrease or increase in the number of pustules; 4- Reduction of erythema; 5- Reduction of skin oiliness - Reduction of facial skin oiliness. 6- Reduction of the degree of acne - clinical evaluation by the dermatologist.

3. RESULTS AND DISCUSSION

The results were first analyzed through the scripts (Annex 2) completed by the evaluating dermatologist, where we scored each item evaluated from 1 to 4, being the value 1 characterized as "lighter" and 4 as "more severe".

We added the points of all items evaluated at the beginning and the end of treatment and then we made the improvement percentages of each group, according to Tables 2, 3, 4, and 5.

We observed that group 1, which used blue light (420nm), had an improvement of 20% in the number of comedones, 18.88% in the number of papules, 12.5% decrease in the number of pustules, 42.85% decrease in oiliness, 30.76% improvement in erythema, 45% improvement in the appearance of lesions and 8,33% improvement in reducing the degree of a pustules, a 43.75% improvement in oiliness, no improvement in erythema, a 21.05% improvement in the appearance of lesions, and no improvement in the degree of acne.

Group 2, which used Red light (660nm), had a 30% improvement in the number of comedones, a 10% worsening in the number of papules, an 80% increase in the number of pustules, a 43.75% improvement in oiliness, no improvement in erythema, a 21.05% improvement in the appearance of lesions, and no improvement in the degree of acne.

Group 3, which used combined blue (420nm) and red (660nm) light, had an improvement of 20% in the number of comedones, 18.18% in the number of papules, 44.44% improvement in the

number of pustules, 35.71% of improvement in oiliness, 16.66% of improvement in erythema, 29.41% improvement in the appearance of lesions, 21.42% improvement in the degree of acne.

Group 4, which used salicylic acid peeling had a 40% improvement in the number of comedones, 33.33% improvement in the number of papules, 16.66% improvement in the number of pustules, 33.33% improvement in oiliness, 40% improvement in erythema, 31.25% improvement in the appearance of lesions and no improvement in the degree of acne.

We observed that the degree of acne had a change of 21.42% in group 3, which used combined blue and red light. In the rest of the groups, there was no difference.

The treatment group that used red light obtained the best result in the decrease in oil, with a 43.75% improvement. We observed that in the group that used red light, there was an 80% increase in the number of pustules and a 10% increase in the number of papules between the beginning and the end of treatment. There was no difference between erythema at the beginning or end of treatment.

As for erythema, the salicylic acid peeling group had a 40% improvement in the picture, followed by blue light, 30% blue and red light combined (16.66%), and no improvement in the red light group.

The number of papules had an improvement of 33.33% in the salicylic acid peeling group, 18.88% improvement in the groups that used blue light, 18.88% in the group that used blue and red light combined, and a worsening of 10% in the group that used red light.

Table 2. Group 1 – Blue Light

Data Evaluated	P1 B	P1 A	P2 B	P2 A	P3 B	P3 A	P4 B	P4 A	P5B	P5 A	Total before	Total after	% improv
N. of comedones	2	2	2	2	2	1	2	1	2	2	10	8	20%
N. of Papules	3	3	3	2	2	1	1	1	2	2	11	9	18,18%
N. of pustules	2	1	3	2	1	1	1	1	1	2	8	7	12,5%
Oiliness	3	2	3	2	2	1	3	1	3	2	14	8	42,85%
Erythema	3	2	3	2	2	1	2	1	3	3	13	9	30,76%
Aspect of injuries	4	2	4	2	4	2	4	1	4	4	20	11	45%
Degree of acne	2	2	3	3	2	2	2	1	3	3	12	11	8,33%
Total	19	14	21	15	15	9	15	7	18	18	88	63	28,40%

Legend: P1B = Patient 1 before; P1A = Patient 1 after; P2B = patient 2 before; P2A =patient 2 after; P3B = patient 3 before; P3A = patient 3 after; P4B = patient 4 before; P4A=patient 4 after; P5B=patient 5 before ; P5A=paciente 5 after.

Table 3. Group 2 – Red Light

Data Evaluated	P1 B	P1 A	P2 B	P2 A	P3 B	P3 A	P4 B	P4 A	P5B	P5 A	Total before	Total after	% improv
N. of comedones	2	1	2	1	2	1	2	2	2	2	10	7	30 %
N. of Papules	2	1	2	3	2	3	1	1	3	3	10	11	↑10% worst
N. of pustules	1	1	1	3	1	1	1	1	1	3	5	9	↑80% worst
Oiliness	3	1	3	2	4	2	3	2	3	2	16	9	43,75%
Erythema	2	1	2	2	2	3	2	2	3	3	11	11	0 %
Aspect of injuries	4	1	4	4	4	4	3	2	4	4	19	15	21,05%
Degree of acne	2	2	3	3	2	2	2	2	2	2	11	11	0%
Total	16	8	17	18	17	16	14	12	18	19	82	73	10,97%

Legend: P1B= Patient 1 before; P1A = Patient 1 after; P2B = patient 2 before; P2A =patient 2 after; P3B = patient 3 before; P3A = patient 3 after; P4B= patient 4 before; P4A=patient 4 after; P5B=patient 5 before; P5A=paciente 5 after

Table 4. Group 3 - Combined blue and red light

Data Evaluated	P1 B	P1 A	P2 B	P2 A	P3 B	P3 A	P4 B	P4 A	P5B	P5A	Total before	Total after	% improv
N. of comedones	2	2	2	1	1	1	3	2	2	2	10	8	20%
N. of Papules	1	1	3	2	1	2	3	1	3	3	11	9	18,18%
N. of pustules	1	1	3	1	1	1	2	1	2	1	9	5	44,44%
Oiliness	3	2	4	2	3	2	2	1	2	2	14	9	35,71%
Erythema	2	2	3	2	1	2	3	1	3	3	12	10	16,66 %
Aspect of injuries	2	2	4	3	3	2	4	2	4	3	17	12	29,41%
Degree of acne	3	3	3	2	2	2	3	2	3	2	14	11	21,42 %
Total	14	13	22	13	12	12	20	10	19	16	87	64	26,43%

Legend: P1B= Patient 1 before; P1A = Patient 1 after; P2B = patient 2 before; P2A =patient 2 after; P3B = patient 3 before; P3A = patient 3 after; P4B = patient 4 before; P4A=patient 4 after; P5B=patient 5 before; P5A=paciente 5

Table 5. Group 4 - Peeling of salicylic acid

Data Evaluated	P1 B	P1 A	P2 B	P2 A	P3 B	P3 A	P4 B	P4 A	P5 B	P5 A	Total before	Total after	% improv
N. of comedones	2	1	2	2	2	2	2	1	2	1	10	6	40%
N. of Papules	3	1	1	1	2	1	1	1	2	2	9	6	33,33%
N. of pustules	2	1	1	1	1	1	1	1	1	1	6	5	16,66%
Oleosidade	3	2	2	1	3	2	2	2	2	1	12	8	33,33%
Erythema	3	2	1	1	2	1	2	1	2	1	10	6	40%
Aspect of injuries	4	4	2	2	4	2	3	2	3	1	16	11	31,25%
Degree of acne	3	3	2	2	2	2	2	2	2	2	11	11	0 %
Total	20	14	11	10	16	11	13	10	14	9	74	53	28,37%

Legend: P1B = Patient 1 before; P1A = Patient 1 after; P2B = patient 2 before; P2A =patient 2 after; P3B = patient 3 before; P3A = patient 3 after; P4B = patient 4 before; P4A=patient 4 after; P5B=patient 5 before ; P5A=paciente 5 after.

The number of pustules had an improvement of 44.44% in the group that used combined blue and red light, 16.66% improvement in the salicylic acid peeling group, 12.5% improvement in the group that used blue light, and 80% worsening in the group that used red light.

The aspect of the lesions was considered better in the group that used blue light (45%), followed by the salicylic acid group (31.25%), the combined blue and red lights group (29.42%), and finally, the group that used red light with 21.05% improvement.

The number of comedones was considered better in the group that was treated with salicylic acid peeling, with a 40% improvement, followed by the group that used red light, with a 30% improvement. The groups that were treated with blue light and combined blue and red lights had a 20% improvement.

However, in the overall improvement of the skin, the blue light had the best result, with 28.40%, followed by group 4, the salicylic acid peeling with 28.37% improvement, third group 3, combined blue and red lights with 26.43% improvement and red light with 10,97% of improvement.

3.1 Discussion

Treatment of inflammatory acne is not an easy treatment, it often requires joint therapies depending on the degree of dermatosis [25].

Many treatments offered cause side effects such as post-inflammatory hyperpigmentation,

irritation, burning, and redness, changing the skin barrier [26], leading the individual to abandon treatment.

The appearance of the skin, erythema, lesions (papules and pustules), oiliness, post-inflammatory hyperpigmentation, and scars are extremely uncomfortable, causing severe psychological damage, from anguish, depression, and suicide [27].

Health professionals, clinical research has shown that combined treatments are the most effective and that antibiotic treatments should be used in necessary cases, avoiding their use in patients with mild to moderate acne.

Light treatments (lasers and LEDs) demonstrate good effectiveness but still require reliable research, randomized and controlled clinical studies, with a minimum number of participants, and who determine a safe parameter in the use of devices and appliances that can be used at home with due security.

In this study, we can observe that all treatment groups had a satisfactory result, despite the small number of observed.

In the group that was treated with blue light (group 1), we found that the improvement was more evident in the aspect of the lesions (45%). Blue light can affect the mitochondrial function of cells, through the cytochrome c oxidase, which is the IV complex of the electron carrier chain, found in the mitochondrial membrane. After light absorption, molecular photoreceptors (flavins, porphyrins, opsins, and nitrous proteins) are transformed from the ground state to the excited state, singlet, and triplet, and released from reactive oxygen species (ROS) [28,29].

In the group that used red light (group 2), we had an increase in the number of pustules and a small increase in the number of papules between the beginning and the end of treatment. However, the red light group, coincidentally, formed only by women in the hormonal production phase, and with periods of menstruation, which may have interfered at some point in the results. Another important detail is that we have a period between inflammation, production, and emptying of the sebaceous duct, which perhaps occurred in this group. From the moment the inflammatory papule turns into a pustule and is drained. Even so, this result is intriguing, since the oiliness of the skin in this group decreased by 43.75% and the overall appearance of the skin improved by 30%.

The group that made use of combined Blue and Red light (group 3) had the best result in the reduction of pustules (44.44%).

The number of papules and the overall appearance of the skin had an improvement in the salicylic acid peeling group (group 4) with 33.33% and 40% respectively. However, some participants reported a burning sensation and burning during the application of the product, as well as irritated and reddish skin the day after application.

4. CONCLUSION

Based on the case series presented, all groups showed improvement, but blue light showed superior results to red light and salicylic acid. These results underline the need to elucidate the relationships between different parameters and results for the development of treatment protocols for inflammatory acne.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

CONSENT

The participants signed an informed consent form (ICF), an authorization for the use of the image, and in the case of minors, the parents signed an authorization for participation in the study.

ETHICAL APPROVAL

The study was approved by the ethics committee under the number CAEE: 40188920.0.0000.5511 [Research Ethics Committee of Universidade Nove de Julho (UNINOVE)], on 04/27/2022. And yet, the study was registered in the Brazilian Registry of Clinical Trials (Rebec) - N. Opinion 5,395,443.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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ANNEX 1

How the photos were made

ANNEX 2

EVALUATION ROADMAP

1) SKIN APPEARANCE DAY 1/15 and 30
A - Number of comedones
( ) Up to 10 - 1 point
( ) Between 10 and 30 - 2 points
( ) Between 30 and 50 - 3 points
( ) More than 50 - 4 points

B - Number of papules
( ) Up to 5 - 1 point
( ) Between 5 and 10 - 2 points
( ) Between 10 and 20 - 3 points
( ) More than 20 - 4 points

C - Number of pustules
( ) Up to 5 - 1 point
( ) Between 5 and 10 - 2 points
( ) Between 10 and 20 - 3 points
( ) More than 20 - 4 points

D - Oiliness
( ) + 1 point
( ) ++ 2 points
( ) +++ 3 points
( ) ++++ 4 points

E - Eritema
( ) + 1 point
( ) ++ 2 points
( ) +++ 3 points
( ) ++++ 4 points

F - Appearance of injuries
( ) active- erythematous- edematous - 4 points
( ) In decline but erythematous - 3 points
( ) Dried – purplish- 2 points
( ) Dried -pink - 1 point

F - Degree of Acne
( ) Grade 1 - 1 point
( ) Grade 2 - 2 points
( ) Grade 3 - 3 points
( ) Grade 4 - 4 points

Comments:
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