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Research Article

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Histological Comparison Between Deep Chemical Peeling DE ROSSI FATTACCIOLI's Formulae) and Ultra-Pulsed CO_2 Laser Resurfacing

Daniel De Rossi-Fattaccioli*

Private University of Tacna & Master Cathedratic Dermatology, National Public University of Tacna "Jorge Basadre Grossman, Peru

***Corresponding author**
Daniel De Rossi-Fattaccioli, Peruvian Society of Dermatology, Gregory Walls 386. Lima 1–Peru, Tel: (511) 332-9596; Fax: (511) 423-8428; E-mail:mailto: derossifattaccioli@hotmail.com

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Abstract

The laser treatment of carbon dioxide ultra-pulsed and peelings chemical phenol-deep oil crotón (formulas Backer-Gordon and Litton) have been and remain the most used for the rejuvenation of the skin of the face. This study was conducted to compare the effects of both treatments by histological sections at different periods of the evolution of the same. Biopsies were performed face treaties skin before and retro immediately and 24 hours after the ablations CO_2 laser and 24 hours after application of the formula of Litton for chemical peeling deep. Areas in areas near the biopsies were biopsied 12 hours, 24 hours, 1 week, 2 weeks, 2 and 3 months later, in the case of treatment with phenol 24 hours, 48 hours, 72 hours, 1 week, 1 year and 10 years later. The initial biopsies showed that being ablations CO_2 laser deeper than the chemical peeling with phenol, a month both had formed an area neocolágeno. But after three months, the comparatively deep phenol chemical peeling (formula Litton) had been an area neocolágeno more compact and wide as that produced by the CO_2 laser ultra-pulsed.

Keywords: Peeling (Chemodermabrasion) Re surfacing (laser dermoevaporation) Ultra pulsed

Introduction

The so-called CO_2 laser skin resurfacing ultrapulsado (denoting an action of 'resuperficiar: remove surface' a new epidermis) is a safe and effective, predictable results, non-toxic, for the reduction of facial wrinkles and scars and atrophic dermoepidérmicas for multiple injuries. The introduction of systems for scanning, ultrapulsado, geometric patterns of different diameters and high energy laser shot has enabled surgeons to make customized ablation laser epidermal and dermal tissue with minimal risk of unwanted scars.

The old technology of using CO_2 laser systems and continuous waves superpulsadas were efficient in the removal of tissue, but carbonizaban too with a thermal damage and residual significantly high that resulted in significant changes in the texture of the skin and scar formation, too long posláser of erythema and hyperpigmentation [1-5].

Using the principles of fotodermólisis selective, the new generation of laser limits the thermal residual damage to the skin by producing high-energy laser light with time evaporating very short tissue, in relation to the thermal relaxation time of the epidermis (estimated about one millisecond for CO_2 laser in a fabric containing 70% water) for which the systems were developed laser scanning and ultrapulsado, using radio frequency waves stimulated to produce only high-energy pulses of very short duration [6-10].

The CO_2 laser system can develop ultrapulsado frequencies above 7 J/cm2 with pulse widths, shorter than a millisecond (ms).

The laser systems scanned operate generating a continuous beam of CO_2 laser energy that moves through quickly in different directions that are programmed by computer. This limits the time evaporation tissue at 0.3 ms (smaller than the thermal relaxation time of epidermal) thereby preventing the overheating of the continuous wave of high energy laser [3,11-13].

The peeling chemical phenol are the first described in the history of chemical peeling. The first formula dating from 1800. You could say they are the mother of all peelings. The initial histological studies were made by Samuel Stegman animal, in 1980, and in human skin in 1982, which was proved scientifically action and the dominance of chemical peeling on the media and peelings dermoabrasión [4]. The formulas varied, and even empirical 'secret' that was what gave him the dye from non-scientific were systematized and regulated in 1961 by plastic surgeons Backer and Gordon (phenol, 3 mL, double-distilled water, 2 mL; Septisol, 8 drops; crotón oil, 3 drops) in 1962 and Litton made another formula that increased the penetration and destruction of tissue [15,17-18].

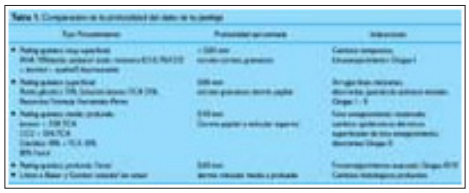
These standardized formulas, along with the precautions cardiorespiratory monitoring during and after surgery, in addition

to laboratory tests (blood count, glucose, liver and kidney profile), and ultrasound-Holter electrocardiogram (to prevent arrhythmias which are the most frequent complication) have made the peelings deep chemical treatments safe, predictable and clinically with very satisfactory results for both physicians and patients for the duration of their results [17.18].

The peelings chemical phenol have shown that acting on destruction (necrosis) of the skin, which is proportional to its dilution (unlike other chemical peelings that the penetration depends on the concentration of acids), the time it left in the treated skin, which sometimes is rubbed on the area, occlusion, the presence vesiculizante oil crotón and heat (the latter makes me unique and different procedure).

As with lasers, chemical agents peelings cause deposits of a zone of new collagen which is comparable to the extensive tissue destruction [19]. Unlike lasers, in the peelings phenol, the results depend heavily on the experience of performing, known as the 'state of the art' [15-20].

The purpose of this study is to identify and compare the effects of chemical peeling histological deep phenol (formula Litton and the CO_2 laser ultrapulsado consistent. Depth of the damage and the area of new collagen are compared. Table 1.



Materials and Methods

Ten patients underwent laser resurfacing and 20 patients undergoing deep phenol chemical peeling (De Rossi Fattaccioli & Litton formula hot). All gave their consent to be treated and biopsy. We excluded patients who had received either of the two treatments in the last twelve months, photosensitizing used drugs, steroids, chemotherapy and having problems healing, photosensitivity, diabetes mellitus, hepatic dysfunction and heart disease.

The ages ranged between 40 and 60 years, 10% white and mestizo 90%. All had fotodaño III to IV on the scale of Glogau [21].

Patients were prepared using alcohol-ether as diluent fat facial cleanser, a cm2 area before and retro were infiltrated with lidocaine 2% + 1 / 1000 000 epinephrine.

The CO_2 laser was used ultrapulsado to 300 mJ and 3.0 mm spot size of the generator-shot with computerized figures, and 60 W power density 6 J/cm^2. A hydrocortisone cream was applied more mupirocin the first 3 days and then a cream reepitelizante. Every morning she applied a sunscreen that does not produce heartburn.

After a week of complete epitelización has started implementing a formula based personalized de-pigmenting retinoic acid 0025% -0.05% 4% kójico acid, hydroquinone 4% -10% and 1% hydrocortisone, fur-III IV Fitzpatrick [2.23].

Also, he famciclovir or valacyclovir in adequate doses to prevent reactivation of herpes simplex (24). Litton's solution was prepared by melt crystals phenol water bath and immediately adding more distilled water and glycerin shake. It takes 113.40 g of this mixture and add oil crotón. Shake the mixture. Take an empty bottle of 226.8 mL introduces the 113.40 grams of the above mix, which contains oil crotón, with double-distilled water, resulted in 227 mL of solution are stable for 3 years for use unchanged [18,23-25]. This mixture is deposited at the bottom of a glass of crystal thick, is placed in a metal container with a water temperature of approximately 50 ° C to 70 ° C is not boiling, as this would cause evaporation of water bidistilled distorting the formula, reducing its penetration. In our experience solving Litton needs to be warm for better application and improved security. The heat makes it more fluid and penetration increases. The glycerin in the formula makes it safer to apply it near the cornea when trying eyelids because it adheres better to the skin.

Sequence suggested time peeling phenol-oil crotón (15)

08:30 h	Preparation preoperative: skin is cleansed and defatted. Analgesia: neuroleptoanalgesia more local anesthesia in the face. Via intravenous fast-jet. Monitoring cardiorespiratory. Urinary probe.
09:00 am	The solution is applied on the forehead of two subunits.
09:15 h	Cheek left path from nasogenianopreauricular region, to temples and mandibular edge.
09:30 h	The other cheek
09:45 h	Nose and glabela
10:00 am	Area Perioral, chin.
10:15 h	Eyelids lower near the edge ciliary 1-3 mm, open eyes looking up.
10:30 h	Eyelids higher, eyes closed, covering the eyebrows 1 to 3 mm from the edge of space ciliary prepare swabs to tears canthus.
10:35 h	Placing esparadrapos in the same order of retreating eyelids to face. At the end put 2 to 3 layers of esparadrapos.
11:35 h	Ending mandatory cardiac monitoring and let placed a urinary catheter.
12:00 pm	Patient observation room began pethidine EV conditional. Not orally

There was immediately shown that white marble stadium in graded VI at the table Visual Stadiums to determine the end point for the neutralization chemical peeling (Rubin) (12). Table 2.

With the CO_2 laser first biopsy was done immediately after the second and third passes at 24 hours, 1 week and 3 months. With deep phenol chemical peeling (formula Litton), the first biopsy was taken at 24 hours, then 48 hours, 1 week, 1 month, 6 months and 10 years later. The biopsy specimens, preserved in formalin, stainings were processed with a hematoxylin-eosin.

In the case of phenol and oil stains were used crotón Masson and Verhoff. Areas of neocolágeno were measured using a calibrated micrometer with a 100x microscope increases.

Results

The initial biopsies showed the depth of ablation-tissue destruction. Unlike the peelings chemical phenol, the CO_2 laser causes a thermal insult histologically demonstrable on the periphery of the area. With two passes CO_2 laser is pulsed note necrosis and disappearance of the epidermis and dermis papillary higher evaporation (95 + 8 µ m) and thermal effect of the papillary dermis deep to the dermis lattice higher (30 + 2 µ m), with the second pass-ablation faded papillary dermis and the epidermis, with the third go-ablation is vaporizó the dermis to the area with a lattice higher penetration of 130 + 5 µ m and thermal damage of 80 + 2 µ m. (Figure 1).

The most important findings are shown in Figures 1 through 8 in relation to laser resurfacing.

The most significant histological findings of biopsies from patients treated with chemical peeling deep formula Litton, are presented and described in Figures 9 and 18.

By measuring microscopy and calibrated with a micrometer to 100x increases, it was observed that, with two passes ablation, penetration with CO_2 laser was 95 + 8 µ m and the thermal damage, 30 + 2 µ m. With three passes ablation, the penetration was 130 + 5 µ m and the thermal damage, 80 + 2 µ m. While peeling with phenol Litton ocluido more heat penetration was 75 + 7 µ m.

The area neocolágeno formed with the use of CO_2 laser ablation ultrapulsado consistent two passes was 140 + 10 µ m and 3 passes ablation of 180 + 9 µ m. With the use of phenol peeling Litton ocluido formula, the area neocolágeno was formed 400 µ m (Figures 1,2 and 3).

Discussion

It has been confirmed that the phenol and other chemicals cause tissue destruction dermoepidérmico. In the unique case of phenol its penetration is directly proportional to its dilution and occlusion and its action is necrotizing contact. With regard to trichloroacetic acid, resorcinol and alpha-hidroxiácidos (AHA) is proven that its penetration depends on its concentration, the time between application and neutralization, as well as the times and pressure from the application [14-20]

The destruction occurs lattice deep to the dermis and regeneration of tissue "area neocolágeno" compact is formed in all areas destroyed. The area neocolágeno replaces elastosis layers of the dermis photodamaged are necrotizadas by peeling phenol. Several studies have shown that the area of collagen generated by the chemical peeling is directly proportional to the extent of the chemical destruction and the power of acid used [20-25].

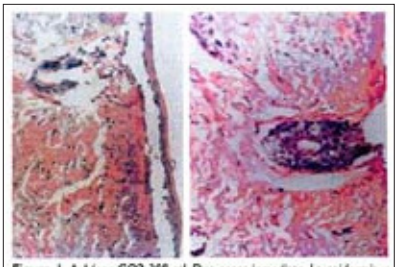


Figura 1. A. Láser CO2 300 mJ. Dos pases inmediato. La epidermis y dermis papilar superior vaporizada. Daño termal hasta dermis reticular superior. B. Láser CO2 300 mJ. Tres pases inmediato. La dermis papilar totalmente vaporizada. Se observa daño termal hasta dermis reticular como una banda de color homogéneo.

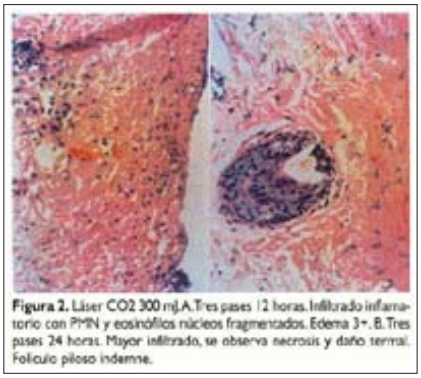


Figura 2. Láser CO2 300 mJ. A. Tres pases 12 horas. Infiltrado inflamatorio con PMN y eosinófilos núcleos fragmentados. Edema 3+. B. Tres pases 24 horas. Mayor infiltrado, se observa necrosis y daño termal. Folículo piloso indemne.

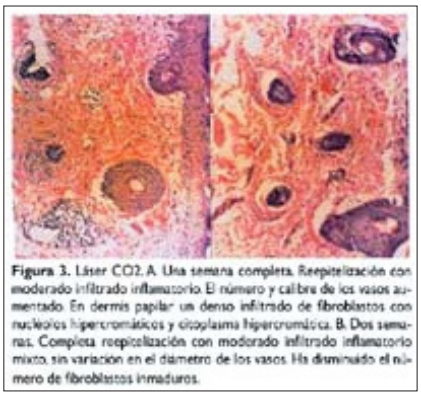


Figura 3. Láser CO2. A. Una semana completa. Reepitelización con moderado infiltrado inflamatorio. El número y calibre de los vasos aumentado. En dermis papilar un denso infiltrado de fibroblastos con nucleolos hipercromáticos y citoplasma hipercromática. B. Dos semanas. Completa reepitelización con moderado infiltrado inflamatorio mixto, sin variación en el diámetro de los vasos. Ha disminuido el número de fibroblastos inmaduros.

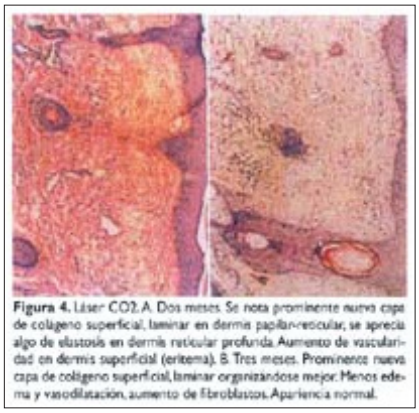
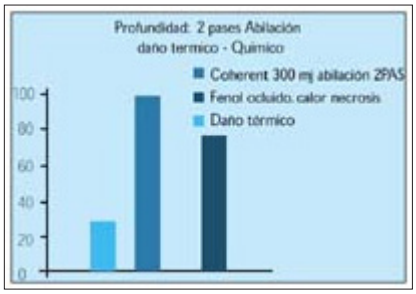
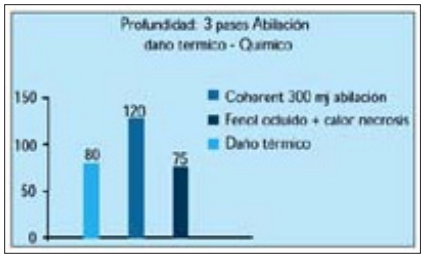
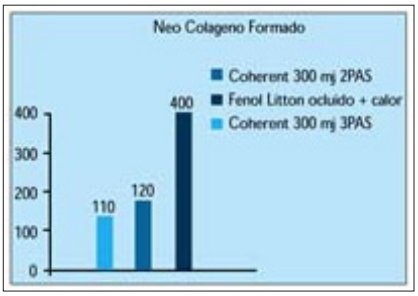


Figura 4. Láser CO2. A. Dos meses. Se nota prominente nueva capa de colágeno superficial, laminar en dermis papilar-reticular, se aprecia algo de elastosis en dermis reticular profunda. Aumento de vascularidad en dermis superficial (eritema). B. Tres meses. Prominente nueva capa de colágeno superficial, laminar organizándose mejor. Menos edema y vasodilatación, aumento de fibroblastos. Apariencia normal.







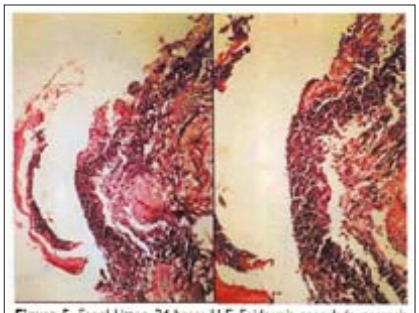


Figura 5. Fenol Litton. 24 horas H-E. Epidermis coagulada, necrosis total. En dermis papilar a reticular media se aprecia necrosis. Infiltrado inflamatorio a linfocitos, PMN y eosinofilos abundante. Anexos con necrosis periferica.

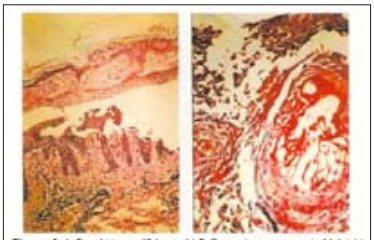


Figura 6. A. Fenol Litton. 48 horas H-E. Capa córnea y capa de Malpighi reemplazada por necrosis y detritus nuclear. Infiltrado inflamatorio en vacuolas. Debajo de la necrosis epidérmica observamos yo regeneración de capas basal y espinosa, no se aprecia granulosa un córnea. Vasodilatación marcada del plexo papilar. Neocolageno compacto que se horizontaliza con abundantes fibroblastos. Abundante infiltrado inflamatorio a predominio de linfocitos y PMN. Edema 4+. Haces de colageno necrotico y en reparación. B. Fenol. 48 horas tricrómica de Masson. Folículo pilosebáceo parcialmente necrosado, se observa regeneración por zonas. Infiltrado inflamatorio y abundante necrosis periférica en dermis reticular profunda.

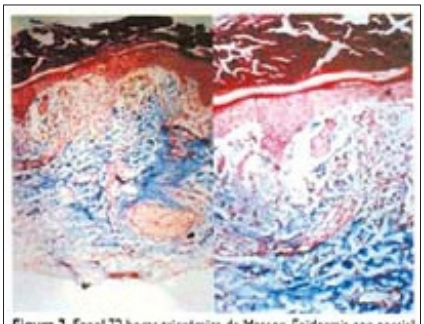


Figura 7. Fenol 72 horas tricrómica de Masson. Epidermis con parcial regeneración bajo la costra de timol yodado. Capa córnea incipiente, no hay granulosa. Necrosis más infiltrado inflamatorio mixto en dermis papilar, abundante neocolágeno organizándose

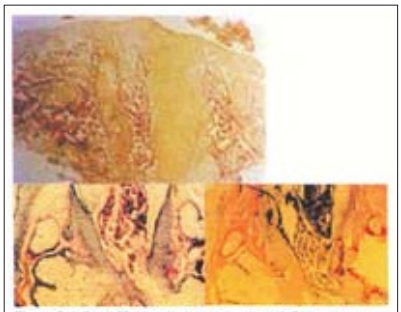


Figura 8. A. Fenol. 72 horas (tinción para colágeno). Epidermis muestra regeneración parcial bajo la costra de timol yodado. Capa córnea incipiente, no hay granulosa. En dermis reticular abundante neocolágeno organizándose alrededor de los anexos, marcado edema. B. Fenol. Siete días tricrómico Masson más tinción especial. Se observa epidermis completa. Vemos un conducto pilosebáceo con material necrótico en su interior.

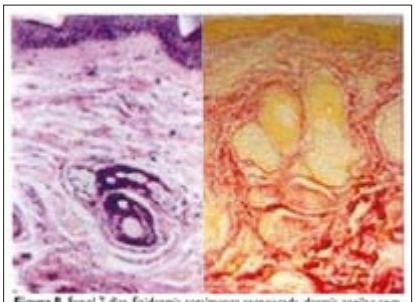


Figura 9. Fenol 7 días. Epidermis totalmente regenerada, dermis papilar compacta con abundantes fibroblastos, dermis reticular con abundante neocolágeno con tendencia a la horizontalización e infiltrado inflamatorio presente por zonas, anexos íntegros, marcado edema.

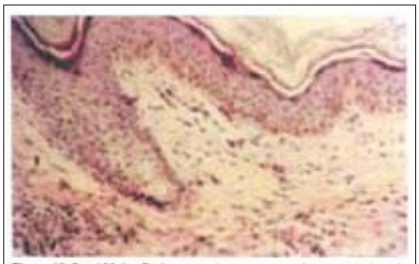


Figura 10. Fenol 30 días. Epidermis totalmente regenerada, presencia de melanocitos con gránulos de melanina en la capa basal. Dermis papilar compacta con abundantes fibroblastos, plexo papilar ligeramente dilatado.

Figura 11. Fenol 90 días. Epidermis totalmente regenerada, plexo papilar proliferado y dilatado, abundantes fibroblastos, abundante neocolágeno e infiltrado inflamatorio presente por zonas, anexos íntegros, tejido necrótico arrepado en haces de colágeno en dermis reticular, edema

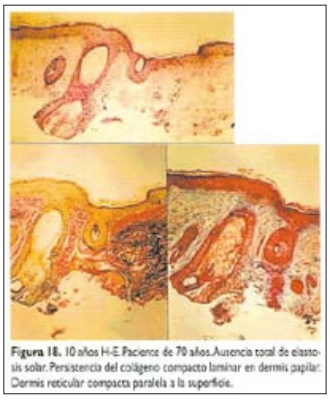


Figura 18. 10 años H-E. Paciente de 70 años. Ausencia total de elastosis solar. Persistencia del colágeno compacto laminar en dermis papilar. Dermis reticular compacta paralela a la superficie.

For our study settling De Rossi Fattaccioli & Litton we use penetrates deeper and more extensive than that of Backer-Gordon used as heat, so the area neocolágeno is greater than that of other studies.

The solution of phenol-oil crotón hot act seems more active, more depth and substance in the presence of water in the central and reticular dermis and therefore despite being less destructive and aparatosa initially treatments resurfacing penetrates active and very evenly and necrosis was seen in the dermis respects Annex in its media and lower portion, from which happen regeneration integument.

Also, the tape says with occlusion and increases its penetration. In this study the results of the resurfacing with phenol prove without doubt that there is a significant and major destruction of the epidermis and dermis lattice-half deep and that the area neocolágeno is directly proportional to this extent and compaction destruction observed since first day.

The histological findings confirm the prior described in the literature (14-25).

With respect to the results obtained by the pulsed laser system are described the benefits of laser resurfacing [1-7,10-13].

The depth of customized ablation were described for two to three passes in the same areas of the face. The results measured the third month showed that the deposits of new collagen dermal replaced the elastosis of photodamaged skin that was vaporized or thermally affected.

In recent publications found that with respect to the laser ablation-destruction CO_2 coherent ultrapulsado to 350 mg dose passes, the penetration was 105 + μ m with a thermal insult of 37 + 6 μ m. A 500 mJ penetration was 134 + 13 μ m and the thermal insult 50 + 7 μ m.

The peeling of phenol-Backer Gordon caused penetration-destruction of 41 + 8 μ m not occluded and 56 + 10 μ m occluded. For the 3 months with a CO_2 laser 350 mJ area neocolágeno was formed 150 + 18 μ m and 500 mJ 190 + 20 μ m.

With the resurfacing phenol not ocluidoneocolágeno thickness was 260 + 22 μ m. With occlusion was 350 + 20 μ m demonstrating that the phenol Backer taking lower-penetration destruction nearly doubled the length (length-width-volume) of the new zone of collagen formed [24].

With respect to CO_2 laser ultrapulsado, atrophy and epidermal skin atrophy own photo damaged and the elastosis were eliminated. Biopsies showed normal regeneration of skin, the melanocytes showed hyperplasia and hypertrophy ranging normalization with time. The density and operation Melanocytic appear normal. All biopsies showed a substantial increase in final training neocolágeno in the papillary dermis and lattice surface, a similar degree of proliferation of elastic fibers and decreased glycosaminoglycans. The latter are typically present in the dermis of photodamaged elastosis. The melanocytes epidermales then 2 months appear completely normal [25.26].

With regard to deep resurfacing chemical phenol-oil crotón, is shown rising at the beginning and glycosaminoglycans that starts to decline from the day 30 for normalized since the day 60 (27). The elastic fibers show a marked morphological change. These fibers in the area of skin regenerated were immature, seemingly fragile and scattered at six months of treatment. The tensiométricos preliminary analysis of the skin treated with phenol six months later indicated that the elastic fibers were thinner and weak appearance [28].

Our study showed that both treatments are effective, safe and predictable results, performance and longer clinically give a lot of satisfaction to those who practised as treated patients. Neocolágeno deposits, new elastic fibers are obvious and histologically proven. All histological signs of photo damage (solar elastosis) are replaced with new tissue with a reorganization of the structural elements dermal and an increase in the volume dermal.

The resurfacing chemical phenol-oil crotón being less pervasive is the one that produces more collagen, and the formula for Litton - hot is producing more than the neocolágeno Backer-Gordon comparing the last histological study, therefore, produces effects remarkable and enduring than any other method of rejuvenation.

All precautions must be taken into account when carried out by the high possibility of complications to be as sensitive-dependent to a doctor who performs at his technique and training.

While the CO_2 laser resurfacing ultrapulsado have been presented as a weapon safer with technology that supports the optional, not producing hypopigmentation of phenol, with erythema that lasts longer but that is reversible, being more attractive to younger patients. The thermal damage still is a controversial topic in regard to its actions in the formation of collagen.

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