DR ANNA MARIA FENECH MAGRIN

# An Overview of Superficial and Medium-Depth Chemical Peels – Part I


## ABSTRACT

A chemical peel is the application of a chemical agent to the skin, which causes controlled and predictable destruction of a part or entire epidermis, with or without the dermis. This ultimately results in an improved appearance of the skin, removal of superficial lesions and regeneration of new epidermal and dermal tissue.


## INTRODUCTION

### Objectives

The primary objective is to discuss the components like pH and composition, that affect tolerability and safety of superficial and medium-depth peels. Another objective is to explain the differences between the different major medium-depth peels and explain how one can recognize the level of injury of superficial vs medium-depth peels.

Over the past decade, facial rejuvenation procedures have become increasingly popular, especially office-based, minimally invasive procedures. This is because they can promote a youthful appearance without the downtime and risk of complications associated with surgical procedures. These procedures include chemical peels, which despite their relative simplicity and reliability, can still carry complications which can happen to the most experienced. Therefore, the goal is to perform the procedures safely and properly with the appropriate preparation and to recognize complications when they occur, to prevent long-term consequences, like scaring and pigmentary changes.

## CHEMICAL PEELS

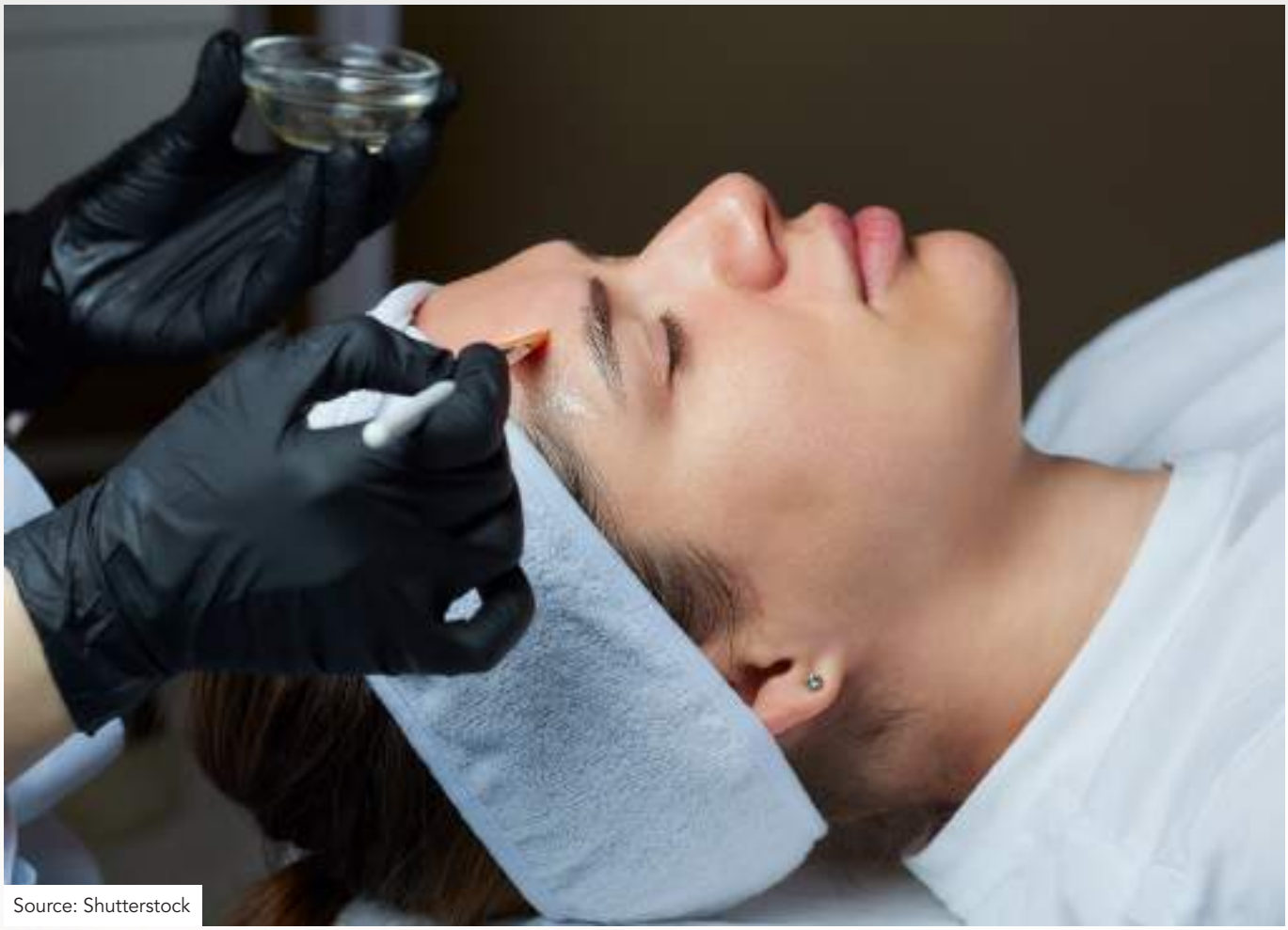
The skin comprises 3 primary layers - the epidermis, the dermis, and the subcutaneous tissue, also referred to as the hypodermis. The epidermis is the top layer of the skin and consists of five layers, i.e. Stratum corneum,

Stratum lucidum, Stratum granulosum, Stratum spinosum, Stratum basale. The epidermis is avascular and contains melanocytes which form the skin pigmentation. The dermis is a connective tissue layer comprising various structures, including hair follicles, nerves, sebaceous glands, and blood vessels. It consists of the papillary layer and reticular layer. The hypodermis is the deepest layer of the skin and is composed of loose connective tissue and adipose tissue.

The effect of a chemical peel depends primarily on the depth of injury of the skin. They are classified according to the depth or wound created by the peel.

**Superficial peels** penetrate the epidermis only.
**Medium-depth peels** penetrate down and produce injury into or through the papillary dermis.
**Deep peels** allow for controlled injury down to the mid-reticular dermis.

A number of factors determine the depth of the peel. These include the type of chemical used, the concentration, the skin type, the mode of application and the number of "passes" on application. One layer of application with certain chemical peels allows for a more superficial peel. If multiple layers are applied, a deeper peeling results. Multiple layers of a superficial peel give different results from a single application of a medium-depth peel. The pKa represents the pH level at which 50% of the chemical is present in a free acid state. When selecting the type of peel, a lower pKa is associated with a more potent peel.



Source: Shutterstock

## PATIENT SELECTION

A complete medical history and skin examination should be conducted by the physician before performing a chemical peel. This will help in the choice of the appropriate peeling agent and helps to prevent complications post-treatment.

The following factors should be considered before performing a chemical peel:

- Patient's psychological state.
- Unrealistic expectations.
- Current medications, like minocycline, and oral contraceptives (these may cause photosensitivity).
- Current or previous infections, like herpes simplex virus (HSV) and other bacterial and fungal infections. If prophylaxis is not given, HSV can be reactivated and delayed wound healing occurs.
- Immunosuppression, like HIV. These patients are at a higher risk of infection and altered wound healing with scarring.
- Recent major surgery, like facelift or brow-lift.
- Pregnancy (avoid).

The Fitzpatrick scale is a tool to classify patients based on skin colour and ability to tan.

It can also be used to evaluate the preprocedural risk of post-peel response and complications.

Patients with skin types IV-VI are at a greater risk of developing post-inflammatory hyperpigmentation. Therefore, special attention must be paid when dealing with dark-skinned patients, and deep peels should be avoided in Fitzpatrick skin types III-VI. Medium-depth peels should only be used by very experienced practitioners in skin types III-VI.[1]

Table 1. The Fitzpatrick scale.[2]

| Skin type | Skin Colour | Tanning History |
|---|---|---|
| I | White | Always burns, never tans |
| II | White | Usually burns, tan with difficulty |
| III | White | Sometimes mild burn, tan average |
| IV | Moderate brown | Rarely burns, tan very easily |
| V | Dark brown | Very rarely burn, tan very easily |
| VI | Black | No burn, tan very easily |

## A. SUPERFICIAL PEELS

The commonly used agents include the following:

1. AHAs (Alpha Hydroxy acids)
   - Glycolic acid (30-70%)
   - Lactic acid (30%)
   - Mandelic acid (40%)

2. BHAs (Beta Hydroxy acids)
   - Salicylic acid (20-30%)

3. AKAs (Alpha Keto acids)
   - Pyruvic acid (50%)

### Mechanism of Action

Superficial peels penetrate the epidermis. Dermo-epidermal junction disruption is, however, possible. During the application of superficial peels, controlled keratocoagulation and liquefaction of the cells confined to the epidermis occurs. As superficial peels produce injuries limited to the epidermis, they are indicated to treat conditions confined to the epidermis, like mild acne and epidermal and mixed melasma.[3]

The patient should be advised to avoid any cosmetic treatments with bleaching, depilation, or exfoliation for one week before the treatment. Shaving must also be avoided 24 hours before a peel.

## 1. AHAs

### Glycolic Acid (GA)

This alpha-hydroxy acid is derived from sugar cane. GA is the most common alpha-hydroxy acid peel and has the smallest molecular weight amongst all the alpha-hydroxy acids.[4] It is a highly hydrophilic molecule.

It is used at concentrations of 30 to 50% applied for 1-2 minutes for very superficial exfoliation, at concentrations of 50–70% applied for 2-5 minutes for superficial peels, and 70% GA, applied for 3-15 minutes, is used as a medium-depth peel.[5]

### Indication

GA peels are indicated for the treatment of acne, acne scars, melasma, hyperpigmentation, photoaging, and seborrhoea.

### Mechanism of Action

GA peels have anti-inflammatory, keratolytic, and antioxidant effects. In low concentrations, GA facilitates the weakening of cohesion of intercellular material of the stratum corneum, causing desquamation.[6]

The depth of the GA peel depends on the concentration of the acid used and also, on the number of coats applied and the time for which it is applied.[7]

GA peels are not self-neutralizing, which means that keratocoagulation continues to occur, as long as it remains on the skin. The acid is neutralised by using water or an alkaline neutralising agent, like 10% sodium bicarbonate, ammonium salts or sodium hydroxide.[8] Neutralization is an exothermic process, therefore it can cause increase in warmth, burning or stinging sensation. When the clinical endpoint is reached, in this case erythema, the acid has to be neutralised. GA peels are frequently combined with other peels and treatments, to give better results.

### Application Method

The skin is cleansed and degreased. The degreasing agent, like chlorhexidine, removes surface grease and allows better penetration. The hair is pulled back with a hair band or cap. The patient lies down with the head elevated to 45 degrees and with the eyes closed. The required strength of the peeling agent is poured into a glass beaker. The neutralizing agent is also kept ready. Sensitive areas like the inner canthus of the eyes, and the corners of the nose and lips are protected with petroleum jelly such as Vaseline®. The peeling agent is then applied either with a brush, cotton-tipped applicator or saturated gauze pad. The chemical is applied quickly on the entire face, which is divided into cosmetic units, beginning from the forehead, then the right cheek, nose, left cheek and chin.

[GA] IS USED AT CONCENTRATIONS OF 30 TO 50% APPLIED FOR 1-2 MINUTES FOR VERY SUPERFICIAL EXFOLIATION, AT CONCENTRATIONS OF 50–70% APPLIED FOR 2-5 MINUTES FOR SUPERFICIAL PEELS, AND 70% GA, APPLIED FOR 3-15 MINUTES, IS USED AS A MEDIUM-DEPTH PEEL.

For GA peels, the peel is neutralized after the predetermined duration of time (usually 3-5 minutes). However, if erythema or epidermolysis occurs, seen as a greyish-white appearance of the epidermis or small blisters, the peel must be neutralized immediately irrespective of the duration. Neutralization is done with 10-15% sodium bicarbonate solution or lotion and then washed off with water.

The erythema can rapidly progress to light frosting (level 1), which indicates epidermolysis with separation of the epidermis from the underlying dermis. Care must be taken as this transition to frosting can result in scarring or post- inflammatory hyperpigmentation (PIH).

It is always better to start with a low concentration (20% GA) and increase the concentration and application time during subsequent sessions. Peeling is repeated once every 15 days for 4-6 months until the desired result is achieved.[7]

### Side Effects

Good results and minimal side effects should result if patients are selected properly. The timing of the peel and timely neutralization are also very important. Minor side effects include erythema, burning sensation and transient PIH. In rare cases, blistering and scarring can occur.

### Lactic Acid and Mandelic Acid

Lactic acid is also an alpha hydroxy acid having activities similar to GA. It has a lower pH than glycolic acid at the same concentrations. This allows for efficient peeling at lower concentrations than glycolic acid, with fewer side effects and faster recovery time. It is indicated to reduce fine wrinkling, uneven pigmentation and to improve the texture of sun-damaged skin.[9]

Mandelic acid, a simple phenolic alpha-hydroxy acid is soluble in both water and polar organic solutions, and therefore results in more uniform penetration through lipid-rich areas of the skin. The results are more subtle than those with GA peels. Side effects and downtime are also less. This peel is effective in the treatment of superficial erythema and dyspigmentation, as well as in the reduction of cutaneous sebum production.[10]

## 2. BHAs

### Salicylic Acid

Salicylic Acid is a beta-hydroxy acid and a phenolic compound. It is poorly soluble in water but highly lipophilic, which combined with its low pKa and small molecular size makes it ideal for rapid penetration through the lipid barriers of the epidermis.

It has anti-inflammatory, antimicrobial and depigmenting properties. It is very effective in the treatment of cutaneous disorders involving excess sebum production.[1]

30% salicylic acid is considered the "gold-standard" superficial peel for the treatment of acne.

Salicylic acid is self-neutralizing or self-limiting. However, care must be taken as overpenetration may still occur due to a cumulative dose effect. Multiple layers or long application time may cause rapid and excessive keratocoagulation beyond the epidermis into the papillary dermis. Overpenetration may thus result in PIH.

## 3. AKAs

### Pyruvic Acid

Pyruvic acid is the simplest alpha-keto acid and is partially lipophilic and partially hydrophilic, giving it properties similar to both salicylic and glycolic acid. Pyruvic acid is not self-neutralizing, and has to be neutralised with an alkaline solution when the endpoint is reached. Although pyruvic acid has demonstrated clinical efficacy for the treatment of disorders associated with excess sebum production, it is not as efficacious as salicylic acid which is more lipophilic.[10] At 50% concentration it is also indicated for mild to moderate acne and fine wrinkles.

[to be continued ...]

## REFERENCES


1. Castillo DE, Keri JE. Chemical peels in the treatment of acne: patient selection and perspectives. Clin Cosmet Investig Dermatol 2018;11:365-372.
2. Roberts WE. Skin type classification systems old and new. Dermatol Clin 2009;27(4):529–533.
3. Lee KC, Wambier CG, Soon SL, et al. Basic chemical peeling: superficial and medium-depth peels. Journal of the American Academy of Dermatology 2019;81(2):313-24.
4. Landau M. Chemical peels. Clinics in dermatology 2008;26(2):200-8.
5. Fabbrocini G, De Padova MP, Tosti A. Chemical peels: what's new and what isn't new but still works well. Facial plastic surgery 2009;25(05):329-36.
6. Fartasch M, Teal J, Menon GK. Mode of action of glycolic acid on human stratum corneum: ultrastructural and functional evaluation of the epidermal barrier. Archives of dermatological research 1997;289:404-9.
7. Sharad J. Glycolic acid peel therapy–a current review. Clinical, cosmetic and investigational dermatology 2013;6:281-8.
8. Dayal S, Sahu P, Sangal B, et al. Role of chemical peels in postinflammatory hyperpigmentation: a comprehensive review. Pigment International 2019;6(2):59-66.
9. Sachdeva S. Lactic acid peeling in superficial acne scarring in Indian skin. Journal of Cosmetic Dermatology 2010;9(3):246-8.
10. Soleymani T, Lanoue J, Rahman Z. A practical approach to chemical peels: a review of fundamentals and step-by-step algorithmic protocol for treatment. The Journal of clinical and aesthetic dermatology 2018;11(8):21.