Introduction

Chemical Peeling

History

History shows us that exfoliation of the skin has been performed for centuries by various cultures. One of the earliest cultures in which this is recorded is that of Egypt. Sun-damaged skin was a sign of lower rank in society, and women used a variety of substances such as alabaster, oils, and salt to improve the skin. Also used was sour milk which we now know to contain lactic acid, an alpha-hydroxy acid commonly used today.

Other substances used throughout the historical record include poultices of mustard, sulfur, and limestone. The Turks were known to use fire to produce a thermal exfoliation by singeing the skin. Indian women mixed urine with pumice and mechanically abraded the skin. Apparently Hungarian gypsies have had formulas which pass from generation to generation a closely-guarded secret. Madame Pompadour in eighteenth-century France was fond of bathing in red wine, which we now know to contain tartaric acid.

The modern body of knowledge regarding chemical agents began with the description of a variety of agents still in use today by the German dermatologist P.G. Unna, including salicylic acid, resorcinol, phenol, and trichloroacetic acid (TCA). Mackee began using phenol for acne scarring in 1903 and eventually became chairman of dermatology at New York University. During World War I phenol, which has antiseptic properties, was used for wound care, especially after powder burns to the face. LaGasse’ in France noted the improved cosmetic outcome after wounds dressed in phenol were allowed to heal. The techniques he developed were brought to America by his daughter Antoinette who then began a lay practice in southern California. As these techniques spread among the lay practitioners physicians began to investigate, and soon chemical peeling became accepted into mainstream medicine. The last few decades have seen a steady evolution of various peels and their indications.
Skin Histology and Aging

As one ages there is a loss of subepidermal collagen. As the relatively inelastic epidermis loses volume beneath it, then, fine wrinkles form. Also there is irregular formation of connective tissue termed elastosis. Melanocytes can form local irregularities. Epidermis tends to become thin and atrophic. Many of the changes are actinic in nature, and any skin rejuvenation program should include sun protection as part of its regimen.

Chemical peeling has been shown to improve the dermis with formation of dense, homogenous, parallel collagen fibers. These changes persist histologically for at least twenty years. Histological sections will show a new layer of connective tissue above the older elastotic tissue. Addition of tretinoin can also aid these changes as well as reverse epidermal atypia, cause uniform dispersion of melanin granules, and reverse epidermal atrophy. Increased angiogenesis occurs which is thought to aid the appearance of the skin by adding a warm glow.

Patient Selection

Indication for superficial chemical peels are usually dyschromias, comedonal acne, and for skin refreshing. They are also commonly used outside the facial area. Indications for medium and deep peels are treatment of actinic changes and preneoplasia, fine rhytides, pigmentary dyschromias, selected superficial scars, and acne vulgaris and rosacea.

The student of chemical peeling will be familiar with the Fitzpatrick and Glogau systems of evaluating skin. Patients with higher Fitzpatrick skin types are at risk for post-peel pigmentary changes. Glogau's system is useful for evaluating actinic changes in the skin, but generalizations regarding care may be difficult.

Cosmetically, patients must have realistic expectations and the physician must understand what can be accomplished with chemical peeling. For deep rhytids and overall skin laxity the patient may be better served with a rhytidectomy. Dynamic wrinkles may be better treated with Botox. Patients with collagen vascular disease, history of hypertrophic scarring, use of isotretinoin (Accutane) in the last year or two, advanced HIV disease, and general poor mental and physical well-being may be poor candidates for chemical peeling. A patient with cardiac disease must be evaluated by a cardiologist before consideration of phenol peeling. History of melasma, recent pregnancy, estrogen use, and unwillingness to avoid the sun may portend post-peel hyperpigmentation problems.

Peeling Agents

Many different agents have been used in chemical peeling. It has been shown that the effect of the peel is due to the depth of injury, so in choosing a peel one must factor in
the depth of injury needed for the desired effect, the pigmentary changes associated with each agent, the toxicities, and the individual physician's experience and comfort with the various agents.

Very superficial peeling agents include 10-20% trichloroacetic acid, Jessner's solution applied in one to three layers, and glycolic acid 20-30%. Superficial peeling agents include trichloroacetic acid 20-30%, Jessner's solution applied in four or more layers, and glycolic acid 40-50%. Medium peeling agents include trichloroacetic acid in concentrations of 30-50% and trichloroacetic acid plus various other adjunctive solutions such as Jessner's, solid carbon dioxide, and glycolic acid. Some categorize 88% Phenol as a medium peel and others as a deep peel. There is no disputing that the Baker-Gordon peel is a deep peel, and some feel that tape occlusion of a baker peel provides the deepest depth of penetration.

Jessner’s solution is composed of 14 g of resorcinol, 14 g of salicylic acid, and 14 ml of 85% lactic acid mixed in enough 95% ethanol to bring the quantity to 100 cc. This formulation was concocted to minimize the toxicities of each individual agent. This solution must be stored in a dark bottle as light will discolor the solution and cause staining. Repetitive layers may be applied for a slightly deeper peel. This can also be used in combination with TCA for a medium depth peel.

Trichloroacetic acid can be mixed to various concentrations by adding water to however many grams of solute to bring the total volume to 100 cc. For example, 25 grams makes a 25% solution. The solutions can be stored safely for up to six months, although they can dissolve plastic so a glass bottle must be employed. These solutions can be used for very reliable peels with increase in depth corresponding to increase in strength. A 50% solution can be used comparably to a phenol peel although there is more chance of scarring. Greater concentrations cannot be used safely. Some feel that 35% is the highest concentration which can be safely used. There is less hypopigmentation than there is after phenol peeling. A nice advantage of the TCA peels is that the solution is neutralized by the body's serum, and there is no other associated toxicity.

Phenol is the hydroxylated form of benzene. When used at full-strength of 88% it causes keratocoagulation and thus prevents further absorption, although authors note that this theory has never been proven. Used alone it causes a medium-depth peel. As it becomes more dilute it causes keratolysis due to disruption of the sulfur bridges, and thus deeper penetration is possible. Clinically, this is important, for if a patient is allowed to tear during the peel and it runs across the field a deeper penetration may result.

Baker-Gordon peels are made by combining 3 cc of 88% phenol, 2 cc distilled water, 2 drops of croton oil, and 8 drops of Septisol. Croton oil is an epidermolytic vesicant and provides for more absorption of the phenol. The Septisol decreases surface tension and also provides for a deeper penetration. The phenol concentration of Baker solution is between 50-55%. The solution is not miscible and must be periodically agitated to keep it well-mixed. As such, it must be mixed fresh before each application. Phenol peels have less risk of scarring than TCA peels but are more often associated with hypopigmentation. This is more common in the higher Fitzpatrick skin types.

Phenol is absorbed into circulation and can cause cardiac arrhythmias. To avoid this complication, a patient being considered for a phenol-based peel must be screened with chemistries, urinalysis, and baseline EKG. Phenol is metabolized 75% by urinary excretion. The rest is metabolized into carbon dioxide and water. No more than 25% of
the face should be peeled before a 10-20 minute break is taken. The entire peel should thus take an hour or more. The area peeled is more important with respect to the toxicity than the strength of the phenol. Intravenous fluids should be used for hydration and renal flushing.

**Adjunctive Measures**

Pretreatment with a bleaching agent may prevent hyperpigmentation on susceptible individuals. Hydroquinone, an isomer of resorcinol and phenol, is commonly used to this end. Kojic acid and azealic acid are also used as bleaching agents.

Tretinoin is an important part of pretreatment regimen. In addition to its improvements in collagen, thinning of the stratum corneum allows for a better and more even penetration. Systemic retinoids such as isotretinoin (Accutane), though, are generally regarding as a contraindication for peeling for one to two years, as hypertrophic scarring can result with increased frequency. Depletion of the sebaceous units and systemic inhibition of collagenase are thought to be important etiologic factors in this process.

Patients with laxity of deeper skin structures may benefit from other facial rejuvenative procedures. Rhytidectomy, browlift, and blepharoplasty are all helpful in properly selected patients. Simultaneous facelift and chemical peel are generally approached with caution as there is a higher likelihood of full-thickness flap loss when peeling over elevated flaps.

**Technique**

The patient is instructed to avoid makeup for twenty-four hours. Upon arrival the skin is degreased. This is very important to ensure an even uptake of peeling agent. Different degreasing agents include alcohol, acetone, and Freon. Although a vigorous degreasing is important, care must be taken not to abrade the skin as this may cause increased uptake and thus an uneven peel. Antivirals may be used in patients with a history of fever blisters, or as some believe, in all patients.

For phenol peels an IV, EKG monitoring, and appropriate sedation is undertaken.

**Postoperative Care**

Patients are generally advised to keep the peeled area moist to promote wound healing. this can be accomplished with an emollient lotion or with other products such as Crisco. Some advocate the use of a semi-permeable non-occlusive dressing such as Vigilon for comfort. Cool compresses and elevation of the head of bed can provide symptomatic relief. Gentle soap and water washings help keep the area clean. The skin is generally reepithelialized by 7-9 days and makeup can be applied. Sunscreen is necessary to prevent further actinic damage and to prevent hyperpigmentation.
Complications

Perhaps the most feared complication following chemical peel is scarring. Care must be taken to properly screen patients. Use of Accutane in the last year or two, history of keloid formation, and collagen-vascular disease all may predispose to scarring and may make the patient a poor candidate for chemical peel. History of treatment with radiation also may predispose to scarring, and though long-term radiation dermatitis is an indication for chemical peel, one may consider a biopsy first to adequately assess the presence of enough vellus hairs. This situation should probably be avoided by the novice. Early scarring, if recognized as such, may be averted somewhat with scar massage and intralesional steroid injections.

Another complication of chemical peel if pigmentary changes. With phenol some degree of hypopigmentation is common although this is negligible in patients with Fitzpatrick skin types I and II. Men may be less able to deal with this problem as women often can camouflage changes with makeup. Care must be taken upon application of the peel to feather the peel at the margins to avoid a sharp demarcation between the treated and untreated areas. With the superficial and medium-depth peels hyperpigmentation is a more common problem. Recent pregnancy, history of melasma, and exogenous estrogen exposure are all risk factors. Pretreatment and posttreatment with a bleaching agent such as hydroquinone may minimize this problem in the susceptible patient. Sun avoidance and appropriate sunscreen application will also minimize pigmentary changes.

Infection is uncommonly a problem as the peeling agents are bacteriocidal and the patients should be washing their faces regularly. Occasionally, however, infections ensue, frequently staph. Pseudomonas is also an occasional offender and may be recognized by Woods-lamp examination. Treatment is with local soaks with an agent such as 0.25% acetic acid and appropriate antibiotics.

Post-treatment herpetic outbreak is a possibility. While this usually has few untoward side-effects, it is quite uncomfortable for the patient. Patients with a history of fever blisters should be prophylaxed with anti-virals such as valacyclovir, and patients with acute flare-ups should be appropriately treated. Some advocate prophylaxis for all patients.

Persistent erythema occasionally occurs. While often easily camouflaged with makeup, a gentle steroid cream may be of benefit.

Conclusion

Chemical peeling has been practiced in some form for centuries. Dramatic results in skin texture and appearance can be achieved with proper peels and techniques. Experience and training is necessary to prevent untoward sequelae of chemical peeling. For the physician and patient alike this can be a valuable tool in the arsenal of choices for facial rejuvenation.
Cervicofacial Liposurgery

Introduction

Trials at augmenting or reducing fat content of the have been attempted back into the nineteenth century. Beginning in the 1970's Giorgio and Arpad Fischer in Rome began work with the first modern cannulas. Illouz in Paris adapted their technique and often is credited with developing modern liposuction. During the 1980's liposuction became widely practiced, and soon this was used as a source of fat for transplantation.

Fat Composition

Human fat has two distinct types -- brown fat and white fat. Brown fat is sparse in humans and is generally used for body temperature regulation. White fat, on the other hand is used for storage of lipid. Generally in the adult fat cells do not divide, they instead hypertrophy. Cervicofacial fat remains fairly constant after adolescence despite fluctuations in total body fat, and thus removal of fat can effect permanent changes in the cervicofacial contour.

Liposuction

Liposuction is performed by tunneling hollow cannulas under the skin and removing fat by suction. The wet technique utilizes injection of lidocaine and epinephrine as well as hyaluronidase. This often makes tissue dissection easier and decreases bleeding, but in the head and neck this can cause more post-operative complications and make difficult to determine the precise volume of tissue removed. The dry technique does not utilize pre-injection.

Different size cannulas exist and have different uses. Most general-use cannulas are blunt-tipped and have a side port which suctions away the adipose tissue. Other tips are more curette-like and work better in fibrotic tissue but also are more traumatic to the tissue. Also in use is the liposhaver, which has an inner cannula which oscillates as it suctions and cuts away the fat.

Upon evaluation the patient should be photographed and any preoperative markings made while sitting upright. Attention should be paid to the wattle, the jowls, mandibular contour, parotid and buccal spaces, and cervicomental angle, as these are areas amenable to liposuction. Contraindications include collagen-vascular disease, generalized obesity, and endocrine or bleeding disorders. Some relative contraindications include inelastic skin, stretch marks, cellulitic or pitting defects, age greater than 55, diabetes, hypertension, and fine dermal rhytids.

Care is taken during passage of the cannula to create multiple tunnels in a honeycomb pattern. With postoperative occlusive dressing this will compress the tissue and achieve the desired goal of volumetric fat reduction. If honeycombed evenly the tissue will compress in an even fashion. Use of too large a cannula or uneven
honeycombing can result in an uneven contour. The suction is usually set at about one atmosphere.

Accessing the fatty areas of the head and neck can be done at multiple sites. These can include submental (direct), preauricular (indirect), through the piriform aperture, or even through a subciliary incision. The cannula is passed though fan-like passes, and at the edges the cannula should be passed with the suction off to help feather the transition from the operated area to the unoperated area.

Postoperatively a pressure dressing is placed to help redrape the skin and prevent seroma formation. This is left in place for 2-3 days. Antibiotics are commonly used. Elevation of the head of bed and cool compresses minimize edema and provide symptomatic relief. Bruising and edema are common but generally are improved by one week. Numbness may persist for a few months. Massage helps achieve a smooth contour.

**Fat Augmentation**

Fat augmentation is used for softening contour in the face. Areas amenable to improvement include the glabellar frown line, inframalar groove, nasolabial groove, cheek hollows, mentum, and oral commisures. Patient selection and contraindications are similar to those for liposuctioning.

Fat may be harvested with a 4 or 6 mm cannula or with an eighteen-gauge or larger needle. Smaller needles than this will cause an unacceptable amount of fat damage. The suction machine should be set no higher than four atmospheres. The harvested fat should be filtered to remove cellular debris.

The filtered material is then injected to the appropriate site from distal to proximal. Overcorrection of 20-30% is necessary to accommodate the eventual atrophy. Local wound care and supportive care, usually with antibiotics, usually suffice for post-procedure care. The final result may take a number of months to achieve finality as the fat atrophies to about 70% of the injected volume.

**Complications**

Complications most often seen are hematoma and seroma. These can be managed with pressure dressing and aspiration. Some sensory changes are common and usually resolve. Contour irregularities may be conservatively managed or may require touch-up procedures. Infection, skin loss, and neurovascular injury are rare but serious complications.

**Conclusion**

Liposuction and fat augmentation are common procedures and have applications predominantly in body sculpting. The practitioner of facial cosmetics should be well versed in their application and techniques for optimal results.
Bibliography


