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Research Article

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Peeling with 25% trichloroacetic acid in the treatment of facial skin photoaging

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Abstract

Introduction: *The chemical peel consists of the application of chemical exfoliants that eliminate the layers of the skin so that it can regenerate with an improved texture and pigmentation. It is currently a valuable therapy in dermatology, however, few studies objectively evaluate its efficacy.*

Objective: *To evaluate the efficacy and safety of peeling with 25% trichloroacetic acid in the treatment of facial skin rejuvenation.*

Method: *An observational, analytical and longitudinal study was carried out in 250 patients from two hospitals (Surgical Clinic: "Hermanos Ameijeiras" and General Teaching: "Enrique Cabrera"), in the period between January 2010 and January 2020. Treatment It was applied monthly for 6 months. The final evaluation was carried out 3 months after the end of the treatment.*

Results: *238 women and 12 men were treated with an average age of 30.5 (± 8.4) years. After treatment, there were significant changes in the Glogau Photo Damage Scale (P=0.012), in the Lemperle Wrinkle Assessment Scale (P=0.016) and in the Global Aesthetic Improvement Scale (P=0.021). The adverse events found were burning, inflammation and scaling. The degree of satisfaction reported by the patients was good (4.4%) and very good (95.6%) (P=0.011).*

Conclusion: *The 25% trichloroacetic acid peel proved to be effective and safe to reduce the signs of facial skin aging, associated with a high degree of patient satisfaction.*

Keywords: Chemical peeling, Rejuvenation of facial wrinkles, Facial skin photoaging, Trichloroacetic acid

Introduction

Skin aging goes beyond aesthetics as it can greatly affect the quality of life of patients, so it is extremely important to know the different mechanisms that cause it and become familiar with the different anti-aging strategies that exist in the actuality. In addition, it is essential that the doctor understand the wishes and expectations of the patient in order to guide him towards a therapeutic modality that leads to the best results [1]. One of these modalities is chemical peeling, which involves the application of chemical exfoliants that remove the layers of the skin so that it can regenerate with improved texture and pigmentation [2]. These qualities have made peeling a valuable therapy in dermatology, however, few studies objectively evaluate its efficacy, which led to the realization of the present investigation.

Goals

The primary objective was to determine the efficacy and safety of the 25% trichloroacetic acid peel in the treatment of facial skin photoaging and the secondary objectives were: 1) to evaluate the clinical response to treatment, 2) to evaluate the type and intensity of adverse events that are presented and 3) describe the degree of satisfaction of the patients.

Method

An observational, analytical, longitudinal study was carried out in 250 patients from two hospitals (Surgical Clinic: "Hermanos

Ameijeiras" and General Teaching: "Enrique Cabrera"), in the period between January 2010 and January 2020. Treatment with 25% trichloroacetic acid (TCA) was applied monthly for 6 months. Three months after the end of the treatment, the response to it was evaluated (final evaluation), comparing the current state with the initial state; For this, the patient had to attend the scheduled consultation. Throughout the study there was a rigorous control of adverse reactions.

Inclusion criteria

Patients between 20 and 60 years of age, of any sex, skin phototype I to III according to Fitzpatrick's classification,(3) skin photoaging grade II to III according to Glogau's classification,(4) grade 1 to 3 according to the scale of evaluation of the Lemperle's wrinkles,(5) normal complementary tests (hemogram with differential, coagulogram, blood chemistry and serology for HIV, hepatitis B and C), with signed informed consent.]

Exclusion criteria

Table 1: Exclusion criteria and their relationship with the time limits to perform the procedure.

Criteria	Time limits
Cardiovascular or pacemaker, neurological, liver, kidney, endocrine or immunological diseases, decompensated.	Simultaneous to the procedure.
Severe psychiatric disorder or other limitation that prevents the patient from giving his informed consent or makes his evaluation difficult.	Simultaneous to the procedure.
Pregnancy or breastfeeding	Times New Roman
Herpes simplex infection and / or other septic foci.	Simultaneous to the procedure.
Prone to forming keloids.	Before the procedure.
Application of topical retinoids, aesthetic treatments in the region to be treated, including lasers, intense pulsed light, chemical peels, mesotherapy, carboxytherapy, face lift or others.	Three months prior to the procedure.
Fillers in the region to be treated.	One year prior to the procedure.
One year prior to the procedure.	Ionizing radiation treatments.
Ionizing radiation treatments.	Five years prior to the procedure.
Inadequate photoprotection.	Unlimited

Elimination criteria

Patients who wish to abandon the study, presence of an adverse event and/or complication that prevents continuing with the treatment or patients who have missed a treatment session.

Procedures

Once the patients gave informed consent, the included subjects registry template and the investigator's internal registry were filled out. All information on the included patients was compiled in the data collection notebook. One week before the intervention, it was indicated to apply tretinoin (gel) at night. The peeling technique was as follows: patient adaptation (inclined between 45 and 60 degrees); antiseptic cleaning and degreasing of the entire facial area with alcohol so that its penetration is homogeneous; Small cotton-tipped applicators were used to remove the solution (25% TCA) and apply it to the skin; the patient's eyes remained closed throughout the procedure; abrasion sequentially from front to temples, then to cheeks, and finally to lips and eyelids. The solution is applied evenly, in a single coat to achieve a white frost. The eyelids must be treated delicately and carefully. After an appropriate time, the solution can be diluted (not necessary, only if a yellowish-gray color appears in some area). If severe erythema appears, apply topical antibiotic ointment or mild topical corticosteroid cream. Finally, indications are made to patients about outpatient care and sun protection.

Variables Related to the Response to Treatment

The response to treatment was evaluated taking into account the clinical examination of the patient, using the Glogau photodamage scale (Table 2) [4], the Lemperle wrinkle evaluation scale (Table 3) [5] and the scale of global aesthetic improvement (GAIS) (Table 4) [6].

Table 2: Classification of photoaging according to Glogau [4].

Type	Characterization
Type I "No wrinkles"	Early photoaging: slight pigmentary changes, no keratosis, minimal wrinkles, no scars, young patient, generally 28-35 years of age, no or minimal makeup.
Type II "Movement wrinkles"	Early to moderate photoaging: visible early senile lentigo, early actinic keratosis, slight signs of scars, wrinkles and parallel smile lines begin to appear, patient age: late 30s or 40s, usually she wears some makeup.
Type III "Wrinkles at rest"	Advanced photoaging: obvious dyschromia and telangiectasias, visible keratoses, neoplasms (+), wrinkles even when not moving, patient age: fifty years or older, always wears a lot of makeup.
Type IV "Wrinkles only"	Intense photoaging: grayish-yellow skin, cutaneous neoplasms (+++), all wrinkled skin, no normal skin, age of patient: sixties or seventies, cannot wear makeup, "hard and cracked".

Table 3: Lemperle wrinkle evaluation scale [5].

Grade	Characteristics
0	Without wrinkles.
1	Very fine wrinkles, hardly noticeable.
2	Fine and superficial wrinkles.
3	Moderately deep wrinkles.
4	Deep wrinkles, with well-defined edges.
5	Very deep wrinkles, redundant crease.

Table 4: Global aesthetic improvement scale (GAIS) [6].

Evaluation		Degree of improvement
1	Total answer	Patient with exceptional or much better improvement (excellent corrective result, total disappearance of the lesions).
2	Marked partial response	Patient greatly improved or considerably better (marked improvement in appearance, but not completely optimal, reduction of lesions by ≥ 50% and <100%).
3	Slight partial response	Improved or somewhat better patient (appearance slightly better than initial condition, but needs more treatments, <50% lesions decrease).
4	Non-response	No change (the same number and size of lesions as at the start of treatment).
5	Progression	Worse (increased number or size of lesions).

Adverse Events

Adverse events reported in the reviewed literature are burning, pain, edema, infections, hyperpigmentation, and healing disorders (delayed healing or hypertrophic scar) at the site of application [7,8].

Classification of adverse events (Table 5) [9].

Table 5: Intensity scale of adverse events [9].

Intensity	Characteristics
Mild	if the adverse event subsided without treatment.
Moderate	if treatment was required, but the adverse event subsided with it.
Serious	if he required hospitalization or did not yield to treatment.
Very serious	if it endangered the life of the patient, if it caused sequelae or disability.

Degree of Satisfaction of Patients to Treatment

The degree of satisfaction (PSSS) of the patients with the treatment was evaluated taking into account what was reported by the patient according to the scale (Table 6) [10].

Table 6: Scale of the degree of patient satisfaction [10].

Evaluation		Degree of satisfaction
1	Very bad	I did not get any improvement and the treatment caused me multiple discomforts (inflammation, bruising and pain).
2	Bad	I did not get any improvement, but the treatment did not cause me any discomfort.
3	Regular	The improvement was little.
4	Good	The improvement was noticeable, but not total.
5	Very good	The improvement was complete with minimal discomfort.

Bioethical Considerations

The protocol was submitted to the consideration and approval of a Review and Ethics Committee for Clinical Research created for this purpose, which evaluated it from an ethical point of view. Furthermore, this protocol was submitted to scientific and methodological review and approval by the Institutional Scientific Council of the Hospital Clínico Quirúrgico "Hermanos Ameijeiras".

Statistical Methods Used

The medical records of the patients included in the study were stored in the Department. With the information collected, a Microsoft Office version XP database in Excel format was made, which was exported to the SPSS version 21.0 system for analysis. To summarize the information of the study sample, the arithmetic mean, standard deviation and minimum and maximum values will be used. The Student's t test was used for all quantitative variables. For all qualitative variables (degree of photodamage, degree of aesthetic improvement, degree of severity of wrinkles and degree of satisfaction), the absolute numbers and percentages before and after treatment were calculated, which were compared using the Chi-square test of Pearson. In all the hypothesis tests carried out, a significance level α=0.05 was performed.

Sample's size calculation

The sample size was calculated using the C4-Study Design Pack computerized program. (C4-SDP) for sample size calculation (CTM). Version 1.1 ® Glaxo Wellcome. SA;(11) considering the following values: percentage of success reported in the literature 70%, percentage of success in the current study of 80%. With an alpha error of 0.05, a power of 80% and covering a loss of 5% of patients, it was necessary to have 250 subjects in total.

Results

The study sample consisted of 238 women and 12 men, with skin phototypes between II and IV. The average age ranged around 30.5 (± 8.4) years (Table 7).

Table 7: Epidemiological and clinical characteristics of the subjects.

Age	**Mean (SD)**	**30.5 (± 8.4)**	
	(Minimum; Maximum)	(20; 58)	
			%
	20-29	26	10.4
	30-39	87	34.8
	40-49	75	30.0
	50-60	62	24.8
Sex	Female	238	95.2
	Male	12	4.8
Skin phototype	I	0	0
	II	237	94.8
	III	13	5.2
Glogau	II	38	15.2
	III	212	84.8
Degree of the wrinkles	1	0	0
	2	50	20.0
	3	125	50.0
	4	75	30.0

Regarding the Glogau Photo Damage Scale, 212 patients were classified as grade III, and 38 as grade II before the start of the study. After treatment, 148/212 (69.8%) patients who were classified as grade III were reclassified as grade II and 30/38 (78.9%) patients who were classified as grade II were reclassified as grade I (p=0.012); the rest of the patients remained in the same assigned grade before treatment.

Regarding the scale for the evaluation of Lemperle's wrinkles, 75 patients were classified as grade IV, 125 as grade III and 50 as grade II before the start of the study. After treatment, 58/75 (77.3%) patients who were classified as grade IV were reclassified as grade III, 98/125 (78.4%) patients who were classified as grade III were reclassified as grade II, and 43/50 (86.0%) patients who were classified as grade II were reclassified as grade I (p=0.016); the rest of the patients remained in the same assigned grade before treatment.

According to the Global Esthetic Improvement Scale, there were significant changes after treatment (p=0.021); 5/250 (20.0%) patients achieved a total response, 45/250 (18.0%) patients achieved a marked partial response, and 200/250 (80.0%) patients achieved a mild partial response (Figure 1 and 2).

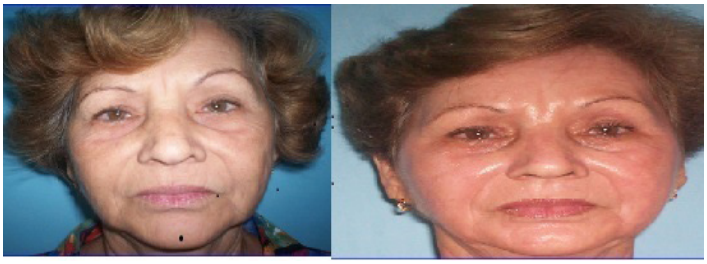

Figure 1: Images showing the improvement of the skin on the face of a patient (A) before and (B) three months after peeling treatment with 25% TCA.

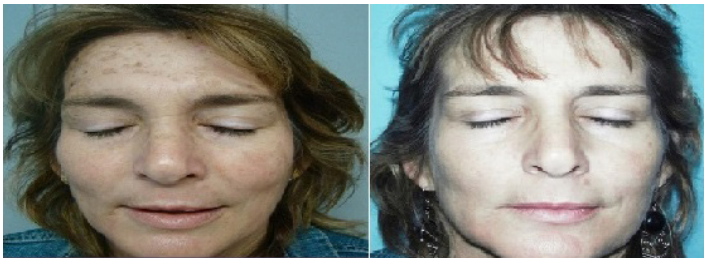

Figure 2: Images showing the improvement of the skin on the face of another patient (A) before and (B) three months after the peeling treatment with 25% TCA.

All patients reported some adverse event (burning, inflammation, scaling), which were of slight intensity, did not imply changes before the intervention and were completely resolved. The burning occurred during the procedure and disappeared immediately after the completion of the procedure (100%), the inflammation (49.6%) lasted 2 to 3 days and the desquamation (100%) lasted 5 to 7 days of duration. One patient presented hyperpigmentation due to inadequate photoprotection, which subsided one month after topical treatment with 2% hydroquinone (Table 8).

Table 8: Adverse events.

		N=250	
		N	**%**
Adverse events	Burning	250	100.0
	Inflammation	124	49.6
	Desquamate	250	100.0
	Hyperpigmentation	1	0.4

Of the 250 patients treated with a 25% trichloroacetic acid peel, 11/250 patients (4.4%) reported a good degree of satisfaction and a very good degree of satisfaction 239/250 patients (95.6%), because they achieved evident improvement with respect to their initial condition (Table 9).]

Table 9: Degree of satisfaction, according to the patients' own satisfaction scale (PSSS).

Satisfaction	N=250		
	N	%	p
Regular	0	0	0,011 (χ^2)
Good	11	4.4	
Very Good	239	95.6	

Discussion

With medicine increasing both the average life span and the quality of life, there has been an increased demand for treatment for age-related skin changes. Many new options are developed annually in skin rejuvenation, chemical peel or chemoexfoliation, it is the one that has withstood the tests of time and scrutiny. Different variations of chemoexfoliation have been used for wrinkles, actinic damage, lentigoes, and dyschromias [12].

Abdel-Daim M el al. evaluated the photochemopreventive effect of various clinically used chemical peel agents on the ultraviolet (UV) irradiated skin of hairless mice. Chemical peeling was performed using 35% glycolic acid dissolved in distilled water, 30% salicylic acid in ethanol, 10% or 35% trichloroacetic acid (TCA) in distilled water on the right back of UV-irradiated hairless mice. every 2 weeks in the case of glycolic acid, salicylic acid and 10% TCA and every 4 weeks in the case of 35% TCA for a total of 18 weeks after the establishment of photo-aged mice by irradiation with light of range UVA+B three times a week for 10 weeks in total doses of 420 J/cm2 at UVA and 9.6 J/cm2 at UVB. Tumor formation was evaluated every week. Skin samples were taken from the treated and untreated area for evaluation under microscopy, evaluation of P53 expression and expression of cyclooxygenase (COX-2) mRNA. The serum level of prostaglandin E2 was also evaluated. The results showed that all types of chemical peels reduced the formation of tumors, mainly in the treated area but also in the untreated area. Peeling suppressed clonal retention of abnormal p53-positive cells and reduced COX-2 mRNA expression in treated skin. Additionally, the serum prostaglandin E2 level decreased in mice treated with chemical peels [13].

Han SH et al investigated the effects of chemical peeling and the wrinkle reduction mechanism on the skin of photoaged hairless mice. After inducing photoaging in the skin of hairless mice by repetitive ultraviolet-B irradiation applied for 14 weeks, they applied 30% trichloroacetic acid (TCA), 50% TCA, and phenol to areas of the same size on the back of the mice. Punch biopsies were performed 7, 14, 28, and 60 days after the procedure for histological and immunohistochemical analysis. The results showed that the histological examination expressed an increase in dermal thickness, in collagen fibers and in elastic fibers in the dermis of the intervention groups compared to the control group. These increases were significantly sustained for 60 days. This study showed that chemical peeling reduces wrinkles and regenerates the skin by increasing dermal thickness and the amount of collagen and elastic fibers in photoaged skin [14].

Vemula S et al. determined the frequency of side effects and complications associated with superficial chemical peels in patients with skin types III-VI. To do this, they performed a 5-year single-center retrospective analysis. The results showed that, of 473 chemical peel treatments included in this study, 18 (3.8%) were associated with short-term (≤ 2 weeks) or long-term (>2 weeks) complications. The most frequent complications were scab formation (2.3%), post-inflammatory hyperpigmentation (1.9%), and erythema (1.9%). All side effects resolved within 8 months of treatment and were localized to the face. When stratified by season, side effects were found to be less common during winter. In the adjusted model, Fitzpatrick skin type VI was associated with higher odds of side effects (odds ratio 5.14, 95% confidence interval 1.21-21.8, P=0.0118) [15].

Over the past 30 years, the science behind chemical peels has evolved, increasing our understanding of the role of the ingredients to perform it and the indications for treatment [16]. The depth of peels is directly related to the improvement of (aesthetic) results. and photochemopreventive) and with the number of complications that can occur [13-16].

In our study, there was clinical improvement in the Glogau photodamage scale (P=0.012), in the scale for evaluation of the severity of Lemperle's wrinkles (P=0.016) and in the global scale of aesthetic improvement (P=0.021), associated with a high degree of patient satisfaction (P=0.011). Adverse events were mild and without any permanent consequences on the individual.

Conclusion

The application of the 25% trichloroacetic acid peel proved to be effective and safe in reducing the signs of facial skin aging, associated with a high degree of patient satisfaction.

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