Chapter 6

Salicylic Acid

6

Pearl E. Grimes

The author has no financial interest in any of the products or equipment mentioned in this chapter.

Contents

6.1 History

P.G. Unna, a German dermatologist, was the first to describe the properties and use of salicylic acid. It has since been used for many decades as a keratolytic agent in concentrations of 3 to 6%. Salicylic acid is frequently utilized in topical acne preparations because of its comedolytic effects. In addition, it facilitates the penetration of other topical agents.

6.2 Chemical Background/Properties

Salicylic acid (ortho-hydroxybenzoic acid) is a beta hydroxy acid agent (Fig. 6.1). It is a lipophilic compound which removes intercellular lipids that are covalently linked to the cornified envelope surrounding cornified epithelioid cells [1]. Due to its antihyperplastic effects on the epidermis, multiple investigators have used salicylic acid as a peeling agent [2, 3, 4]. Recently, histologic assessments using salicylic acid peels in hairless mice reported loss of cornified cells followed by activation of epidermal basal cells and underlying fibroblasts. These findings suggest that salicylic acid peeling can alter the underlying dermal tissue without directly wounding the tissue or causing inflammation [5]. Salicylic acid has also been shown to have anti-inflammatory and antimicrobial properties. When used in combination with benzoic acid in Whitfield's ointment, it has fungicidal properties.

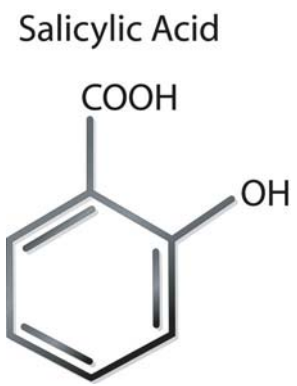


Fig. 6.1. Chemical structure

6.3 Formulations

A variety of formulations of salicylic acid have been used as peeling agents. These include 50% ointment formulations (Table 6.1) [2, 3], as well as 10, 20 and 30% ethanol formulations (Table 6.2) [4, 6]. More recently, commercial formulations of salicylic acid have become available (BioGlan Pharmaceuticals Company, Malvern, PA; Bionet Esthetics, Little Rock, AR).

6.4 Indications

The efficacy of salicylic acid peeling has been assessed in several studies. Fifty percent salicylic acid ointment peeling was first used by Aronsohn to treat 81 patients who had freckles, pigmentation, and aging changes of the hands [3]. He reported excellent results. Subsequently, Swinehart [7] successfully used a methyl-salicylate buffered, croton oil-containing, 50% salicylic acid ointment paste for treatment of lentigines, pigmented keratoses and actinically damaged skin of the dorsal hands and forearms. After pretreatment with topical tretinoin and localized TCA 20%, the 50% salicylic acid paste was applied to the affected area and occluded for 48 h. Following dressing removal, peeling and desquamation occurred and was relatively complete by the tenth day. Overall results were described as excellent. Despite these results, salicylic acid peeling did not move into the arena of popular peeling techniques until the mid 1990s. Kligman and Kligman [4] ushered salicylic acid into the current arena of superficial peeling agents. They treated 50 women with mild to moderate photodamage, reporting improvement in pigmented lesions, surface roughness and reduction in fine lines.

Grimes et al. [8] reported substantial efficacy and minimal side effects in 25 patients treated with 20 and 30% salicylic acid peels in darker racial-ethnic groups. Conditions treated included acne vulgaris, melasma and post-inflammatory hyperpigmentation.

Thirty-five Korean patients with facial acne were treated biweekly for 12 weeks with 30% salicylic acid peels [9]. Both inflammatory and non-inflammatory lesions were significantly improved. In general, the peel was well tolerated with few side effects.

Given these findings, indications for salicylic acid peels include acne vulgaris (inflammatory and non-inflammatory lesions), acne rosacea, melasma, post-inflammatory hyperpigmentation, freckles, lentigines, mild to moderate photodamage, and texturally rough skin.

Table 6.1 Formulations of salicylic acid: salicylic acid ointment

Salicylic acid powder USP	50%
Methyl salicylate	16 drops
Aquaphor	112 g

From Swinehart [7]

Table 6.2 Formulations of salicylic acid: salicylic acid solutions

Salicylic acid peel %	Weight of salicylic acid powder (g)	Amount of ethyl alcohol 95% (cc)
10	10	100
20	20	100
30	30	100
40	40	100
50	50	100

From Draelos [6]

6.5 Contraindications

In general, there are few contraindications to salicylic acid chemical peeling. Salicylic acid peels are well tolerated in all skin types (Fitzpatrick's I–VI) and all racial/ethnic groups. General contraindications include salicylate hypersensitivity/allergy; unrealistic patient expectations; active inflammation/dermatitis or infection at the salicylic acid peeling site; acute viral infection; pregnancy; and isotretinoin therapy within 3–6 months of the peeling procedure. The author has performed more than 1,000 salicylic acid peels without observing any

evidence of salicylate allergy/hypersensitivity following a salicylic acid peel.

6.6 Patient Preparation

Peel preparation varies with the condition being treated. Regimens differ for photodamage, hyperpigmentation (melasma and post-inflammatory hyperpigmentation) and acne vulgaris [10]. In addition there are special issues to be considered when treating darker racial-ethnic groups (see darker skin section). A detailed history and cutaneous examination is performed in all patients prior to chemical peeling. Standardized photographs are taken of the areas to be peeled including full-face frontal and lateral views.

Use of topical retinoids (tretinoin, tazarotene, retinol formulations) for 2–6 weeks prior to peeling thin the stratum corneum and enhance epidermal turnover. Such agents also reduce the content of epidermal melanin and expedite epidermal healing. Retinoids also enhance the penetration of the peeling agent. They should be discontinued several days prior to the peeling procedure. Retinoids can be resumed post-operatively after all evidence of peeling and irritation subsides. In contrast to photodamage, when treating conditions such as melasma, post-inflammatory hyperpigmentation, and acne as well as darker skin types, retinoids should be discontinued 1 or 2 weeks before peeling or even eliminated from the prep to avoid post-peel complications such as excessive erythema, desquamation, and post-inflammatory hyperpigmentation.

Topical alpha hydroxy acid or polyhydroxy acid formulations can also be used to prep the skin. In general, they are less aggressive agents in impacting peel outcomes. The skin is usually prepped for 2–4 weeks with a formulation of hydroquinone 4% or higher compounded formulations (5–10%) to reduce epidermal melanin. This is extremely important when treating hyperpigmentation. Although less effective, other topical bleaching agents include azelaic acid, kojic acid, arbutin, and licorice (see photoaging section). Patients can also resume use of topical bleaching agents post-operatively after peeling and irritation subsides.

When treating acne vulgaris, topical and systemic therapies (if indicated) are initiated 2 to 4 weeks prior to peeling. Topical antibiotics and benzoyl peroxide based products can be used daily and discontinued 1 or 2 days prior to peeling. However, unless a deeper peel is desired, retinoids should be discontinued 7–10 days prior to salicylic acid peeling. Broad-spectrum sunscreens (UVA and UVB) should be worn daily (see Photodamage, Sunscreen section).

6.7 Peeling Technique

Despite some general predictable outcomes, even superficial chemical peeling procedures can cause hyperpigmentation and undesired results. Popular standard salicylic acid peeling

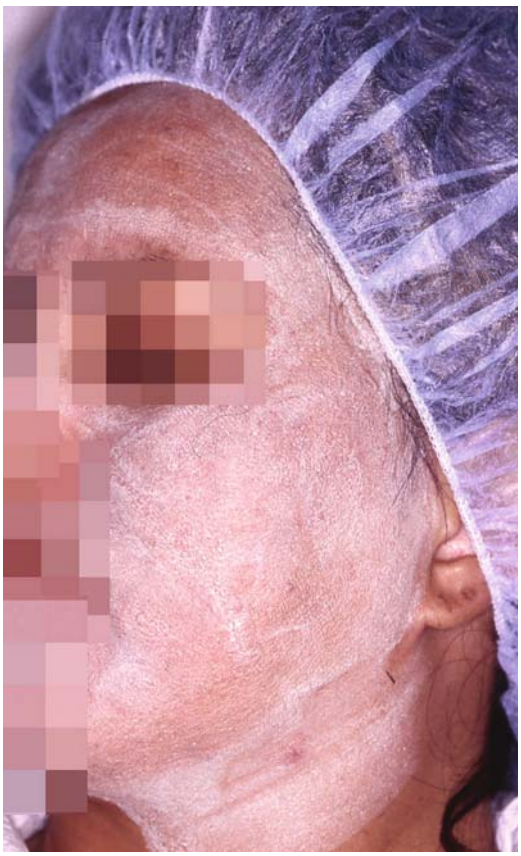


Fig. 6.2. Salicylic acid precipitate

techniques involve the use of 20 and 30% salicylic acid in an ethanol formulation. Salicylic acid peels are performed at 2- to 4-week intervals. Maximal results are achieved with a series of three to six peels.

The author always performs the initial peel with a 20% concentration to assess the patients' sensitivity and reactivity. Before treatment, the face is thoroughly cleansed with alcohol and/or acetone to remove oils. The peel is then applied

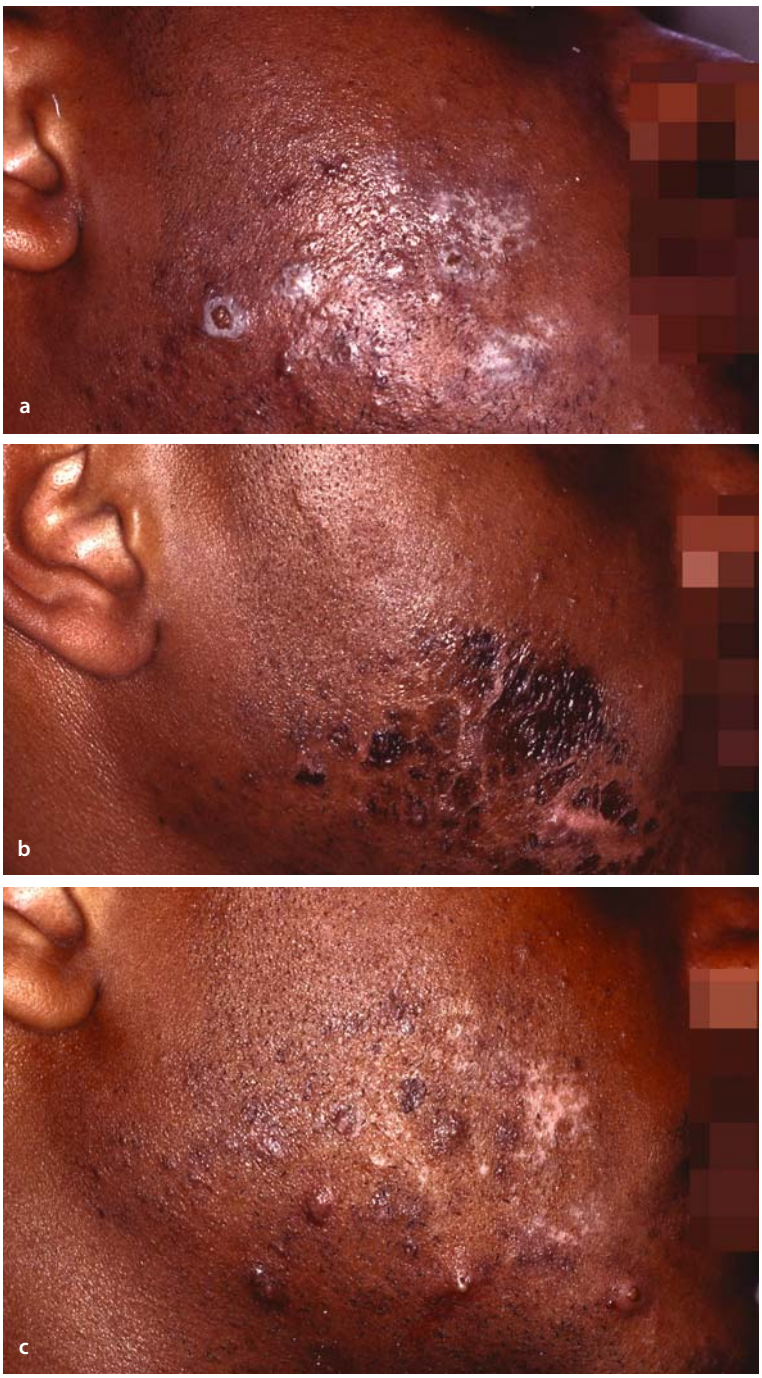


Fig. 6.3.
a Frosting after salicylic acid.
b Crusting 48 h later.
c Resolution of crusting in 3 to 4 days

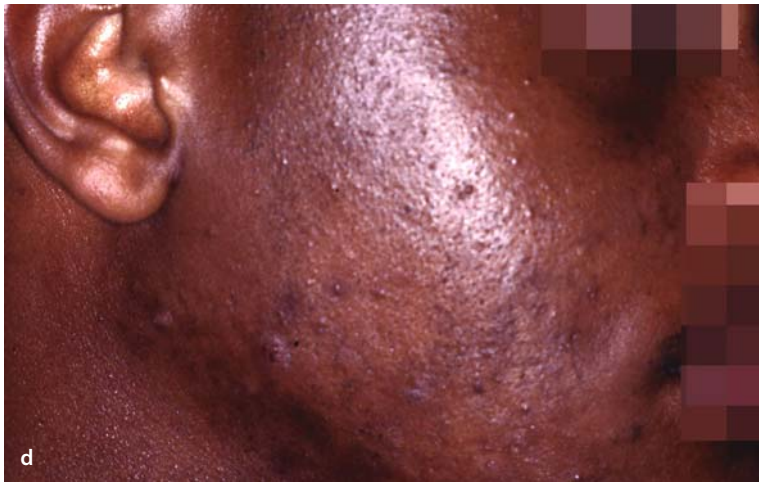


Fig. 6.3.
d Complete clearing of hypopigmentation by days 7–10. Note improvement in acne

with 2 × 2 wedge sponges, 2 × 2 gauze sponges, or cotton-tipped applicators. Cotton-tipped swabs can also be used to apply the peeling agent to periorbital areas. A total of two to three coats of salicylic acid is usually applied. The acid is first applied to the medial cheeks working laterally, followed by application to the perioral area, chin, and forehead. The peel is left on for 3–5 min. Most patients experience some mild burning and stinging during the procedure. After 1–3 min, some patients experience mild peel-related anesthesia of the face. Portable handheld fans substantially mitigate the sensation of burning and stinging.

A white precipitate, representing crystallization of the salicylic acid, begins to form at 30 s to 1 min following peel application (Fig. 6.2). This should not be confused with frosting or whitening of the skin, which represents protein agglutination. Frosting usually indicates that the patient will observe some crusting and peeling following the procedure (Fig. 6.3a–d). This may be appropriate when treating photodamage. However, the author prefers to have minimal to no frosting when treating other conditions. After 3–5 min the face is thoroughly rinsed with tap water, and a bland cleanser such as Cetaphil is used to remove any residual salicylic acid precipitate. A bland moisturizer is applied after rinsing. My favorites are Cetaphil, Purpose, Theraplex, and SBR Lipocream (Figs. 6.4a, b, 6.5a, b and 6.6a, b).

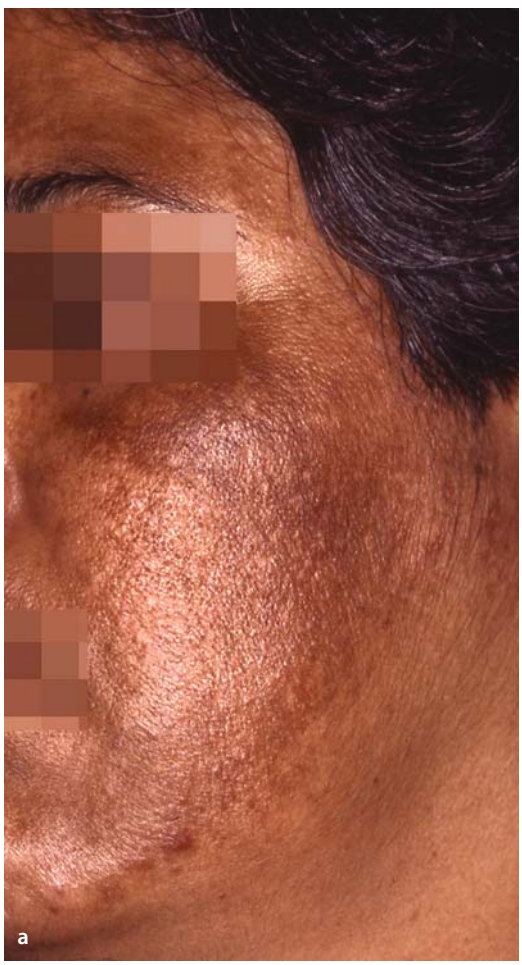


Fig. 6.4a. Melasma before and after a series of five salicylic acid peels and 4% hydroquinone

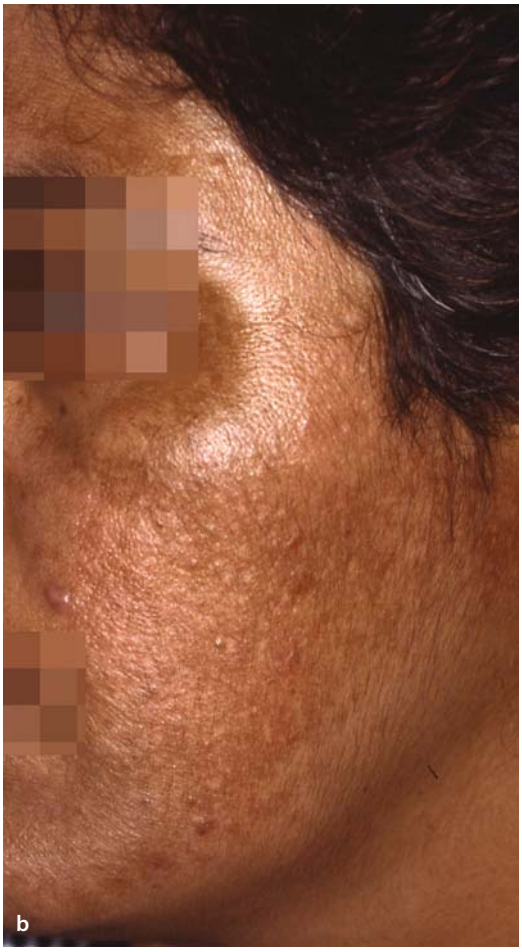
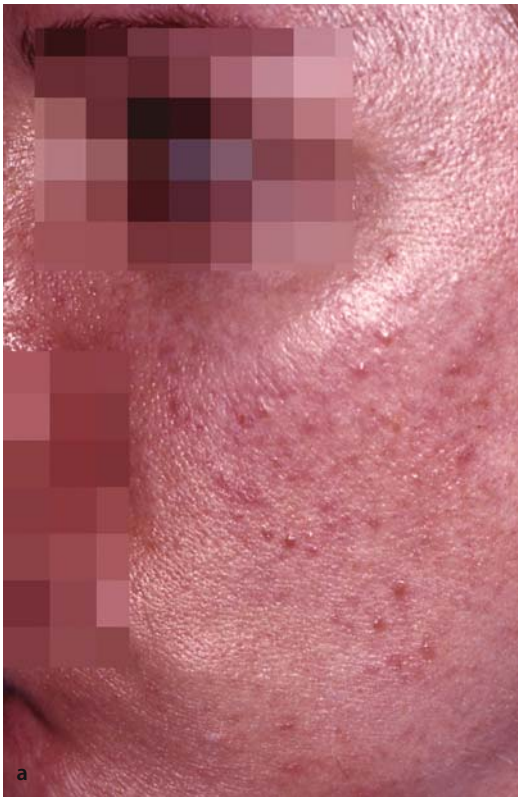


Fig. 6.4b. Melasma before and after a series of five salicylic acid peels and 4% hydroquinone



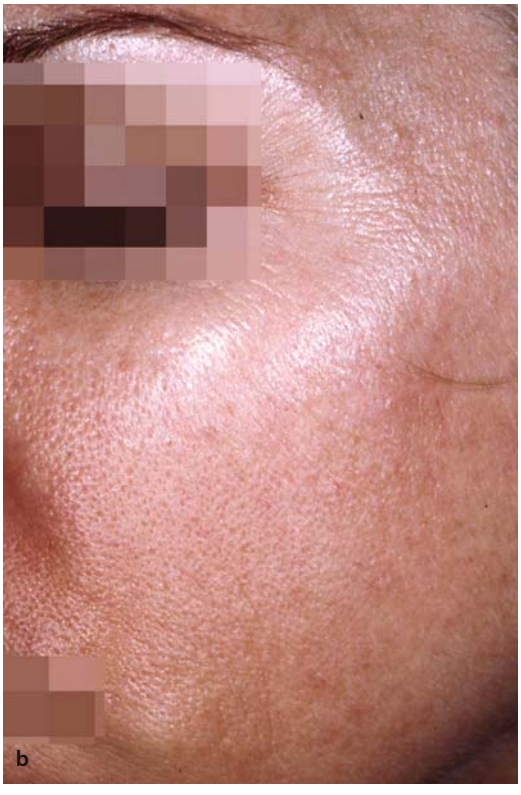


Fig. 6.5a, b. Acne vulgaris before and after four salicylic acid peels

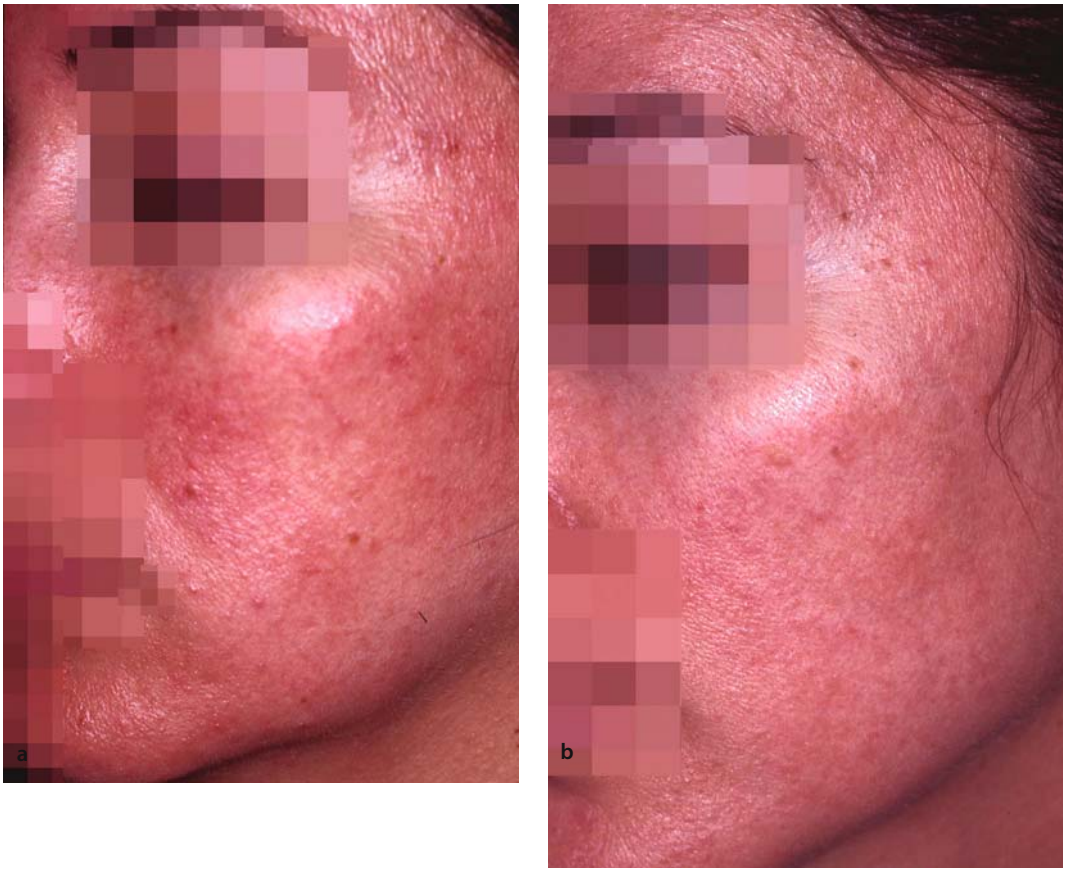


Fig. 6.6a, b. Acne rosacea before and after three salicylic acid peels, moderate improvement

6.8 Post-peeling Care and Complications

Bland cleansers and moisturizers are continued for 48 h or until all post-peel irritation subsides. Patients are then able to resume the use of their topical skin care regimen including topical bleaching agents, acne medications, and/or retinoids. Post-peel adverse reactions such as excessive desquamation and irritation are treated with low to high potency topical steroids. Topical steroids are extremely effective in resolving post-peel inflammation and mitigating the complication of post-inflammatory hyperpigmentation. In the author's experience, any residual post-inflammatory hyperpigmentation resolves with use of topical hydroquinone formulations following salicylic acid peeling.

6.9 Advantages

The key benefits of salicylic acid peeling include:

- An established safety profile in patients with skin types I–VI
- An excellent peeling agent in patients with acne vulgaris
- Given the appearance of the white precipitate, uniformity of application is easily achieved
- After several minutes the peel can induce an anesthetic effect whereby increasing patient tolerance

6.10 Disadvantages

- Limited depth of peeling
- Minimal efficacy in patients with significant photodamage

6.11 Side Effects

Side effects of salicylic acid peeling are mild and transient. In a series of 35 Korean patients, 8.8% had prolonged erythema that lasted more than 2 days [9]. Dryness occurred in 32.3%, responding to frequent applications of moisturizers. Intense exfoliation occurred in 17.6%, clearing in 7–10 days. Crusting was noted in 11.7%. There were no cases of persistent post-inflammatory hyperpigmentation or scarring. In a series of 25 patients comprising 20 African Americans and five Hispanics, 16% experienced mild side effects [8]. One patient experienced temporary crusting and hypopigmentation that cleared in 7 days. Three patients had transient dryness and hyperpigmentation that resolved in 7–14 days.

Salicylism, or salicylic acid toxicity, is characterized by rapid breathing, tinnitus, hearing loss, dizziness, abdominal cramps, and central nervous system reactions. It has been reported with 20% salicylic acid applied to 50% of the body surface, and it has also been reported with use of 40 and 50% salicylic acid paste preparations [7]. The author has peeled more than 1,000 patients with the current 20 and 30% marketed ethanol formulations and has observed no cases of salicylism.

6.12 Patient's Informed Consent

I, _____, hereby consent to having my _____ (site) treated with SALICYLIC ACID CHEMICAL PEELING. The peel will be performed to improve the overall appearance of the skin at the site of treatment. Salicylic acid peels are used to improve acne vulgaris, hyperpigmentation (dark spots), rough texture, oily skin, and photodamage (sun damage).

The procedure involves first having the peel site prepped with alcohol, acetone or other pre-peel cleansing agents. The peeling agent is applied for 3–5 min followed by cleaning with tap water and a bland cleanser.

In general, salicylic acid peels are extremely well tolerated. However, the procedure can cause swelling, redness, crusting, dryness and obvious peeling of the face which could last for up to 7–10 days.

I understand that there is a small risk of developing permanent darkening after the procedure. There is a rare chance that the peel could cause undesirable pigment loss at the treated site, the condition being treated could worsen after the peeling procedure, or a scar could develop. In addition, there is a small chance that a bacterial infection could develop, or the peel could also trigger a flare of a pre-existing Herpes infection at the treated site. In addition, there have been uncommon cases of allergic reactions to salicylates (the active peel ingredient). The benefits and side effects of the procedure have been explained to me in detail. All of my questions have been answered.

- I am in stable health.
- I have not used Isotretinoin in the past 6 months.
- I have no allergies to salicylic acid.
- I am not pregnant.

Outcomes are not guaranteed.

Signature of Patient

Date

Patient Name (Please Print)

Witness

Date

References

1. Lazo ND, Meine JG, Downing DT (1995) Lipids are covalently attached to rigid corneocyte protein envelope existing predominantly as beta-sheets: a solid state nuclear magnetic resonance study. J Invest Dermatol 105:296–300
2. Swinehart JM (1992) Salicylic acid ointment peeling of the hands and forearms. J Dermatol Surg Oncol 18:495–498
3. Aronsohn RB (1984) Hand chemosurgery. Am J Cosmet Surg 24–28
4. Kligman D, Kligman AM (1998) Salicylic acid peels for the treatment of photoaging. Dermatol Surg 24:325–328
5. Imayama S, Ueda S, Isoda M (2000) Histologic changes in the skin of hairless mice following peeling with salicylic acid. Arch Dermatol 136:1390–1395
6. Draelos ZD (2000) Atlas of cosmetic dermatology. Churchill Livingstone, New York, pp 94–97
7. Swinehart JM (1992) Salicylic acid ointment peeling of the hands and forearms. Effective nonsurgical removal of pigmented lesions and actinic damage. J Dermatol Surg Oncol 18:495–498
8. Grimes PE (1999) The safety and efficacy of salicylic acid chemical peels in darker racial-ethnic groups. Dermatol Surg 18–22
9. Lee HS, Kim IH (2003) Salicylic acid peels for the treatment of acne vulgaris in Asian patients. Dermatol Surg 29:1196–1199
10. Brody HJ (1997) Chemical peeling, 2nd ed. Mosby, St Louis