Mechanical, chemical, enzymatic - peelings for every type of skin

published in Beauty Forum 2009 (7), 56-58 (Beauty Forum Download inclusive)

No matter whether salt, sand or acid based: peelings are used to stimulate the skin recovery and to restore a youthful appearance. The cosmetician today has various techniques at her disposal to achieve these goals.

In great grandma's days people used to take a stiff bristle brush to clean their bodies once a week. It helped not only remove ingrained dirt but also peeled off loose skin scales. At the same time the microcirculation in the superficial skin vessels as well as the skin recovery were stimulated. The professional peeling today concentrates on the latter mentioned effect and yet somehow resembles the traditional bristle brush treatment if carried out with mechanical abrasive bodies. In the past decades chemical, enzymatic, device- and even laser-assisted peelings have been added to the mechanical peelings.

Mechanical peelings

Mechanical peelings activate the microcirculation in the skin. They intensify the natural scaling process and the dosage is quite simple. Compared with chemical peelings they have no adverse effects and regarding abrasive bodies and their matrix they can easily be adapted to every type of skin, even problem skin.

- Finely ground silica sands, pumice and wood flour as well as ground olive stones belong to the oldest **water-insoluble abrasive bodies**. They are still sold today in form of abrasive cleansing pastes which then are removed with water. As the cleansing agents contained therein are too aggressive in combination with a cosmetic peeling it is common practice to first cleanse the skin and then go ahead with the peeling in a second step. In this case the abrasive bodies are applied together with skin care oils, creams or gels. Besides ground fruit stones and peels from olives, apricots, peaches and walnuts, also coffee grounds and polyethylene (PE), polypropylene (PP) and polyurethane (PUR) plastic particles are used. In addition to healing earths (clay, bolus alba) also tiny spherical wax bodies are applied as e.g. jojoba beads. Due to their rounded structure they are gentler than sharp-edged mineral or wooden particles.
- **Water-soluble abrasive bodies** as for instance table salt, sea salt, Dead Sea salt, ground rock sugar or sugar crystals are favorite ingredients as they can either be used in form of a moist paste or in combination with a vegetable oil or oleogel. Their advantage consists in the fact that they dissolve when they are rinsed off. Excess oil or gel can eventually be removed with a cleansing or shower gel. The latter mentioned should be free of re-fattening substances so that they do not impair the following treatments. If water-soluble abrasive bodies and specifically salts are used the individual sensitivity should be kept in mind as minor skin lesions could cause a temporary but harmless burning sensation on the skin.

Mechanical peelings are not recommended for the **teleangiectasia** or **rosacea prone skin** or similar skin problems that affect the superficial connective tissue. For **acne skin** chemical or enzymatic peelings should be used. The abrasion of parts of the horny layer temporarily increases the transepidermal water loss (TEWL) which means that a protective cream with moisturizing substances should be applied. The skin should not be peeled too frequently as it gets accustomed to it and then will react with increased cornification.

Chemical peelings

Chemical peelings also activate the microcirculation; however, in this case it is induced by chemical stimulation. The intensity of a chemical peeling varies according to the specific treatment and follows different mechanisms. The treatments require extensive experience and certain procedures are even reserved to dermatological practices.
Today only medical practices are authorized to perform **vitamin A acid** peelings. In the course of this specific peeling process the skin is inten-

tionally irritated in order to stimulate the collagen synthesis and to activate the recovering process of the skin which also involves the shedding of the superficial skin layers. To some extent this specific vitamin A acid effect can be observed when high dosages of cosmetic products with vitamin A derivatives are used. Thus, **retinyl palmitate** is enzymatically hydrolysed into palmitic acid as well as vitamin A which in its turn is metabolized in the skin into vitamin A acid. This "side effect" is more apparent with the application of vitamin A nanoparticles as the active agent is easier released than in conventional products.

After vitamin A acid was banned in cosmetic products, **alpha hydroxy acids** (AHA, fruit acids) have been used. While the acidic function is not the decisive factor in vitamin A acid it is the crux for the application of AHA acids. As everybody knows strong acids cause irritations on the skin which may even result in chemical burns. It is also common understanding though that the peeling should not cause chemical burns. The reason why fruit acids like glycol and lactic acid are less harmful is that they can be applied in a more controlled way and with less risk than diluted hydrochloric acid although it would have the same effects. Experience has shown that fruit acids should also be handled with care in order to exclude permanent skin damages though. While denaturing proteins on the skin surface the irritation at the same time boosts the cell formation. The substitution of the existing horny layer leads to a rosy and fresh appearance of the skin and minor wrinkles disappear for a while. Frequent fruit acid peelings however stress the skin with the effect that it becomes rather sensitive and can look like parchment.

The **trichloroacetic acid** (TCA) used in **dermatology** has an average peeling respectively exfoliating effect of one up to several years. An inappropriate application of acid peelings may lead to permanent pigment disorders and cicatrizations. An important aspect to be kept in mind with all types of peelings is the **increased photosensitivity** of the skin after the application. Unless it is protected with high SPFs or alternatively the exposure to direct sun light is avoided the skin will react with pigment disorders and an accelerated skin aging process. In contrast to mechanical and enzymatic peelings the condition of the chemically peeled skin with symptoms like intense erythema and flaking is not very appealing even days after the treatment. On top of this, TCA peelings are quite painful and generally are carried out under anesthesia.

Phenol compounds: Besides the toxic phenol, which is no longer used though, the keratolytic salicylic acid and salicylic acid derivatives like 2-Hydroxy-5-octanoyl-salicylic acid belong to this group. The latter mentioned are also called beta hydroxy acids. Like the AHA acids they induce a superficial to scaling peeling effect. In general, phenolic substances have anti-microbial features, which is quite important for microbial skin infections as for instance on acne skin. Even after the peeling treatment the skin is still very sensitive to external germs due to the weakened skin barrier. Hence it is significant to provide for adequate skin protection after peeling measures.

Sometimes also **mixtures** are used as for instance of resorcinol (1,3-dihydroxybenzene) which is a phenol compound, and lactic and salicylic acid. This mixture has become known as **Jessner's solution**. Even combinations of vitamin A acid with fruit acids and salicylic acid or vitamin A acid with trichloroacetic acid are applied. Sometimes the results are quite disappointing for the customer or patient, or in other words, there is a relatively high number of chemical peelings after which the skin condition will not improve for a variety of reasons but even to some extent will deteriorate.

The peeling action of herb peelings is similar to that of chemical peelings. The extracts used contain appropriately working chemical compounds however of natural origin in this case.

Enzyme peelings

The horny cells in the horny layer are kept together by proteins. If these are enzymatically hydrolyzed the dead cells can be loosened and superficially removed about 10 to 20 min after application. To this effect, masks are applied which consist of dry extracts of enzyme-containing vegetable juices that are mixed with water.
The enzymes used are proteases (= proteolytic enzymes) as for instance papain gained from papaya juice and bromelain gained from both pineapple juice and stalks. Enzymatic peelings are very gentle and smooth; their effect is limited to the skin surface. That is why they can be applied once a month without any problems. They will not activate the microcirculation as there is no mechanical or deeply penetrating chemical stimulant involved.

Laser and microdermabrasion

Alternatively to chemical peelings dermatological practices also offer laser peelings carried out with specific **laser devices** like erbium laser

or CO2 laser. In this process the surface skin layers are removed with the help of the laser-generated thermal energy. The laser peeling may also involve adverse effects like dry skin, infections and cicatrication. The healing will take about a week, erythemas may eventually last up to several months. The laser peeling requires local or intravenous anesthesia and is mainly used to smoothen wrinkles or to ameliorate or remove skin anomalies like acne scars, age marks, hyperpigmentation and cornification disorders.

A device-assisted version of the mechanical peeling is **microdermabrasion**. This technique consists of spraying tiny mineral crystals of e.g. aluminum oxide, quartz or similar substances on the skin through a nozzle. Crystals as well as the removed skin cells are vacuumed back right away by the device.
It is applied against wrinkles, scars including striae, photodamages, and cornifications but also used to stimulate the skin recovery and microcirculation in general. It takes several treatments at monthly intervals usually.
The advantages of this procedure are the excellent supervision of the process and the immediately visible result. Lately also simple mechanical devices for the manual microdermabrasion have become available on the market.

The optimal application

All the different mechanical peelings concerning the skin surface (including microdermabrasion and enzyme peeling) can easily be integrated into the cosmetic treatment procedures.

- The skin is **cleansed** before the peeling. After the peeling a **skin toning** and the application of a mask may follow. Toning helps to prepare the skin for the active agents of the mask as it improves their penetration.
- Sometimes also a treatment with **ultrasound** and **active agents** may then follow just like after the microdermabrasion.
- As the skin is quite photosensitive after the peeling, also a liposomal **ascorbyl phosphate** (vitamin C ester) and **tyrosinase inhibitors** may be used besides the following **sun screen** in order to safely impede the melanin formation. This is specifically important if hyperpigmentations or age marks have been treated.

How "fit" is the skin?

An extensive analysis of the skin condition is recommended before the peeling procedure to make sure that the skin in fact is capable to react with the intended recovery. This cannot automatically be taken for granted after a chemotherapy treatment, a disease or after a specific medical drug therapy. Hence it can be useful to proceed with an intense skin recovery treatment of several weeks before the planned peeling procedure. Otherwise it has to be taken into account that an already pre-damaged skin may additionally be stressed by the peeling procedure. This specifically applies in case of barrier disorders. It has been observed that the skin condition in this case initially deteriorates.
The treatment intervals of the microdermabrasion have to be adapted to the recovering potential of the skin. After the peeling it is very important to protect the skin. The following long term skin care at home should focus on the protection of the skin in a way that the recovering process is not impeded which is quite a balancing act requiring a well-funded professional consultation in every individual case.
Deep chemical peels and laser peelings need medical attention after the treatments in order to prevent infections.

Peeling methods at a glance

The following chart gives an overview on the applications and risks (not intended to be exhaustive):

	Mechanical Peeling	Chemical Peeling	Enzyme peeling	Laser Peeling	Microdermabrasion
Peeling depth	Single barrier layers	(a) Single barrier layers (b) Complete horny layer (c) Deeper layers	Single barrier layers	(a) Complete horny layer (b) Deeper layers	(a) Single barrier layers (b) Complete horny layer
Treatments	Atrophic skin Keratoses Scars Hyperpigmentation Blemished skin	Atrophic skin Keratoses Scars Hyperpigmentation Age marks Lifting Wrinkles Photodamages Acne skin	Atrophic skin Blemished Skin Hyperpigmentation Acne skin	Atrophic skin Keratoses Scars Hyperpigmentation Age marks Wrinkles	Atrophic skin Keratoses Scars Hyperpigmentation Age marks Wrinkles Photodamages Cornifications
Contraindications	Teleangiektasia Rosacea Inflammatory acne Barrier disorders Sensitive, allergy-prone skin Viral and bacterial infects Naevi	Barrier disorders Sensitive, allergy-prone skin Diagnosis by medical staff	Barrier disorders Sensitive, allergy-prone skin Viral and bacterial infects	Diagnosis by medical staff	Teleangiektasia Rosacea Barrier disorders Sensitive, allergy-prone skin Viral and bacterial infects Naevi
Healing time	---	About a week (b,c)	---	About a week (a,b)	About a week (b)
Adverse Effects	Dry Skin Cornification-prone skin	Dry Skin (a), Cornification-prone skin (a) Erythema like sun burns (b,c): Blistering and crusts (b,c)	Dry Skin Cornification-prone skin	Erythema up to several months	Dry Skin (a) Cornification-prone skin Punctate bleeding (b)
Risks	---	Chemical burns Infections Cicatrications Pigment disorders Damage of deeper skin layers	---	Infections Cicatrications Pigment disorders Damage of deeper skin layers	Infections (b)
Frequency	Every 2-4 weeks	4 weeks (a) Max. once per year (b, c)	2-4 weeks	Diagnosis by medical staff	4 weeks

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Blue marked paragraphs - not contained in original article