Chemical peels: review and practical applications

Peelings químicos: revisão e aplicação prática

ABSTRACT
Cosmetic-driven research currently yields an avalanche of products and treatments for all dermatological sub-segments. Many treatments aimed at rejuvenating skin have been developed. Although chemical peels have now been used for more than a century—and despite the availability of new technologies—the treatment is still widely known and employed due to its practicality, low cost, and excellent results. The present study offers a review of all types of peelings recognized by the scientific literature—from the most superficial to the deepest—compiling the practical experience of the authors and detailed descriptions of the application technique, results, and complications.

Keywords: chemexfoliation; phenol; skin.

INTRODUCTION
An ever-growing number of peelings have continued to arise, improving on or being associated with existing ones, or innovating with new formulas. The controlled therapeutic desquamation caused by these procedures is a powerful weapon in the treatment of various diseases and aesthetic disorders. Their main indications are the treatment of spots, and scars and fine wrinkles, and can be performed on the face and body areas.

The term peeling originates from the English to peel = to come off in sheets or scales, to lose an outer layer, or to strip off. It refers to the application of a chemical agent to the skin that may cause the controlled destruction of part or all of the epidermis, leading to the removal of the lesions with exfoliation, and followed by the regeneration of new tissues.1,2
Chemical peelings

HISTORY

Chemical peelings were first described in Egyptian medicine in 1550 BC, in the Ebers papyrus. Reports are also found in ancient Greek and Roman literature. In previous centuries, some formulas were passed on by peoples of Gypsy origin. Dermatologists began to show an interest in peelings in the nineteenth century. In 1874, in Vienna, the dermatologist Ferdinand Von Hebra used the technique to treat melasma, Addison’s disease, and ephelides. In 1882, in Hamburg, Paul G. Unna described the actions of salicylic acid, resorcinol, trichloroacetic acid (TCA) and phenol on the skin. His early work was followed by a prolific academic production.1

The use of phenol was developed after the First World War, in France. In England, Mac Kee had already used phenol to treat scars, but did not publish his results until 1952. Meanwhile, in the United States during the 1940s, Eller and Wolff provided the first systematic description of the use of phenol, salicylic acid, resorcinol, and dry ice for the treatment of scars. The modern era of peelings began in the 1960’s, with the development of modified solutions of phenol (addition of croton oil, septisol and water) by Baker and Gordon, and with the histological evaluation of results, comparing effects between phenol and TCA. The scientific basis for TCA-based treatments was expanded in the 1970’s and early 1980’s through the comparison of histological effects caused by three different TCA concentrations. Concomitantly, alpha-hydroxy acids (AHA) were developed by Van Scott and Yu for more superficial peelings, which were indicated for the treatment of hyperkeratosis. The glycolic acid-based peeling was developed later on. The combination of two substances aimed at achieving medium depth effects, described by Brody and Hailey, and subsequently by Monheit, lent further progress in the use of peelings. The most recent development is the use of lipohydroxy acid (LHA).4,5

CLASSIFICATION

Peelings can be classified according to depth into:
- Very superficial: removing the stratum corneum (depth = 0.06 mm);
- Superficial: causing epidermal exfoliation of the granular layer up until the basal layer (depth = 0.45 mm);
- Medium: reaching the papillary dermis (depth = 0.6 mm)
- Deep: reaching the midreticular dermis (depth = 0.8 mm). The deeper the peelings, the more apparent the results—however risks and discomfort in the period after the procedure will also increase.

The criteria used in the indication of each peeling type include age, skin phototype, body area to be treated, degree of photoaging, results sought, and the skillfulness of the applicator physician, in addition to factors intrinsic to each patient.1

The absorption of the medications varies according to:
- Characteristics of the skin: thickness of the epidermis, density of the follicles, degree of photo-agression, gender (male skin is oilier, hampering penetration), skin phototype (the lower the phototype, the greater the penetration), integrity of the epidermal barrier, previous preparation, cleansing prior to the exfoliating agent application, previous procedures, and recent use of oral isotretinoin;
  - Chemical agent: physico-chemical characteristics, volume, concentration, vehicle, duration of exposure;
  - Application technique: use of swabs, brush, gloved fingers or gauze, occlusion or not of the treated area, pressure and friction during application, number of layers and frequency of the procedure.

The doctor must have adequate knowledge of the different agents for chemical exfoliations, of the skin regeneration process, of the technique, and of how to identify and treat complications.1

PRIOR PREPARATION

When indicating a peeling, the physician must consider the patient’s psychological profile, professional activity, and time available for recovery. Detailed information must also be provided through educational material, indicating the necessary preparation beforehand, and clarification on the period of desquamation and expected benefits.

The anamnesis must include the patient’s medical history, degree of exposure to the sun, occupation, herpes simplex history, treatment with isotretinoin in the previous six months, tendency for developing keloids and post-inflammatory hyperpigmentation, use of medications, immune impairment, and smoking habits, which despite not being relevant in superficial peelings, can cause alterations to the outcome of deep procedures. For phenol peelings, it is necessary to investigate systemic diseases in general and heart diseases in particular.

In the dermatological examination it is necessary to investigate the patient’s phototype, degree of photoaging, and sebaceous activity (oily or dry). In addition, the presence of post-inflammatory hyperpigmentation, the presence or history of keloids, and preexisting infection or inflammation must be verified.

The preparation must be initiated at least two weeks prior to the procedure, since it reduces the healing time, allows a more uniform penetration of the agent and decreases the risk of post-inflammatory hyperpigmentation. Very superficial peelings do not need previous preparation, however deeper peelings require it in proportion to the desired depth. The preparation is carried out with substances that provide a conditioning effect on the skin. Formulas containing retinoic acid (from 0.025 to 0.1%) and/or glycolic acid (5 to 10%), associated or not with depigmenters such as hydroquinone (2.5 to 5%), kojic acid (1 to 2%) or phytic acid, are used in vehicles appropriate for each skin type.6 Care with exposure to the sun is essential, even before the application of the peeling. Sunscreens with a high SPF and moisturizers are indicated throughout the process of the skin’s recovery. Patients with a history of herpes simplex must undergo prophylactic antiviral therapy (acyclovir 200mg—4/4 hours or valacyclovir 500mg—12/12 hours, for five days).

It is mandatory to obtain the informed consent of the patient and carry out a photographic documentation.
The following observations are important for the safe application of the *peelings*:
- Avoid applying on irritated, erythematous, or inflamed skin
- Always have available the neutralizing substance of the chemical agent being used
- Use the pain scale (ranging from 1 to 10)
- Be continuously aware of visual signals, such as erythema and whitening (frosting), which help to identify the degree of penetration of the substances and the depth reached (Figure 1)
- Very superficial *peelings*: erythema only
- Superficial *peelings*: arboriform frosting with erythema on the background
- Medium depth *peelings*: uniform and solid frosting

**SUPERFICIAL AND VERY SUPERFICIAL PEELINGS**

As superficial and very superficial *peelings* affect only the epidermis, the best results are obtained with serial applications, performed at short intervals. The subsequent desquamation is usually thin and pale in color, and does not have an impact on the patient’s daily routine. These *peelings* improve the skin texture, are adjuvants in the treatment of acne, lighten spots, and attenuate fine wrinkles in addition to stimulating collagen renewal.

**Agents for very superficial *peelings***:
- 30% glycolic acid, for one to two minutes
- Jessner’s solution, one to three layers
- 30% salicylic acid
- 20-30% resorcinol, for five to ten minutes
- 10% trichloroacetic acid, one layer
- Lactic acid
- Phytic acid

**Agents for superficial *peelings***:
- 10% retinoic acid
- 50-70% glycolic acid, for two to 20 minutes
- 10-25% trichloroacetic acid
- 40-50% resorcinol, for ten to 20 minutes
- Jessner’s solution, four to ten layers
- Mandelic acid
- Pyruvic acid
- Thioglycolic acid

**MEDIUM DEPTH PEELINGS**

Medium *peelings* cause thick and dark desquamation, demanding between 7 to 15 days for the return to normal life. They are indicated for keratoses (precancerous lesions) and more pronounced wrinkles.

**Agents for medium *peelings***:
- 70% glycolic acid, for 3 to 30 minutes
- Jessner’s solution + 35% trichloroacetic acid
- 70% glycolic acid + 35% trichloroacetic acid
- 35-50% trichloroacetic acid

**DEEP PEELINGS**

Deep *peelings* are stronger and more aggressive than other procedures. They cause the formation of numerous thick crusts, and the post-peeling may require the use of dressings. The recovery time may last up to three months. This peeling depth leads to significant results, with a major renovation of the skin and a decrease of deep wrinkles, such as wrinkles located around the mouth and eyes.

**Agents for deep *peelings***:
- Phenol
- Baker’s solution

**COMBINED DEPTH PEELINGS**

When aiming at obtaining more noticeable results in shorter times, the combined *peeling* technique—which corresponds to the association of two types of substances in the same session—can be used. It takes advantage of the best effects of each substance, resulting in a more efficient action without unnecessary deepening. For example, Jessner’s solution can be combined to 35% TCA; or 10% TCA can be combined with 5-10% retinoic acid; or even 70% glycolic acid can be combined with resorcinol, one over the other.

It is also possible to use different acid types and concentrations according to the alterations of each area of the face. Medium depth *peelings* can be used only in sites where photaging is more pronounced, using weaker acids in areas where the damage is more limited. In this manner, the more intense side effects remain restricted to places where stronger acids were used, reducing the discomfort in post-peeling. The adjustment of the depth must follow the concept of aesthetic units.

For the rejuvenation of middle-aged patients with photodamaged skin, the following can be used (Figure 2):
化学剥脱：逐一（根据个人情况）

- 正前方、面颊和下颌区域：Jessner溶液 + 35% TCA
- 眼周区域：88% 苯酚
- 上唇区域：贝克溶液。

化学剥脱：逐一（根据个人情况）

视黄酸剥脱

它用于浓度范围为5-12%的溶液。它可以使用带色凝胶、乳液、乳霜或丙二醇基底。

其作用机制包括：
- 真皮角质层的变薄和压缩
- 恢复表皮细胞的异形
- 真皮色素的分散
- 激活真皮胶原沉积
- 增加真皮粘多糖沉积
- 增加真皮新生血管

它可用于中度至轻度的光老化、色斑、皮损和炎症后色素沉着（图3）。它不推荐用于孕妇。在应用之前，皮肤必须用酒精去除所有油脂。这可以通过戴手套、纱布或刷子进行。应用后，剥脱将形成一种需要持续4至24小时的面膜。然后用水和温和的肥皂或清洁乳液去除。应用可以序列化，每周或每月。该程序的并发症很少，包括典型的水疱、睑花斑和轻度角膜炎。

葡萄糖酸剥脱

葡萄糖酸是2-羟基乙酸（2-羟基乙酸）存在于甘蔗或由甲醛合成的。由于其渗透性高度可变，它不适合中度或深度剥脱，更常用于浅度剥脱。其渗透可能根据处方的pH而变化。pH越低，葡萄糖酸越容易渗透，特别是对敏感区域。70%葡萄糖酸（GA）溶液的pH 2.75时，48%的自由葡萄糖酸。当pH为0.6时，所有的酸成分都将自由。50% GA溶液在pH 1.2时有48%的自由葡萄糖酸。

溶液的呈现形式可以是水溶液或酒精、丙二醇的混合物，或以凝胶形式，这有助于应用（图4）。应用后，用刷子或纱布彻底清洗皮肤。皮肤必须持续观察，以防止烧伤。白色灰色的出现对应于表皮溶解，霜状的出现意味着真皮损伤。

葡萄糖酸在3至7分钟内对皮肤类型起作用。因为它不被吸收，所以无毒性。需要用水或10%的碳酸氢钠中和。它用于活跃性痤疮、色斑和轻度日光性皮炎。定期葡萄糖酸剥脱（每两周一次），可以获得非常好的结果。感染和疤痕是正常的，只要程序进行得当。14-15

Herpes labialis must be prevented with oral
Yokomizo VMF, Benemond TMH, Chisaki C, Benemond PH

Lactic acid peeling
Lactic acid is an alpha-hydroxy acid, used at 85%, pH 3.5 in hydroalcoholic solution, with activities similar to those of glycolic acid. It can be used as a peeling agent in the treatment of melasma. It is a low cost and easy to use product.

The first pilot study was carried out by Sharquie et al., who showed that it was a safe and effective peeling agent for the treatment of melasma in dark skins.16

Phytic acid peeling
Phytic acid is an alpha-hydroxy acid that has efficiency at low pH and does not require neutralization.17 It has progressive and sequential therapeutic action, in a non-aggressive manner. It does not cause a burning sensation. The solution is applied to the face and left until the following day. It can be repeated weekly or twice weekly should faster effect be required, up to a total of five or six sessions. It is very safe and effective agent for the treatment of melasma in dark skins.16

Pyruvic acid peeling
This is performed in concentrations of 50%, 60%, and 80% of the acid, diluted in ethanol. Pyruvic acid is an alpha-keto acid. Its mechanism of action is the epidermolysis, which takes place in 30 to 60 seconds. It penetrates the skin in one to two minutes, and has no systemic toxicity.

It is indicated for the treatment of extrinsic aging, acne, and superficial scarring due to its keratolytic, antimicrobial, and anti-seborrheic properties as well as its ability to stimulate the formation of new collagen and elastic fibers.18

After previously removing skin oils with alcohol, it can be applied with a damp gauze using mild pressure. When erythema followed by frosting arise (between two and five minutes), it must be removed with water, for the patient's comfort.

The erythema resulting from the treatment can last from 15 days to two months.

Pyruvic acid can decompose over time, forming carbon dioxide gas and acetaldehyde; these vapors, if inhaled, may be caustic and irritating to the upper respiratory tract. Prevention is achieved with the use of a fan during application.

It is important to note that pyruvic acid peeling is a product whose penetration is unpredictable, and thus must be used with caution. Its very fast penetration can lead to the formation of scars.16

A recent study in patients with Fitzpatrick skin types II and III was conducted by Berardesca et al., who used a new, less inflammatory formulation (50% pyruvic acid) with significant benefits in its tolerability—mainly linked to burning sensation—during application and in the post-peeling.19

Salicylic acid peeling
Salicylic acid is a beta-hydroxyacid, formulated at 20 or 30% in alcohol solution or at 40 or 50% in ointment, for application in upper limbs. It has keratolytic action and can promote very superficial or superficial peeling.

It is indicated for mild to moderate photaging, melasma, and superficial acne scars, and is an exellent agent for treating any skin disorder in people with dark skin types.20 It is contraindicated in patients allergic to salicylic acid.

Formulations
Solution: Salicylic acid (20 or 30%) / ethanol 96 °GL (30m) / acrylate copolymer (colophony) - qsp (the copolymer has adhesive action on the skin, providing the formation of a salicylic acid film as the ethanol evaporates).

Ointment: Salicylic Acid (40 or 50%) / Methyl salicylate sodium (16 drops) / Solid petrolatum (112g).

Application method: After degreasing the skin with alcohol, apply one or two layers of 20 or 30% salicylic acid with gauze or brush. As penetration is limited, the number of layers is not relevant. Wash with mild soap and water after five minutes. Do not apply over large areas and avoid applying in patients with renal insufficiency.

The percutaneous absorption of salicylic acid can lead to
Salicylic acid peelings, which can be characterized as:
- mild: rapid breathing, ringing in the ears, hearing loss, dizziness, nausea, vomiting and abdominal pain
- severe: alterations in the central nervous system with mental disturbances (similar to alcoholic intoxication)

Other possible complications are allergic reactions (rare) and post-inflammatory hyperpigmentation. More recently, a new derivative of salicylic acid was introduced with the addition of a lipid chain (liphohydroxy acid), which has higher lipophilicity in comparison to salicylic acid, promoting a more specific mechanism of action and greater keratolytic effect. It also modifies the stratum corneum making it thinner, more flexible and more resistant to wrinkling and cracking. Although it has shown good results in patients with acne, its effectiveness in melasma is still being studied.

Salicylic and mandelic acids peeling
This is a combination of a 20% beta-hydroxy acid (salicylic acid) with a 10% alpha-hydroxy acid (mandelic acid). It is still not frequently used. In addition to the benefits of the combination—in which the salicylic acid penetrates rapidly and the mandelic acid penetrates the epidermis slowly and evenly, which is ideal for sensitive skins—it has the added benefit of preventing post-inflammatory pigmentation, making it especially useful for ethnic skins. It is indicated for the treatment of acne, post-acne scars, and dyschromias, including melasma. Studies by Garg et al. demonstrate that the combination of salicylic and mandelic acids is more effective in treating active acne and post-acne hyperpigmentation than the traditional glycolic acid peeling, with fewer side effects.

Thioglycolic acid peelings
Also known as mercaptoacetic acid, it is a compound that includes sulfur with a molecular weight of 92.12 (between trichloroacetic and glycolic acids, with 76.05 and 163.4, respectively). It is highly soluble in water, alcohol, and ether, being easily oxidated. Concentrations of 5-12% are typically used in the approach of hemosiderotic hyperchromies. Its affinity for iron is similar to that of apoferritin—with the capacity to chelate hemosiderin's iron—for presenting the thiolic group.

It is an organic acid. As an agent for chemical peelings, it can be used to treat constitutional periocular hyperchromia, and in hemosiderin deposits (such as the ochre dermatitis of the legs) it proves to be an excellent therapeutic adjuvant in the approach to these dermatoses.

Serial and progressive thioglycolic acid peelings are seen as safe, efficient, and cost-effective therapeutic tools to treat constitutional periocular hyperchromia (Figure 5). Application method: After removing body oils in the periocular region with 70% alcohol (with the aid of swabs), 10% thioglycolic acid gel is applied to the lower eyelid, observing the limits of the cosmetic unit. In the first session, the product is removed with gauze after two minutes of agent contact with the skin. The area must be subsequently washed with water in order to remove the substance completely. It can cause mild discomfort associated with mild erythema. In case of contact with the ocular conjunctive, the latter must be washed vigorously, given that the product has low ocular toxicity. Two or three days later, the skin is expected to be erythematous, sometimes with thin and brownish crusts, and mild palpebral edema. This process can last up to seven days and is directly related to the skin's duration of exposure to the product. Up to five sessions applied with a fortnightly interval are indicated. Three minutes are added to each session, with the duration of the agent contact with skin lasting 15 minutes in the last session.

Biweekly sessions of 15% thioglycolic acid in all pigmented areas can be carried out for the treatment of ochre dermatitis.

Tranexamic acid peelings
Tranexamic acid has been effectively used to reduce hyperpigmentation in patients with melasma through applications of 3-5% tranexamic acid cream, twice a day, at home. The
Resorcinol peeling

Resorcinol is a caustic agent from the phenols group, however with different properties. It can be used as an exfoliant in the form of solutions or ointments, in concentrations ranging from 10-70%, or associated with other substances.

Used in concentrations of 40-60%, an ointment’s penetration increases according to the duration of exposure and the thickness of the layer. It can be applied with a wooden spatula or gloved fingers, and should be left in contact with the skin for up to 20 minutes. After drying, the mask is removed with a spatula, with any residue cleaned off with gauze soaked in water (Figure 6).

The advantages of ointments are stability and low cost. They can be used on darker skins, which are more prone to hyperpigmentation. A disadvantage is the possibility of allergic reaction and intoxication, the probability of which increases with multiple passes.

Indication: acne, dyschromias, fine wrinkles, and post-inflammatory hyperpigmentation.

Jessner’s peeling

The solution developed by Max Jessner is composed of 14% salicylic acid, 14% lactic acid, and 14% resorcinol in 95% ethanol. Salicylic acid is photosensitive and lactic acid absorbs water present in the air, hence the solution is sensitive to light and air. It is suitable for comedonal acne, post-inflammatory hyperpigmentation, mild melasma, and photoaging. Its mechanism of action is based on the salicylic acid and resorcinol’s keratolytic property and the lactic acid’s epidermolysis action. The penetration depends on the number of layers, and medium depth peelings can be used. It can cause a burning sensation, which may (or may not) be helped with water. It can be applied in the face and body (neck, dorsum), nevertheless the procedure must be carried out in only one area per session in order to avoid risk of salicylism.

Application method: After cleansing the skin with alcohol, apply the solution uniformly with a brush, gauze, or cotton. Reapply a new layer after three or four minutes. Rinse with water, removing the crystals of salicylic acid.

Depth levels:
- Level I: one layer. Causes mild erythema and whitish flaking on the surface resembling a powder that can be easily removed
- Level II: two to three layers. A more marked erythema is absorbed, as well as frosting in dotted and thin areas. There is a mild to moderate burning sensation
- Level III: three to four layers. Causes significant erythema, with areas of frosting and moderate burning sensation

Complications are related to the resorcinol’s and salicylic acid’s systemic toxicities, and are based on the absorbed amount of those substances, which in turn vary with the extension of the treated area and number of layers applied. Intoxication by resorcinol causes tremors, circulatory collapse, hematuria, methemoglobinemia, methemoglobinuria, and hypothyroidism. Dizziness or syncope may occur, caused by vasodilation resulting from the use of resorcinol. Prevention of these symptoms can be achieved by preferably carrying out the procedure with the patient lying down and being instructed to stand up slowly at the end of the procedure.

Resorcinol can cause contact dermatitis. In order to prevent this, a prior test with the agent must be carried out in the retroauricular region.

The product should be left on the application area for 15 minutes and re-evaluated after two days. Erythema, edema, and vesicles are indicative signs of allergic reaction.

Jessner’s peeling can be associated to 35% TCA, retinoic acid, and 5-fluorouracil—the latter in the treatment of actinic keratoses. Gary Monheit was the first to popularize the use of the combination of the classic Jessner’s solution with 35% TCA. The use of the Jessner’s solution allows a uniform penetration with low and safe concentrations of TCA. Safoury28 compared the results obtained with the Jessner’s solution combined with 15% TCA and isolated 15% TCA, with significantly better results having been observed on the side treated with the combination.

Trichloroacetic acid peeling

TCA allows the implementation of superficial, medium depth, and deep peelings.
- 10% TCA: superficial peelings
- 10-30% TCA: medium depth peelings
- 35-50% TCA: deep peelings

There is a great risk of scarring when applied in concentrations above 50%, which are not recommended.
In order to prepare a 30% solution, 30 grams of TCA crystals are dissolved in water up until obtaining a volume of 100ml.

The solutions can be applied with cotton swabs or gauze, and 10-20% ointments, with spatulas (Figure 7).

Application method: After removing all skin oils with alcohol, apply the product with slightly moistened gauze. Start from the frontal region, followed by the nose, malar and perioral regions, and eyelids. Evenly distribute the solution mainly in the borders in order to avoid demarcation lines. The goal is to achieve a uniform coating. Reinforce the application in areas where necessary.

It is important to watch for the presence of tears forming in the patient’s eyes, in order to prevent the dilution of the acid and avoid it flowing to areas such as the neck, for example, which must not be affected. It can be helpful to use a fan on the face of the patient to make the application more bearable. Intense hydration and use of sunscreen are recommended throughout the desquamation stage.

The TCA precipitates the epidermis’ proteins, causing necrosis due to coagulation. It is a very versatile peeling, with excellent rejuvenation results and improvement of scars, and as a treatment for actinic keratosis and melasma. It does not cause systemic toxicity.

If methyl salicylate is added, activation of TCA is achieved. The first drug works as a carrier, increasing the degree of penetration and allowing a faster and more intense whitening effect.

Formulation: 35% TCA / 5 to 10% methyl salicylate / 1% Polysorbate / distilled water (qsp).

The addition of saponins also makes its application more uniform.

Formulation: 35% ATA / 5% saponins complex.

Another variation of the TCA peeling is the Obagi Blue Peel®, a compound of fixed concentration of TCA, added to a non-ionic blue base containing glycerin and saponins. In a study of 18 Korean women, this peeling was compared to the application of 1,550nm erbium laser. The improvement in melasma caused by both treatments was significant, with no difference between the two therapies.

**Phenol peeling**

Phenol, or carbolic acid (C₆H₅OH), is derived from coal tar. It has a molecular weight of 94.11 and is in the form of needle-shaped crystals, ranging in color from clear to pink, with a characteristic odor. It becomes liquid when heated, releasing a flammable vapor, and darkens when exposed to air and light. Its melting and boiling points are approximately 39°C and 182°C. It has bacteriostatic effects at minimum concentrations of up to 1%. Above that concentration it has bactericidal action. It acts as a local anesthetic in the skin’s nerve endings. It is oil and fat-soluble and can be quickly removed from the skin with glycerin, vegetable oils, or 50% ethyl alcohol, in case of accidental contact.

When used at a concentration of 88%, it penetrates the upper reticular dermis, coagulates the keratin, and prevents its permeation to deeper levels.

The Baker-Gordon formula (1962) is the more widely known formulation used in peeling, employing phenol in concentrations from 45-55%, promoting deep peeling:

Phenol: 88% phenol + 12% water (3ml) / common or distilled water (2ml) / Soap: liquid hexachlorophene (0.025%, 8
drops) / Croton oil: (3 drops).

Croton oil is extracted from the seed of the Croton tiglium plant and is a component that increases the phenol’s kerato-coagulating capacity and skin penetration by increasing the site’s vascularization. It is deemed a resin, and its bioactivity is due to the free hydroxyl groups (OH), being highly toxic to the skin, causing edema and erythema. It is insoluble in water and highly soluble in alcohol and benzene (phenol is a monohydroxy-benzene).

Because it is a surfactant (detergent), the liquid soap acts as a vehicle in the formulation and reduces the surface tension of the oil present in the skin, removing it by emulsification, thus providing uniform exfoliation. In this manner it also acts to promote penetration. The Baker-Gordon formula is a suspension comprising thin particles of solid component dispersed in a liquid medium and should be agitated before use.

This formulation produces peeling, and is indicated for the treatment of deep wrinkles and actinic keratoses caused by severe photoaging, in any region of the face.

Its proper use requires prior anamnesis, physical examination, and laboratory tests, given that phenol is absorbed systematically from the skin and may cause cardiotoxicity, nephrotoxicity, hepatotoxicity and depression of the central nervous system. Seventy to 80% of phenol absorbed is excreted in the urine 15 to 20 minutes after the application. Tachycardia, ventricular extrasystoles, atrial fibrillation, ventricular fibrillation and electromechanical dissociation may occur. It must be used in a hospital setting due to the mandatory requirement for cardiac monitoring of the patient. Its use should be avoided in cases of heart, kidney, or liver disease, herpes simplex, recent use of isotretinoin, psychological instability, predisposition to keloids, continuous exposure to UV rays, and in skin types IV to VI.

It is a very painful peeling due to the phenol’s action in the intermediate reticular dermis, requiring sedation and analgesics. It is necessary to maintain good hydration with 0.9% saline, before and during the procedure.

The application is carried out with cotton gauze or cotton swabs. Vigorous friction must be avoided, because it could lead to a very fast penetration and increased risk of toxic over-application. The application must start in the largest aesthetic unit of the face (the face is divided into six aesthetic units: frontal, nasal, malar, mentum, perioral, and periorbital), with a waiting time of 10 to 15 minutes before applying in subsequent areas.

Partial or complete occlusion of the face with white impermeable tape can be used to increase penetration. The Baker-Gordon solution combined with occlusion penetrates through to the intermediate reticular dermis, and through to the upper reticular dermis without occlusion. The average procedure lasts 60 to 90 minutes, and the patient should be observed for four hours after its completion. It is recommended that the following medicaments be prescribed post-operatively: hypnotics/anxiolytics for rest, analgesics, antibiotics, and ice compresses. Burning sensation and pain may occur for up to eight hours, and there may be accentuated edema as well. The eyelids can even become protruded. The patient should be instructed to return in 24 hours for psychological support, and in 48 hours for the removal of the dressing.

Applications of three to five 3% boric acid compresses should be administered per day, followed by the application of bacitracin cream or vaselinized ointment with antibiotic, or bismuth antiseptic powder for 7 days. Epidermal regeneration begins within 48 hours and should be complete in about 10 days.
days. Pruritus is a common symptom during the healing process, and can be alleviated with the application of low-strength corticosteroids and ice packs. Erythema and crusting may remain for 14 days. Formation of milia is relatively common, and may disappear spontaneously or by manual extraction (Figure 8).

It is deemed to be extremely effective and must be performed only by physicians.

**Punctuated phenol peeling**

This is a new technique aimed at minimizing possible side effects as well as the recovery time. After removing skin oils with alcohol, demarcation lines are drawn in the areas to be treated. 88% phenol is applied in a punctuated way with the aid of cotton swab sticks. This method of application keeps the tissue around each application point untouched. The points can be arranged in rows over the static wrinkles of the face, resulting in whitish spots, which develop into crusts and desquamate within ten days. Neither sedation nor anesthetics necessary, as the application method is quite tolerable.

Up to five sessions can be applied in monthly intervals. The clinical findings are similar to those resulting from other peeling, i.e. there is a decrease of static wrinkles of the face in the periocular and perioral regions, improvement in the overall texture of the skin, and in the contour of the lips. Histological studies corroborate these observations. The most common complications are:

- pigmentary changes: post-inflammatory hyperpigmentation and hypopigmentation. The latter can be very persistent and often difficult to treat. Topical corticosteroids, tretinoin, hydroquinone, or alpha-hydroxy acids can be used (Figure 9)
- infections: bacterial (Staphylococcus, Streptococcus, Pseudomonas), viral (herpes simplex) and fungal (candida). Must be treated aggressively and appropriately (Figure 10)
- scars are more frequent after medium depth or deep peeling. A proper preparation, the correct choice of peeling agent, and post-operative care can help to prevent this complication
- allergic reactions
- milia
- acneiform eruptions
- demarcation lines

![Figure 9: Hyperpigmentation: Jessner + TCA + Baker periorbital](image)

![Figure 10: Herpes Simplex, post-medium depth peeling](image)

![Figure 11: Persistent Erythema](image)
- textural alterations
- persistent erythema: erythema lasting for more than three weeks is indicative of hypertrophic scarring and must be treated with potent topical corticosteroids (Figure 11)
toxicity:it may occur with salicylic acid, resorcinol and phenol

**REFERENCES**