Mien Shiang

• Taoist practice
• Art and a science that means literally face (mien) reading (shiang)
• China as a diagnostic tool of Traditional Chinese Medicine to detect signs of existing ailments as well as predispositions to illness of mind, body and spirit, simply by studying one’s face.
Skin Resurfacing

Mike Puricelli, MD
CW David Chang, MD
Goals

• Review skin anatomy and facilitate understanding of the important role of ultraviolet light exposure in skin aging

• Review active agents in superficial, medium and deep chemical peels and understand the histologic correlate to various preparations

• Highlight complications of chemical peels and appropriate preventive/therapeutic steps

• Review commonly used lasers in facial rejuvenation and correctly identify chromophore and wavelength for CO2 and Er:YAG lasers. Understand confluence as it applies to fractionated lasers
Overview

• Background
• Skin anatomy/function and aging
• Evaluation and pretreatment considerations for chemical peels
• Types of chemical peels
• Complications from chemical peels
• Laser resurfacing
Beauty

• Nancy Etcoff, *Survival of the Prettiest: the Science of Beauty*
  • “Beauty is a universal component of the human experience which promotes pleasure, rivets attention, and impels action that helps ensure survival of our genes”
Beauty – Historical Perspective

- Over 40,000 years ago
  - Red ochre paints for facial and body ornamentation
- 5 BC Roman author Ovid wrote *The Art of Beauty*
  - Black eye shadow from wood ash and golden eye shadow from saffron

Rohrer, TE. Wesley, NO. Et al. Evaluation of Beauty and the Aging Face. Cosmetic Surgery Chapter 152
Beauty – Hard Wired

• 3 mo old babies
  • Stare longer at attractive faces than those judged to be less attractive

• 1 yr old children
  • Play longer with attractive dolls than plain dolls

• MRI studies show viewing beautiful faces activate reward pathways

Rohrer, TE. Wesley, NO. Et al. Evaluation of Beauty and the Aging Face. Cosmetic Surgery Chapter 152
Beauty – Evolutionary Perspective

• Increases opportunity for mating
• “Beauty is a burden that only the healthy can carry”
  • Screen for disease?
• 1920s yearbook were graded by 20 individuals on attractiveness
  • Facial attractiveness correlated with increased lifespan

Rohrer, TE. Wesley, NO. Et al. Evaluation of Beauty and the Aging Face. Cosmetic Surgery Chapter 152
Beauty – Modern Perspective

- Others tend to respond positively to beautiful people without seeking reward
- Beautiful people tend to be less penalized
  - Earn up to 12% higher wages as compared to “average” looking coworkers
- Pharmaceutical reps have a 1.9% increase in sales for every 1 unit increase on Likert Scale for attractiveness
- West Point graduates with higher attractiveness scores rose to higher military rank

Rohrer, TE. Wesley, NO. Et al. Evaluation of Beauty and the Aging Face. Cosmetic Surgery Chapter 152
Trends of Use

• Some argue laser resurfacing is gold standard

• The disappearance of chemical peels in favor of laser resurfacing has been predicted, but there has been a 435% increase in chemical peels from 1992 to 2005

• Bottom line: Need to know about both

Overview

• Background
• Skin anatomy/function and aging
• Evaluation and pretreatment considerations for chemical peels
• Types of chemical peels
• Complications from chemical peels
• Laser resurfacing
Structure and Function of Skin

- Skin weighs over 5 kg, covers approximately 2 square meters
- Basal cells migrate to the environment over 40-50 days
- Collagen most abundant protein in the body
  - 70% of the dry weight of dermis
  - A single 1-mm diameter fiber can withstand a static load of up to 20 kg
- Barrier, thermoregulatory, neural, immunologic, and endocrine organ with remarkable reparative and regenerative ability

Structure and Function of Skin

Structure and Function of Skin

• Epidermis
  • Stratified squamous epithelium 0.05 mm on eyelid to 1.5 mm on the soles
  • 5 layers
  • Keratinocytes are linked by desmosomes, transmembrane proteins and anchor the keratin intermediate filament cytoskeleton
  • Melanocytes (basal layer: 1 for every 30 keratinocytes and give melanin to keratinocytes)
    • Number is constant among various skin tones, activity, however, is variable
  • Langerhans cells (dendritic cell family), Merkel cells (pressure mechanoreceptors)
Structure and Function of Skin

• Dermis
  • >90% of skin thickness
  • 0.3 mm on eyelid to 3 mm on back
  • 2 layers
    • Papillary (random collagen fibers, fine elastic fibrils, and ground substance)
    • Reticular (thick collagen bundles arranged parallel to skin surface and coarse elastic fibers)
      • Elastin (stretch to 2x length and recoil)
      • Collagen matrix to support epidermis, maintains dermal appendages, and provides conduit for nutrients
        • Hydroxyproline and hydroxylysine
  • Fibroblasts, mast cells, histiocytes

Papillary and Reticular Dermis

Fig. 1.82
Normal skin of forearm: in the papillary dermis the collagen fibers are fine and sometimes have a vertical orientation. Masson's trichrome.

Fig. 1.87
Reticular dermis: the elastic fibers are long and fairly thick and tend to run parallel to the surface epithelium.

Skin Anatomy

• Different thickness at different regions/zones of face
• Variable tolerability to peels as shown by Hetter trials:
  • Nose could tolerate croton oil concentrations up to 1.2%
  • Cheeks and forehead tolerated concentrations up to 0.8%
  • Upper nose, temple, and lateral brow up to 0.4%
    • Before the risk of complications rose

Facial Aging

• 1965 Gonzales-Ulloa and Flores “senility of the face”
  • Aging result of gradual reabsorption of fat, decreased thickness and elasticity of skin, decreased adherence between skin and subcutaneous tissue, sagging of the soft tissues, weakening of the orbital muscle and septae, and progressive decrease in the volume of the craniofacial skeleton
  • Many dynamic components rather than single object

Fitzgerald, R. Graivier, MH. Et al. Update on Facial Aging. 30 (suppl 1) 11S-24S American Society for Aesthetic Plastic Surgery
Rhytids - Multifactorial

• UV radiation damage
• Loss of elasticity
• Repetitive movement
• Changes in volume/fat redistribution
• Bone and cartilage resorption
Skin Aging

- **Intrinsic/Chronological**
  - Gradual deterioration independent of overt environmental effects
    - Genetics, cellular senescence, and accumulation of oxidative injury and decreased oxidant capacity

- **Extrinsic/Photoaging**
  - UV radiation superimposed on intrinsic aging (80%)
    - Sun exposed skin (face, hands)
    - Most sun absorbed by stratum corneum, transmitted energy absorbed in dermis
      - DNA thymidine dimers, reactive oxygen species
  - Dehydration, poor nutrition, temperature extremes, trauma, toxins/smoke

Sunburn and Solar Erythema

• UV Radiation (<400 nm)
  • UVA: 320-400 nm
  • UVB: 280-320 nm
  • UVC: Absorbed by ozone

• Visible (400-760 nm)
  • Stimulates retina

• Infrared
  • Radiant heat

Sunburn and Solar Erythema

• Minimal erythema dose
  • Minimal amount of light at a wavelength to produce skin erythema
  • Ambient ratio of UVA:UVB is 100:1
  • UVB is 1,000 more erythmogenic than UVA
    • UVB - Major role in sunburn
    • UVA – Limited role in sunburn but contributes to photoaging

• Most biologically effective radiation wavelength for sunburn
  • 308 nm

• Clouds have minimal to no impact on UV radiation

• UVB intensity is 2-4 times greater in middle of day than morning/evening

• Typical sunscreen application achieves approximately half listed SPF

Sunburn and Solar Erythema

• After UV exposure, skin pigment undergoes two changes: immediate pigment darkening and delayed melanogenesis

• IPD
  • Hours – metabolic changes, redistribution of melanin
  • Occurs with UVB, UVA, and visible light
    • Prolonged with UVA
  • NOT photoprotective

• Delayed melanogenesis
  • Induced by UVB
  • Starts 2-3 days after exposure and lasts 10-14 days
  • Mediated by DNA damage and cyclobutane pyrimidine dimers
  • Provides some photoprotection (at the expense of damage to dermis and epidermis)

Sunburn and Solar Erythema

• Commercial sunbed tanning
  • Pre-trip tan?
    • Not photoprotective against UVB damage

• Skin type
  • Ability to tan, ease of burning

Aged Skin Characteristics - Intrinsic

• Decreased thickness
  • Linear reduction in dermal thickness with age
  • Male 1.1 mm average at age 20 → 0.8 mm at age 70
  • Female 0.85 mm average at age 20 → 0.75 mm at age 70

• Increased fragility
  • Dermal epidermal junction flattening
  • Barrier function of stratum corneum more easily disturbed

• Loss of elasticity
  • Increased matrix metalloproteinase activity
  • Increased extracellular matrix degradation

• Increased fine wrinkles

• Reduction in cells numerically and proliferative capacity
  • Keratinocyte differentiation prolonged
  • Decreased immune responsiveness
  • Reduced UV protection

• Increased susceptibility to malignancy

• Compromised thermoregulation

• Decreased sensation

Fitzgerald, R. Graivier, MH. Et al. Update on Facial Aging. 30 (suppl 1) 11S-24S American Society for Aesthetic Plastic Surgery
Skin Aging - Intrinsic

Aged Skin Characteristics - Extrinsic

• Rough leathery texture with deep wrinkles
• Loss of elasticity
• Dryness
• Irregular pigmentation
• Epidermal thickening with loss of orderly keratinocyte maturation
  • Thickening particularly in stratum corneum
• Chronic inflammation of dermis (heliodermatitis)
• Disordered metabolism of extracellular matrix
  • Solar elastosis (disorganized elastic fibers in dermis)

Fitzgerald, R. Graивier, MH. Et al. Update on Facial Aging. 30 (suppl 1) 11S-24S American Society for Aesthetic Plastic Surgery
• Which of the following factors plays the most significant role in extrinsic skin aging?
  • Dehydration
  • Poor nutrition
  • Smoking
  • Temperature extremes
  • Trauma
  • Light 50-280 nm
  • Light 280-320 nm
  • Light 320-400 nm
• Which of the following factors plays the most significant role in extrinsic skin aging?
  • Dehydration
  • Poor nutrition
  • Smoking
  • Temperature extremes
  • Trauma
  • Light 50-280 nm
  • Light **280-320 nm - UVB**
  • Light 320-400 mn
Overview

• Background
• Skin anatomy/function and aging
• Evaluation and pretreatment considerations for chemical peels
• Types of chemical peels
• Complications from chemical peels
• Laser resurfacing
History

• Medical problems (prior RT)
• Medications (oral contraceptives/hormones)
• Allergic reactions/sensitivities
• Prior facial rejuvenation
• Acne
• Keloids
• Dental abscesses
• Herpes simplex
• Bleeding Tendency
• Immunocompromise

History

- Which of the following medications/supplements will NOT increase the patient’s risk for peel-related bleeding?
  - Arnica
  - Garlic
  - Ginger
  - Ginseng
  - Ginko
  - Isotretinoin
  - St. John’s Wort
  - Vitamin E
History

- Which of the following medications/supplements will NOT increase the patient’s risk for peel-related bleeding?
  - Arnica
  - Garlic
  - Ginger
  - Ginseng
  - Ginko
  - **Isotretinoin**
  - St. John’s Wort
  - Vitamin E

History

- Arnica, Garlic, Ginger, Ginseng, Ginko, St. John’s Wort, Vitamin E all increase risk for bleeding and should be stopped 7-10 days in advance of a procedure.
- ASA, clopidogrel, warfarin, etc.
  - Medical indications - potentially continued
- Isotretinoin (Accutane) – use is associated with atypical scarring and should be held for 1 year prior to skin resurfacing
  - Logic: Post peel reepitheliazation originates from follicles and sebaceous glands
  - Evidence: Limited

Does Systemic Isotretinoin Inhibit Healing in a Porcine Wound Model?

David L. Larson, MD; Nicholas A. Flugstad, MD; Elizabeth O'Conner, MD; Karri A. Kluesner, MD; and Jose A. Plaza, MD

Abstract

Background: Within the plastic surgery community, it is widely believed that waiting a minimum of 6 to 12 months after patient cessation of systemic retinoid therapy is necessary before proceeding with elective surgery.

Objective: The authors investigate partial- and full-thickness wound healing after treatment with systemic isotretinoin in a porcine model.

Methods: Following institutional approval, 2 Hanford miniature pigs were obtained. One pig received isotretinoin at a dose of 0.1 mg/kg/d, administered orally along with pig feed over a 60-day period; the other (control) pig received only pig feed over the same time period. After the treatment period ended, a total of 24 full-thickness wounds and 24 partial-thickness wounds were made on each pig. The wounds were evaluated by photographic and histological analysis at 7, 14, and 28 days.

Results: The average full-thickness wound size in the control animal was 0.4546 cm² at 14 days and 0.3999 cm² at 28 days. The average full-thickness wound size in the isotretinoin-treated animal was 0.4205 cm² at 14 days and 0.2263 cm² at 28 days. The differences were not statistically significant between the 2 animals at either time point. On histological analysis, the healing characteristics of partial- and full-thickness wounds were similar at 7, 14, and 28 days for both animals.

Conclusions: Isotretinoin surgery might be safely performed even in the presence of recent isotretinoin therapy. This finding challenges the current practice of waiting longer than 6 months after completion of therapy to perform surgery.

Figure 1. Full-thickness wounds on the control pig (A, C) and isotretinoin-treated pig (B, D). (A, B) Two weeks after the wounds were made. (C, D) Four weeks after the wounds were made.
### Table 193.3: Glogau Classification Scale

<table>
<thead>
<tr>
<th>Skin Class</th>
<th>Description</th>
</tr>
</thead>
</table>
| I          | "Early Wrinkles"  
  Patient age: 20s–30s  
  Early photoaging  
  Mild pigment changes  
  Minimel wrinkles  
  No "age spots" |
| II         | "Wrinkles in Motion"  
  Patient age: 30s–40s  
  Early to moderate photoaging  
  Appearance of smile lines  
  Early brown "age spots"  
  Skin pores more prominent  
  Early changes in skin texture |
| III        | "Wrinkles at Rest"  
  Patient age: 50s and older  
  Advanced photoaging  
  Prominent brown pigmentation  
  Visible brown "age spots"  
  Prominent, small blood vessels  
  Wrinkles, even at rest |
| IV         | "Only Wrinkles"  
  Patient age: 60s or 70s  
  Severe photoaging  
  Yellow-gray skin color  
  Prior skin cancers  
  Precancerous skin changes (actinic keratosis) |

### Table 193.2: Fitzpatrick Classification Scale

<table>
<thead>
<tr>
<th>Skin Type</th>
<th>Skin Color</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Yellow</td>
<td>Always burns, never tans</td>
</tr>
<tr>
<td>II</td>
<td>Yellow</td>
<td>Usually burns, tans with difficulty</td>
</tr>
<tr>
<td>III</td>
<td>Yellow</td>
<td>Sometimes mild burn, gradually tans</td>
</tr>
<tr>
<td>IV</td>
<td>Yellow</td>
<td>Rarely burns, tans with ease</td>
</tr>
<tr>
<td>V</td>
<td>Yellow</td>
<td>Very rarely burns, tans very easily</td>
</tr>
<tr>
<td>VI</td>
<td>Yellow</td>
<td>Never burns, tans very easily</td>
</tr>
</tbody>
</table>
Indications for Peels

- Variable by type
  - Rhytides, irregular pigmentation, scars, actinic keratosis, and acne
- Must choose appropriate depth

### Table 1: Classification of chemical peels by depth of injury

<table>
<thead>
<tr>
<th>Peel type</th>
<th>Depth (µm)</th>
<th>Level of injury</th>
<th>Chemical agent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Superficial—very</td>
<td>&lt; 100</td>
<td>Injury to the stratum corneum +/- stratum granulosum; exfoliation of the stratum corneum</td>
<td>Low potency AHA&lt;br&gt;Salicylic acid&lt;br&gt;10–20% TCA&lt;br&gt;Retinoic acid</td>
</tr>
<tr>
<td>light</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Superficial—light</td>
<td>100</td>
<td>Necrosis of the entire epidermis down to the basal layer; stimulate regeneration of new epithelium</td>
<td>40–70% GA/AHA&lt;br&gt;25–30% TCA&lt;br&gt;Jessner solution&lt;br&gt;Solid CO₂&lt;br&gt;Vi Peel&lt;br&gt;Nomelan Fenol KH&lt;br&gt;Melanage</td>
</tr>
<tr>
<td>Medium depth</td>
<td>200</td>
<td>Wound extends through the epidermis and papillary dermis +/- upper reticular dermis; increased collagen production</td>
<td>35–50% TCA (not recommended)&lt;br&gt;Jessner + 35% TCA&lt;br&gt;70% glycolic acid + 35% TCA&lt;br&gt;Hetter VL (phenol)&lt;br&gt;Solid CO₂ + 35% TCA</td>
</tr>
<tr>
<td>Deep</td>
<td>&gt; 400</td>
<td>Necrosis to part or all of the mid- reticular dermis; leads to new collagen production</td>
<td>&gt; 50% TCA&lt;br&gt;Hetter all around&lt;br&gt;Stone 100 (Grade 2)&lt;br&gt;Exoderm-Lift&lt;br&gt;Baker–Gordon phenol peel</td>
</tr>
</tbody>
</table>

Abbreviations: AHA, alpha-hydroxy acid; CO₂, carbon dioxide; GA, glycolic acid; TCA, trichloroacetic acid.
Depth of Peels

- Ephelides (freckles), epidermal melasma, and epidermal hyperpigmentation
  - Epidermal peels

- Senile lentigines and lentigines simplex need involvement of dermis
  - Medium depth

- Dermal melasma, dermal postinflammatory hyperpigmentation, and seborrheic keratoses as well as elastosis and collagen distortion
  - Deep peels

<table>
<thead>
<tr>
<th>Treatment steps</th>
<th>Peeling agent</th>
<th>Superficial AHA/BHA/LHA</th>
<th>Peeling level TCA 35% or combinations</th>
<th>Deep TCA &gt; 50%, phenol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Indications</td>
<td>Photoaging</td>
<td>Roughness, yellow stains</td>
<td>Fine lines; keratosis; Solar lentigines</td>
<td>Pigmentary disorders, Superficial atrophic scars</td>
</tr>
<tr>
<td></td>
<td>Pigmentary disorders</td>
<td>Melasma; Post-inflammatory</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Retentional acne ± comedone extraction</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contraindications</td>
<td>Absolute</td>
<td>Pregnant, nursing patients, 6 months isotretinoin treatment</td>
<td>Pregnant, nursing patients, 6 months isotretinoin treatment</td>
<td>Pregnant, nursing patients, 6 months isotretinoin treatment</td>
</tr>
<tr>
<td></td>
<td>Cold sores: 4–6 weeks after healing</td>
<td>Active herpes simplex; cold sores</td>
<td>Active herpes simplex; cold sores</td>
<td>Active herpes simplex; cold sores</td>
</tr>
<tr>
<td></td>
<td>Botulinum toxin: 1–2 weeks after Collagen injections: 2 weeks before or after</td>
<td>Fitzpatrick skin types V-VI</td>
<td>Fitzpatrick skin types IV-VI</td>
<td>Fitzpatrick skin types IV-VI</td>
</tr>
<tr>
<td></td>
<td>Facial surgery: 6 weeks after oedema</td>
<td></td>
<td></td>
<td>Phenol: insufficient kidney function</td>
</tr>
<tr>
<td></td>
<td>Laser: 8 weeks after Electrolysis and dying: 7 days before or after</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>Waxing, depilatories: 3 weeks after</td>
<td></td>
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</tbody>
</table>

Prior RT, hypertrophic scarring

TCA, trichloroacetic acid; AHA, alfa-hydroxy acids; BHA, beta-hydroxy acids; LHA, lipo-hydroxy acid.
Pre-Peel Skin Preparation

- Tretinoin (0.05 – 0.1%)
- Hydroquinone (2 – 4%)
- +/- Alpha Hydroxy acid (4 – 10%)
  - Substitute if poorly tolerate tretinoin
- HSV prevention
- Pretreatment for 4-6 weeks prior (stops 1 week prior)
- Sunscreen at least 3 mo prior

Pre-Peel Preparation

• Topical tretinoin
  • 6-12 weeks prior
  • Clinical and histologic healing benefits prior to dermabrasion
  • Sustain effects of chemical peel
  • Aids in reepithelialization and increases melanin distribution
  • Thickens epidermis, decreased corneocyte adhesion, decreases stratum corneum thickness, and neocollagen production
    • Uniform application
  • Adverse effects: irritation, erythema, flaking
    • Reduce concentration

Pre-Peel Preparation

• Hydroquinone
  • 4-6 weeks prior to peel
  • Lentigos, dyschromias, Fitzpatrick III, IV, V, VI
  • Reduces post peel hyperpigmentation
  • Prevents tyrosine conversion to t-dopa and therefore reduces melanin production

Pre-Peel Preparation

• Negative history:
  • Acyclovir: 400 mg TID for 3 days prior and 7 days post

• Positive history:
  • Valacyclovir: 1 g TID for 3 days prior and 7 days post
Overview

• Background
• Skin anatomy/function and aging
• Evaluation and pretreatment considerations for chemical peels
• Types of chemical peels
• Complications from chemical peels
• Laser resurfacing
Chemical Analysis of Peels

• All are alcohols with carboxyl or hydroxyl group or regular acids
• Trichloroacetic acid is a stronger acid than alpha-hydroxyl permitting medium or even deep peels depending upon concentration
• Phenol is an aromatic hydrocarbon that is directly toxic to cell by targeting proteins and membranes including enzymatic inactivation

**Superficial Peels – Alpha Hydroxy Acids (Glycolic Acid)**

- Reduce sulfate and phosphate thereby decreasing corneocyte cohesion and inducing exfoliation
- Typically several sessions starting at low concentration & working up
- Improve skin texture, active acne, actinic keratoses, and superficial dyschromias
  - Keratolytic, anti-inflammatory, antioxidant, disperse basal melanin, increase collagen gene expression, thin stratum corneum
- Must be neutralized (once uniform redness)
  - Ammonium salt, sodium bicarbonate, sodium hydroxide
- Does NOT impact wrinkles or deep pigment

Superficial Peels – Beta Hydroxy Acids (Salicyclic Acid)

- Inflammatory and non-inflammatory acne vulgaris, pigmentations, mild sun damage
- Exfoliant, keratolytic properties
- Penetrates follicles
- Safe for use in skin types prone to hyperpigmentation due to minimal inflammation
- May be used in combinations (Jessner solution)

Glycolic Acid vs Salicylic Acid for Acne

• A split-face, blinded study compared a series of six glycolic acid 30% peels on one side of the face vs. six salicylic acid 30% peels on the other side in patients with facial acne

• Both treatments were effective, but the effect of salicylic acid was sustained longer and this peel was associated with fewer side-effects compared with that of glycolic acid

Superficial Peels – Tretinoin

- Treatment of actinic changes, melasma (avoid in pregnant/lactating women), poikiloderma of Civatte
- Colors skin canary-yellow
- Kept on for 6 hours and decomposes with UV light
  - Peel late in afternoon
- Does not coagulate proteins so no exudate or crust formation

Superficial Peels – Jessner Solution

- 14 g resorcinol, 14 g salicylic acid, 14 ml of lactic acid, and 100 ml of 95% ethanol
- Exfoliation and useful in hyperpigmentation

Medium Peels – Trichloroacetic Acid

• 35% is medium depth peel
  • Lower concentrations (10-20%) result in superficial peel
  • Higher concentrations
    • >35% potential scarring and less predictable so use combinations for deeper depth

• Indications: dyschromia (solar lentigines), multiple solar keratoses, and textural changes of skin
  • Minimal benefit for wrinkles and acne scars

• Restores keratinocyte polarity and increases collagen type I content

“Frosting” – Depth Assessment

• Level I – Speckled white on mild erythema
  • Superficial

• Level II – Even white coated frost with background erythema
  • Medium

• Level III – Solid, opaque frost with little or no background erythema
  • Deep

Post Peel Care

• Continuous wetting of the skin
• Tightening and swelling of the skin together with darkening
• Day 3 or 4, the skin starts to crack, and desquamation begins
  • Moisturizing cream can be applied
  • Full reepithelization is completed after 5 to 7 days
• After 5-7 days, patient is advised to wear camouflage makeup and resume normal daily activities
• Blunt moisturizer and high-level sun protection are recommended for the next 2 to 3 weeks

Deep Peels – Baker-Gordon Formula

- 3 ml of phenol 88%, 2 ml of distilled water, 3 guttas of 2.1% croton oil, and 8 guttas of Septisol
- Phenol at 50% concentration penetrates to the midreticular dermis
  - Higher concentrations result in increased morbidity without additional therapeutic benefit
- Hetter’s Studies
  - Croton oil is active and varying this concentration allows for alteration of peeling depth
- Indications: dyschromia, fine and coarse wrinkles, premalignant skin tumors and acne scars

Deep Peels – Baker-Gordon Formula

• Requires EKG monitoring with full face treatments and IV access
• Arrhythmia
  • More common when 50% of the face is treated within 30 minutes

Fig. 7  Clinical results of deep chemical peel in a 68-year-old patient. A, Before. B, After.
This patient undergoes a superficial peel under the direction of a novice peeler for the skin changes seen below. An ulcer is present after the peel. Which agent was most likely used?

- 70% glycolic acid
- 35% trichloroacetic acid
- 88% phenol
- 30% salicylic acid
- Retin A
• This patient undergoes a superficial peel under the direction of a novice peeler for the skin changes seen below. An ulcer is present after the peel. Which agent was most likely used?
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  • 35% trichloroacetic acid
  • 88% phenol
  • 30% salicylic acid
  • Retin A

• Glycolic acid peels require NEURALIZATION
Which of the following peels penetrates the reticular dermis?

- 70% glycolic acid
- 35% trichloroacetic acid
- 88% phenol with 0.8% croton oil
- 30% salicylic acid
- Retin A
• Which of the following peels penetrates the reticular dermis?
  • 70% glycolic acid
  • 35% trichloroacetic acid
  • **88% phenol with 0.8% croton oil**
  • 30% salicylic acid
  • Retin A
Table 1 Classification of chemical peels by depth of injury

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<th>Peel type</th>
<th>Depth (μm)</th>
<th>Level of injury</th>
<th>Chemical agent</th>
</tr>
</thead>
</table>
| Superficial—very light | < 100      | Injury to the stratum corneum +/- stratum granulosum; exfoliation of the stratum corneum | Low potency AHA  
Salicylic acid  
10–20% TCA  
Retinoic acid |
| Superficial—light | 100        | Necrosis of the entire epidermis down to the basal layer; stimulate regeneration of new epithelium | 40–70% GA/AHA  
25–30% TCA  
Jessner solution  
Solid CO₂  
Vi Peel  
Nomelan Fenol KH  
Melanage |
| Medium depth      | 200        | Wound extends through the epidermis and papillary dermis +/- upper reticular dermis; increased collagen production | 35–50% TCA (not recommended)  
Jessner + 35% TCA  
70% glycolic acid + 35% TCA  
Hetter VL (phenol)  
Solid CO₂ + 35% TCA |
| Deep              | > 400       | Necrosis to part or all of the mid-reticular dermis; leads to new collagen production | > 50% TCA  
Hetter all around  
Stone 100 (Grade 2)  
Exoderm-Lift  
Baker–Gordon phenol peel |

Abbreviations: AHA, alpha-hydroxy acid; CO₂, carbon dioxide; CA, glycolic acid; TCA, trichloroacetic acid.
Overview

• Background
• Skin anatomy/function and aging
• Evaluation and pretreatment considerations for chemical peels
• Types of chemical peels
• Complications from chemical peels
• Laser resurfacing
Complications

• Pigmentary changes
  • Hyperpigment
    • Any depth peel, lighter complexion = lower risk
    • Use of hydroquinone and tretinoin reduces rate of this complication
  • Hypopigment
    • Seen after phenol deep peels
    • Few good therapeutic options

• Infection
  • HSV history
    • Treat prophylactically during medium and deep peels

• Milia
  • 20% of patients after chemical peels
    • 8-16 weeks post peel - electrosurgery

Complications

• Acneiform dermatitis
  • Not rare and might be seen immediately following reepithelialization
  • Short term systemic antibiotics and stopping oily preparations are helpful

• Scarring
  • Dreaded
  • Lower face is more common; heralded by delayed healing and redness
  • Topical antibiotics and potent steroids should be introduced

• Cardiotoxicity
  • Exclusive to phenol peels
    • Phenol is directly toxic to myocardium
    • Recorded in up to 23% with full face peel done in 30 minutes

Future Directions

Effect of chemical peeling on the skin in relation to UV irradiation

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Abstract: Chemical peeling is one of the dermatological treatments available for certain cutaneous diseases and conditions or improvement of cosmetic appearance of photoaged skin. However, it needs to be clarified whether the repetitive procedure of chemical peeling on photodamaged skin is safe and whether the different chemicals used for peeling results in similar outcomes or not. In this article, we reviewed the effect of peeling or peeling agents on the skin in relation to ultraviolet (UV) radiation. The pretreatment of peeling agents usually enhance UV sensitivity by inducing increased sunburn cell formation, lowering minimum erythematosus dose and increasing cyclobutane pyrimidine dimers. However, this sensitivity is reversible and recovers to normal after 1-week discontinuation. Using animals, the chronic effect of peeling and peeling agents was shown to prevent photocarcinogenesis. There is also an in vitro study using culture cells to know the detailed mechanisms of peeling agents, especially on cell proliferation and apoptotic processes via activating signalling cascades and oxidative stress. It is important to understand the effect of peeling agents on photoaged skin and to know how to deal with UV irradiation during the application of peeling agents and treatment of chemical peeling in daily life.

Key words: chemical peeling – glycolic acid – photocarcinogenesis – UV sensitivity

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Following a chemical peel, a patient with Fitzpatrick III skin develops hyperpigmentation. She is treated appropriately and it subsequently improves. Which of the following is the mechanism of action of the medication?

- Prevents cross-linking of DNA
- Prevents formation of melanin
- Prevents microtubule transport of melanin
- Melanotoxic
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Hydroxyquinone Prevents tyrosine conversion to t-dopa and therefore reduces melanin production
• A patient develops supraventricular tachycardia during a facial peel. What is the depth of peel and agent used?
  • Papillary dermis Jessner + 35% TCA
  • Papillary dermis Baker-Gordon
  • Reticular dermis Jessner + 35% TCA
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Laser Resurfacing - Ablative

- Considered “gold standard” for skin resurfacing by some
- Skin is wounded to the level of the dermis and inflammatory cells are recruited to the site of injury.
- Wound healing originates in the dermis
- Fitzpatrick types I-IV are good candidates
- Treats fine and deep rhytides, uncontrollable acne, acne scars, telangiectasias, and actinic keratosis
- Similar adverse effects to peels
- Lasers: CO2 and erbium:yttrium-aluminium-garnet

Ablative CO2 Laser Resurfacing

- 10,600 nm
- Target: water
- Ablation limited to 20 micrometers
- Pulsed laser limits collateral damage from heating
- Pink color occurs following removal of the epidermis, a gray color indicates the papillary dermis, and a chamois yellow color indicates the reticular dermis.

Ablative Erbium:(YAG) Laser Resurfacing

• 2,940 nm
• Target: water (16x more strongly absorbed than CO2)
• Ablation limited to 1 micrometer of skin
  • More precise
• Similar treatment depths to CO2 result in similar healing times

Laser Resurfacing - Fractional

• Microthermal zones by delivering columns of spatially confined thermal injury to the skin
  • Avoids confluent epidermal damage
  • Faster recovery and fewer adverse effects compared to ablative

• Surrounding unaffected follicular units and fibroblasts aid in more rapid repopulation and collagen remodeling

• Yet to be determined if superior to unfractionated technology

The Histologic Evaluation of Pulsed Carbon Dioxide Laser Resurfacing versus Phenol Chemical Peels in Vivo

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Background. Carbon dioxide (CO₂) lasers and phenol chemical peels have been used extensively for facial skin resurfacing.

Objective. The purpose of this study is to compare the histologic effects of phenol chemical peels and CO₂ laser ablations.

Methods. Local preauricular areas were treated with lasers on one side of the face and a phenol peel on the other. One day after the procedures, the affected areas were biopsied for histologic evaluation. The areas were biopsied again after 3 months.

Results. The initial biopsies demonstrated that the CO₂ lasers ablate more superficial skin than the peels, but the 3-month biopsy specimens showed that the zone of new collagen formation was thicker as a result of the phenol peels.

Conclusion. With the parameters used in this study, phenol peels resulted in the formation of a thicker zone of collagen despite the deeper ablation depth of the laser.
Which of the following is the correct wavelength/chromophore for CO2 laser

- 514 nm Hemoglobin
- 2,940 nm H2O
- 2,940 nm Hemoglobin
- 10,600 nm H2O
- 10,600 nm Hemoglobin
Which of the following is the correct wavelength/chromophore for CO2 laser?

- 514 nm Hemoglobin
- 2,940 nm H20
- 2,940 nm Hemoglobin
- **10,600 nm H20**
- 10,600 nm Hemoglobin
Goals

• Review skin anatomy and facilitate understanding of the important role of ultraviolet light exposure in skin aging
• Review superficial, medium and deep chemical peels and understand the histologic correlate to various preparations
• Highlight complications of chemical peels and appropriate preventive/therapeutic steps
• Review commonly used lasers in facial rejuvenation and correctly identify chromophore and wavelength for CO2 and Er:YAG lasers. Understand confluence as it applies to fractionated lasers