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Review Article

Revitalize Your Skin: A Comprehensive Review of Chemical peel

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A B S T R A C T

Recent years have seen tremendous progress in the realm of cosmetic science, with chemical peels becoming a well-liked method for improving and rejuvenating skin. In the field of cosmetic science, a chemical peel entails applying chemical solutions to the skin in order to induce controlled skin peeling and exfoliation. The goals of this operation are to minimize small lines, improve the texture of the skin, and treat conditions like hyperpigmentation or acne. The degree of skin penetration and the ensuing consequences are determined by the peel's depth. Chemical peels can be classified as superficial, medium, or deep, with each type providing unique advantages and things to think about. All things considered, they are essential for skin rejuvenation since they encourage the removal of damaged skin layers, exposing skin that is smoother and looks younger.

Keywords- Chemical peel, cosmetic science, exfoliation, skin texture, fine lines, acne, hyperpigmentation, superficial, medium, deep peel, skin rejuvenation.

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INTRODUCTION

Skin anatomy

To comprehend the basic ideas behind chemical peeling, one must have a solid understanding of skin anatomy and typical wound healing. The skin is responsible for protecting the entire body's exterior, as well as immunologic surveillance, thermoregulation, sensory perception, and the management of insensible fluid loss[1].

The epidermis, dermis, and subcutaneous tissue also known as the hypodermis are the three main layers that make up the skin [1,2].

1. Epidermis:

The two main cell types that make up the stratified, squamous epithelial layer that is the epidermis are dendritic and keratinocytes. Based on the architecture of keratinocytes, the epidermis is often separated into four layers.

Stratum corneum- This is the outermost layer, consisting of 15 to 30 layers of highly keratinized dead cells, that acts as a protective barrier.

Stratum granulosum- Under light microscopy, the squamous cells in this layer have a characteristic gritty look, which is a result of an increased keratin protein concentration.

Stratum spinosum- Langerhans macrophage cells are scattered across this stratum.

Stratum lucidum- This layer is deep to the stratum corneum and is only found on the palms and soles of the feet[3].

2. Dermis:

The dermis's primary job is to support and maintain the epidermis[1]. The dermis is a layer of connective tissue that contains a variety of elements, including as blood vessels, sebaceous glands, nerves, and hair follicles[3].It gives the skin elasticity and strength. Through the dilatation and constriction of blood vessels, the dermis also contributes to the regulation of body temperature.

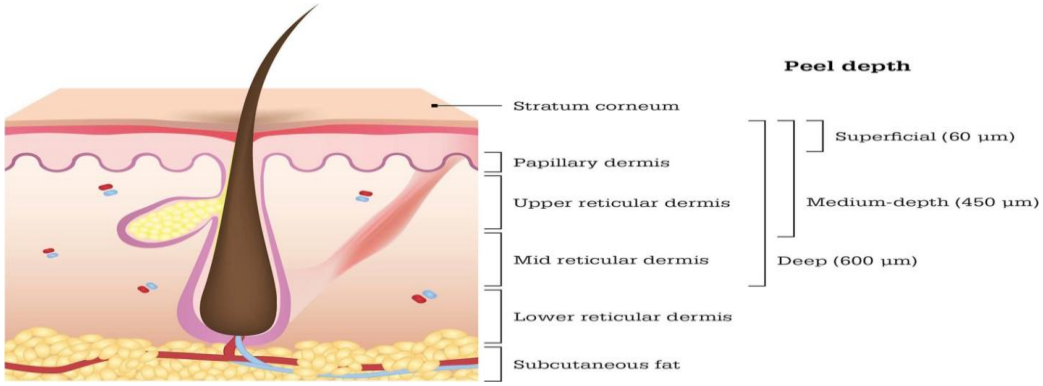

Figure 1: Depth of chemical peel penetration.

Hypodermis (Subcutaneous Tissue):

The lowest layer of the skin, the hypodermis, is sometimes referred to as the subcutaneous tissue and is made up of adipose tissue and loose connective tissue.

Together, these three layers support the skin's structural integrity and functioning, which promotes general health and wellbeing. Every layer has a distinct purpose that is necessary for maintaining body temperature, shielding the body from outside hazards, and enhancing sensory perception.

CHEMICAL PEELS

Chemical peeling is a method used to treat some skin problems or to improve the appearance of skin. When a chemical exfoliant is given to the skin, it breaks down areas of the epidermis and/or dermis, causing the tissues to regenerate and become more youthful[6].

Dermal and epidermal regeneration from nearby epithelium and skin adnexa occurs after the forced exfoliation, improving the skin's surface texture and appearance. This is a straightforward, reasonably priced technique with a variety of dermatological uses [7].

Classification of chemical peels.

Chemical peels are divided into three categories according to the level of penetration: medium (papillary to upper reticular dermis), deep (mid-reticular dermis), and superficial (epidermis–papillary dermis).Several factors determine the depth of the peel, including the type and condition of the skin, the concentration of the chemicals used, and the application technique.[6,7].

The three main types of chemical peels are:

1. Superficial Peels:

Most frequently, moderate skin conditions such actinic keratosis, dyschromia, acne, melasma, and postinflammatory hyperpigmentation are treated with superficial peels[12].

A superficial peeling agent treatment results in a mild apparent exfoliation of the skin. When employing peels based on alpha hydroxy acids, this rarely happens[8].

70% glycolic acid, Jessner's solution (resorcinol, lactic acid, and salicylic acid in ethanol), TCA 10% to 15%, salycilic acid, and retin A peel are examples of light chemical peels[6].

2. Medium Peels:

For pigmentary problems, superficial scars, and sun keratoses or lentigines, medium depth peels are utilized[7].

Peels with a medium depth might produce some irritation in the upper reticular dermis by penetrating both the epidermis and the papillary dermis. The 35% TCA peel has been the typical medium peel.[9].

Using two less strong peeling agents in conjunction is a trendy trend in medium-depth peeling[10].These "combination peels" aim to reduce complications by first pretreating the epidermis with a superficial peeling agent and then applying 35% TCA[11,12].Two of these combination peels the Jessner's solution plus TCA peel and carbon dioxide ice (CO) with TCA peel—have their safety and efficacy well established in the literature[13].

3. Deep Peels:

Deep chemical peels are used to treat precancerous skin lesions, deep scars or wrinkles, and photoaging. Deep peels cause total epidermolysis and coagulate proteins, which results in the clinically seen icing. In order to restore the dermal architecture, deep peels might potentially disrupt the papillary dermis.[14].To attain deep depth peeling, another alpha keto acid linked to AHAs is pyruvic acid. This medication has a limited therapeutic window and occasionally leaves patients with severe scarring. The majority of experts now view this drug as experimental[10].While medium-depth peels target the papillary dermis and encourage the deposition of new collagen, reduce elastic fibers, and boost activated fibroblasts, deep peels act in the reticular dermis.[15].Applying Baker's solution (phenol, croton oil, and septisol) to an anatomic subunit or the entire face, depending on what is appropriate, is the process of the Baker-Gordon phenol peel. When the solution reaches the reticular dermis, it causes severe skin sloughs and, in the end, a noticeable improvement in the deeper rhytides. For certain people, the Baker's peel may result in permanent hypopigmentation. This issue is common but cannot be reversed.

When used incorrectly, the Baker's peel can also cause phenol absorption, which can cause cardiac arrhythmias and kidney damage. Applying the solution gradually, face unit by face unit, over a period of 90 minutes or longer greatly reduces the likelihood of this [16].

Table 1: Classification of Chemical Peels

Depth	Peeling agents	Places of action	Indications	Complications
Very superficial	30-50% Glycolic acid/other AHAs Jessner solution (1-3 layers) 20-30% Resorcinol (for a few minutes)	Entire stratum Corneum preparation	Acne, mild photo-aging	Erythema
Superficial	50-70% Glycolic acid Jessner solution (4-10 layers) BHA (salicylic acid) 40-50% Resorcinol (60 minutes) TCA (10-30%)	Stratum corneum peeling and thicker epidermal layer stimulation	Acne, pigmentation disorders (melasma, post-inflammatory) photo-aging	Erythema, temporary hyper pigmentation, acne form eruption
Medium	70% Glycolic acid (3-30 min) 35-70% TCA Combinations (CO2+35% TCA; Jessner solution 35% TCA, 70% Glycolic acid+ 35% TCA	Damages papillary and upper reticular dermis	photo-aging, fine lines and wrinkles, superficial atrophic scars	Erythema, desquamation, hyper pigmentation, solar lentigines, herpes
Deep	Baker-Gordon phenol formula Phenol 88%	Darriages skin layers by causing necrosis and inflammation in epidermis, papillary and upper reticular dermis	Pigmentation disorders, severe photo-aging, scars	Infections, pigmentation anomalies, scars, cardio toxicity, pain, erythema, herpes

Patient selection

To avoid less-than-ideal outcomes or problems, doctors must customize treatment, obtain a thorough medical history, and examine the patient's skin before selecting the right peeling agent [7]. Individualizing the therapy and carefully choosing the right individuals are essential to the success of a chemical peel.

Age-related gravitational changes, thickness, degree of photoaging, severity of face rhytides, and skin texture must all be taken into account[6,7].

Complexion

Analyzing a patient's skin type and complexion is crucial to figuring out which chemical peels are appropriate for them and which ones are more likely to have pigmentation irregularities complicate the peels. It is common practice to utilize the Fitzpatrick skin type classification (I–VI)[6,9]. Post-inflammatory hyperpigmentation is not typically seen in skin types I through III[6]. however it is not uncommon in type I and II skin types[7]. Individuals with skin types IV to VI are far more likely to experience issues related to hypo- or hyperpigmentation.

Table 2: Table the fitzpatrick scale

Type	Scores	Skin color	Effect of UV	Reaction to sun	Skin tone
I	0-6	Caucasian, blond/red hair, freckles, fair skin, blue eyes	Very sensitive	Always burns, never tans	Very fair
II	7-13	Caucasian	Very sensitive	Usually burns, tans minimally	Fair
III	14-20	Darker Caucasian, light Asian	Sensitive	Burns moderately, tans uniformly	Fair to medium
IV	21-27	Mediterranean, Asian, His- panic	Moderately sensitive	Rarely burns, always tans well	Medium
V	28-34	Middle Eastern, Latin, light-skinned black, Indian	Minimally sensitive	Very rarely burns, tans very easily	Olive or dark
VI	35-36	Dark-skinned black	Least sensitive	Never burn, always tans	Very dark

Patient's lifestyle

The patient's manner of life should constantly be taken into account. It is necessary to guarantee adherence to pre- and post-peel treatment[6]. After a peel, early sun exposure must be avoided; as a result, patients who work outside may not be candidates for chemical peeling[7].

Sex

Generally speaking, men's skin is oilier and thicker than women's. This could result in the peeling agent penetrating unevenly. Men may not be the best candidates for chemical peels due to these reasons[7].

Medical history

A complete medical history, including drug use, is crucial. Treatment choices and the selection of peeling agents may be influenced by medical disorders such as heart, liver, or renal disease. The risk of scarring following a chemical peel increases because previous treatments like radiation or oral isotretinoin diminish the amount of epithelial appendages, which causes reepithelialization to proceed more slowly[6,10].

Superficial Peeling Agents

1. Alpha hydroxy acids

Glycolic acid is the most often used substance for superficial peels.[14,20].Glycolic, lactic, malic, oxalic, tartaric, and citric acids are examples of alpha-hydroxy acids (AHAs), which are carboxylic acids obtained from fruits and vegetables that have been utilized for millennia in cosmetics and cosmetic surgery. Many of them were utilized in their natural forms in Greece and ancient Egypt[17,18].Like other α-hydroxy acids, it causes the melanin to disperse and the epidermis and dermis to thicken with increased synthesis of collagen and mucopolysaccharides[7].The epidermis thickens increases with daily usage of AHAs. Collagen and glycosaminoglycans are deposited more often in the dermis, which causes an increase in dermal thickness. When priming patients with extremely sensitive skin, reddish complexion, telangiectasias, or significant sun exposure, α-hydroxy acids are particularly beneficial[1].More recently, it has been suggested that superficial chemical peeling be done with 70% glycolic acid[20].

2. Pyruvic acid

An α-keto acid called pyruvic acid (PA) biologically transforms into lactic acid. It has a strong peeling effect and a significant chance of leaving scars[17,19].Alpha-keto acid pyruvic acid (CH3–CO–COOH) is physiologically converted to matching alpha-hydroxy acid lactic acid, which is one of the best natural humectants for human skin. Because it combines the humectant properties of lactic acid with the keratolytic activity of an alpha-keto acid, pyruvic acid has the potential to be a novel topical peeling agent. It has recently been utilized to accomplish a superficial to medium-depth peeling with little to no risk of adverse effects at concentrations of 40% to 70% in water and ethanol[17,19].

3. Jessner's Solution (JS)

14% resorcinol, 14% salicylic acid, 14% lactic acid, and 14% ethanol make up Jessner's solution[32]. In order to maximize its penetration, JS peel is frequently combined with other peels[7,32].

Medium-Depth Peeling Agents

TCA

You can apply trichloroacetic acid to get deep, medium, or superficial peels.The concentration of TCA employed is the primary component influencing the peel's depth. 10% to 25% concentrations are utilized for intraepidermal peels, while 30% to 40% concentrations are employed for papillary dermal peeling[1,22,23].TCA peeling, at concentrations between 35 and 50% produces fantastic effects for post-acne scars, particularly for moderate instances of scarring[23].There are several methods to improve the depth and effectiveness of TCA peels without raising the acid's concentration. These include combining TCA with Jessner's solution (Monheit technique), 70% glycolic acid (Coleman method), or solid carbon dioxide (Brody method)[6]. Up to the appearance of white frost, trichloroacetic acid is applied methodically in accordance with the cosmetic units. The depth of solution penetration and icing degree are correlated[6,17].Level I correlates to superficial penetration and is characterized by a white frosting that is speckled and moderate erythema. An uniform layer of white-coated frost with background erythema is indicative of Level II. This level of freezing is often preferred for peels that are medium-depth. Level III is an opaque white frost that is solid with little to no background erythema. It is typically associated with severe peels and is not preferred in TCA procedures (fig.2)[6,27].

Deep-Peeling Agents

Phenol

For years, dermatologists have employed phenol, an aromatic alcohol, as a thorough chemical peel[7]. Deep chemical peeling agents like phenol lead to neocollagenesis by inducing epidermolysis and skin elastolysis[24].Systemic absorption of phenol may result in major adverse consequences, including respiratory depression, liver and kidney damage, and cardiac toxicity[24,25,26].

Figure 2: Frosting pattern on upper lip of a middle-aged woman treated with a local combination peel of alpha hydroxy acid 70%and trichloroacetic acid 40%.

Table 3: Frosting reaction patterns

	Skin Level	Appearance of Skin after Peel
Level 0	Removal of stratum corneum	No frost, skin appears slick and shiny
Level 1	Intraepidermal peel	Irregular, light frost with some erythema, creates 2-4 d of light flaking
Level 2	Full thickness epidermal peel	Pink/white frost, heals in approx. 5 d
Level 3	Superficial retinacular dermis	Solid white frost, additional sign of “epidermal sliding" for papillary dermal peel.

Skin conditions that chemical peels treat

Chemical peels are cosmetic procedures that involve the application of a chemical solution to the skin, causing it to exfoliate and eventually peel off. They can be used to treat various skin conditions and concerns.

It's important to note that the effectiveness of chemical peels can vary, and the type and depth of the peel depend on the specific skin issues being addressed.

Whether you have minor irregularities in your skin pigmentation, slight scarring, or fine wrinkles that are showing your age, you can improve the look and feel of your skin with a chemical peel.

These acidic solutions are great for minor skin issues but aren't designed for deep wrinkles, skin laxity, or severe scarring. If you have any of the following skin conditions, however, chemical peels can make a noticeable difference.

Here are some conditions that can be treated by chemical peels:

Acne vulgaris

Because superficial and medium depth peels are safe and reasonably priced, they are becoming more and more popular as a therapy for acne vulgaris[24,28].Chemical peel also have anti-inflammatory and antibacterial qualities, and they reduce pore size and sebum production[29]. The most often utilized medium- and superficial-depth peeling agents for acne include JS, TCA, SA, and α-hydroxyl acids (GA, LA, etc.)[24,29]. Additionally, acne-related aberrant keratinization can be corrected with glycolic acid[30,31].

Figure 3: Clinical effect of Glycolic & Salicylic peel on Acne

Scarring

A chemical peel might be able to lessen the appearance and feel of a small scar that marries your face. The skilled aestheticians at Gago Wellness assess the size and depth of your scar before creating a unique chemical combination particularly for you.

The purpose of the peel is to get rid of the skin layer containing the scar. Your scar will appear less noticeable since the new skin underneath appears smoother and more youthful.

Figure 4: Clinical effect of Chemical peel on Scarring.

Crow's feet

Your eyes and entire face light up when you laugh and grin. However, there's more to be revealed by the faint lines that remain visible even when you're not grinning. Crow's feet, or those little wrinkles, are some of the earliest indications of aging and start to show when your skin becomes less elastic.

By eliminating the outer layer of your skin and exposing smoother, younger-looking skin, chemical peels can help minimize the appearance of crow's feet and other fine lines and wrinkles. The procedure promotes collagen synthesis and cell regeneration, which could temporarily prevent wrinkles.

Figure 5: Clinical effect of Chemical peel onCrow's feet

Sun damage

You might have neglected to wear sunscreen or overindulged in sun exposure due to the allure of a beautiful summer tan. Should those tans begin to manifest as sun damage, a chemical peel could potentially undo some of the consequences.

Figure 6: Clinical effect of Chemical peel on Sun damage

Age spots, freckles, and melasma

For chemical peels, mild skin discolorations are ideal targets. Chemical peels can help your freckles go away, whether you've started to see age spots popping up sometimes or you no longer think they're cute.

Additionally, melasma—those sporadic, dark blotches that may appear on your face over time—is treated with chemical peels. Expectant mothers refer to this hyperpigmentation as the "mask of pregnancy," and it reacts favorably to the chemical peel procedure. Usually, these kinds of pigmentation anomalies can be reduced with just a superficial chemical peel.

Figure 7: Clinical effect of Chemical peel onAge spots, freckles, and melasma.

Complications

Unexpected results and adverse consequences can be avoided by having a thorough awareness of each agent's chemical characteristics, indications, and application process[7]. Among the possible side effects of chemical peels are-

Tears

Tears streaming down the face may dilute the acid used on the cheek and run down the neck, resulting in a peel in a more easily scarred location. For this reason, it's critical to wipe away any tears and wash any that fall right away. It is possible to apply a petrolatum layer to protect the neck[1].

Pigmentary changes

Patients with darker complexions are more likely to get postinflammatory hyperpigmentation.

it frequently happens as a result of early sun exposure following peeling. Avoiding the sun and using sunscreen every day are crucial for its treatment. Postinflammatory hyperpigmentation may be treated with mild peels that don't cause inflammation, such as 10% TCA, Jessner solution, or 50% to 70% glycolic acid[1]. Following phenol peels, hypopigmentation is correlated with the depth of the peel, volume of solution utilized, quantity of croton oil droplets in solution, natural skin tone, and sun-related behavior following the peel[6]. Because reticular peels destroy melanocytes in the hair follicles, certain patches of persistent hypopigmentation commonly follow[1].

Infection

Deep peels are more vulnerable to infections, which exacerbate the peels and raise the possibility of scarring. Acyclovir or valacyclovir is administered prophylactically to patients with a positive history of herpes simplex infection during medium and deep peels until complete reepithelization is attained. Both topical and oral antibiotics are used to treat infections[1,6].

Scarring

The most terrible side effect of chemical peels is still scarring[6].Those having a documented history of poor healing and keloid development are among them. Additionally, keloid development, hypertrophic scarring, and atrophic scarring could exist.[1]. The lower portion of the face is where scars are most frequently found, most likely as a result of more forceful treatment there or increased tissue movement brought on by eating and talking throughout the healing process.

Cardiotoxicity

Cardiotoxicity is the most significant potential side effect that is unique to peels based on phenol[6]. The heart is immediately poisoned by phenol. Research on rats revealed that systemic exposure to phenol resulted in a decrease in electrical activity and cardiac contraction[32]. Blood phenol levels, age, sex, or prior cardiac history are not reliable indicators of a person's risk of developing a cardiac arrhythmia[33,34]. When chemical peels are conducted correctly, there have been no documented toxicities to the hepatic or central nervous systems in the literature.

CONCLUSION

Chemical peels are aesthetic treatments intended to treat a range of skin issues such as acne, hyperpigmentation, wrinkles, and uneven skin tone. Professionals with the necessary training can conduct these well, but it's important to carefully examine individual considerations including skin type and potential hazards. Chemical peels ought to be customized for individual skin problems, and their application necessitates medical supervision to reduce the possibility of side effects like infection, scarring, and changes in pigmentation. For best outcomes, patients must be fully educated, provide their consent, and get post-treatment care, notably sun protection. Depending on personal preferences and circumstances, alternatives and less intrusive approaches should also be taken into consideration. In general, when performed properly and with an emphasis on patient safety and pleasure, chemical peels can be a useful component of a skincare regimen.

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