Illustrated Guide to Chemical Peels

Basics | Indications | Uses

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1 Dermatology Basics

A chemical peel entails the application of exfoliating chemicals to the skin, resulting in the destruction of the epidermal and dermal structures. Depending on a variety of influencing factors (see the 'six Ps' in the *Introduction*), the effects of the peels can reach varying depths and alter or injure different structures. Regenerative mechanisms are set in motion in the damaged skin layers, the aim being to cause an objective improvement in the structure, and importantly, the appearance of the skin.

Numerous clinical and histologic studies on the effect of chemical peels have been published, but biochemical and molecular biological studies on their mechanisms of action are somewhat lacking. Upon this background, this chapter deals with the basic dermatological knowledge relating to the hypothetical mechanisms of action of chemical peels. Descriptions of the structure and function of the skin are accompanied by an explanation of the basic principles and mechanisms of epidermal barrier regeneration and dermal wound healing. Skin ageing as a key indication for the use of chemical peels is examined in detail.

1.1 Structure and Function of the Skin

As a separating layer between the body and its environment, one of the skin's key functions is to provide protection and resistance against external influences. Furthermore, the skin is responsible for the regulation of body temperature, exchange of significant substances, and importantly, maintenance of the water balance. Communication with the surrounding environment takes place via sensory cells within this organ, which receive stimuli and conduct them to the central nervous system. Such an extensive function list can only be managed by means of a highly complex interaction of differentiated structures and activities. The skin's architecture with its specialised layers provides the prerequisites for this interaction (Fig. 1.1).

The **cutis** has three principal layers: epidermis, dermis and subcutaneous tissue. The **epidermis** is a multi-layered, keratinised squamous epithelium of ectodermal origin. Its principal cells are the keratinocytes (95 %). These cells differentiate during orthokeratosis, which gives the skin its protective function. In addition to the keratinocytes, the basal region of the epidermis also contains melanocytes and Merkel tactile cells. Furthermore, Langerhans cells are also found within the epidermis and play an important role in the skin's immune system. Skin appendages such as the hair roots, sebaceous and sweat glands have their origin in the basal epidermis, but are located in the deep dermis. The **dermis (corium)** consists of connective tissue of mesodermal origin. It is connected to the epidermis via the basal lamina, a link that is reinforced by finger-like papillary projections known as 'rete ridges'. Its basic structure is determined by extracellular protein fibres, fibrocytes, and fibroblasts, embedded

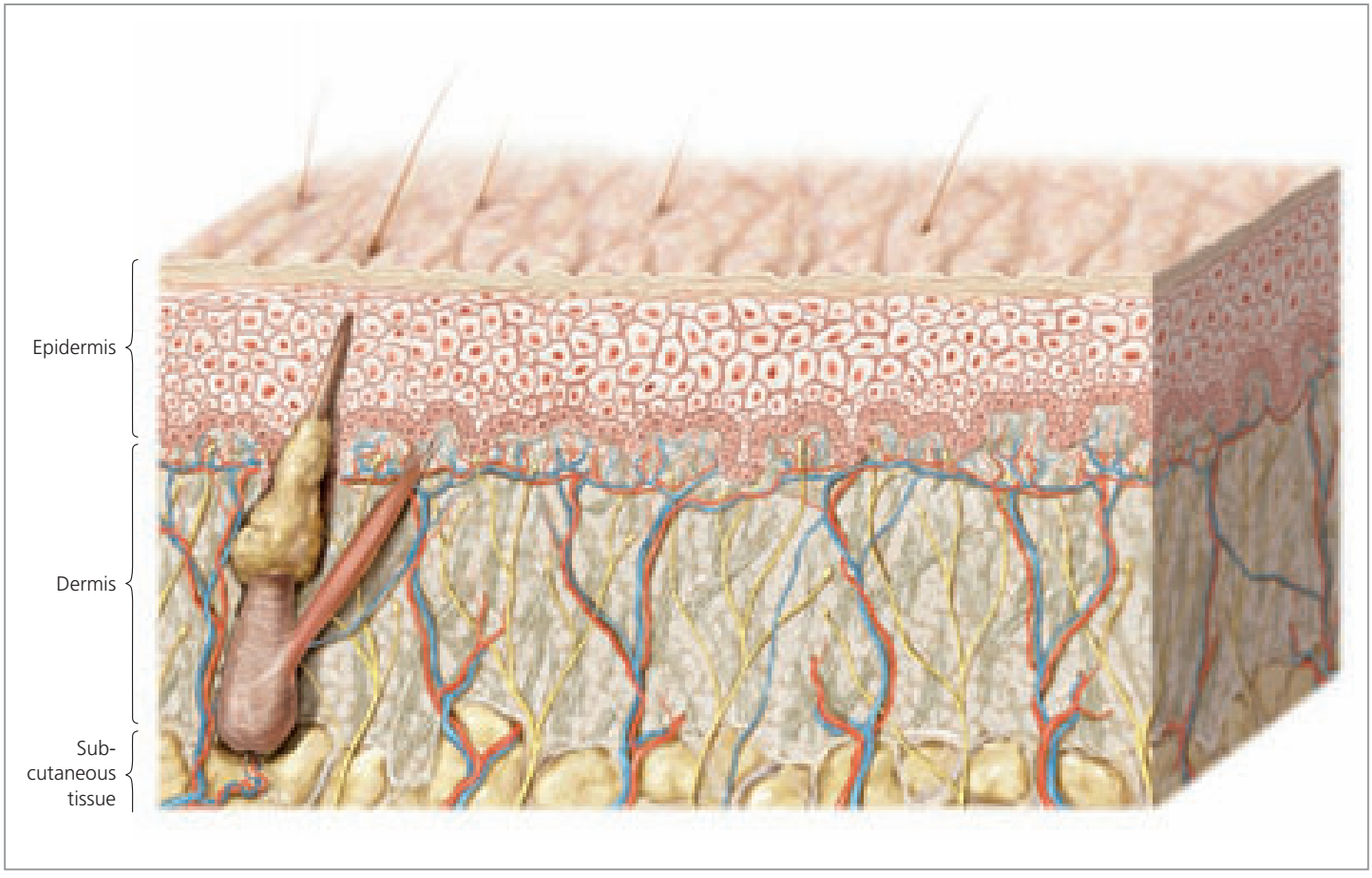


Fig. 1.1 Schematic structure of the cutis.

into an amorphous matrix along with a few immune cells. Blood vessels, lymphatic ducts, and nerve endings are also key components of the dermis. The **subcutaneous tissue (subcutis, hypodermis)** is an adipose layer interspersed with loose connective tissue and larger blood vessels; its main function is to cushion the body against shock.

1.1.1 Epidermis

The epidermis is a classic proliferative tissue that constantly renews itself.

In this process, keratinocytes go through a 2 to 3 week differentiation cycle, ending up as non-nucleated corneocytes, which are shed at the surface after another 2 weeks or thereabouts.

The various cell stages form a multi-layered structure; each stage, with its own properties, contributes specifically toward the barrier and protective function of the epidermis (Fig. 1.2).

Function of the epidermis

The epidermis fulfils its function as a resistant and semipermeable protective layer through the stratum corneum, the end product of its

Structure of the epidermis

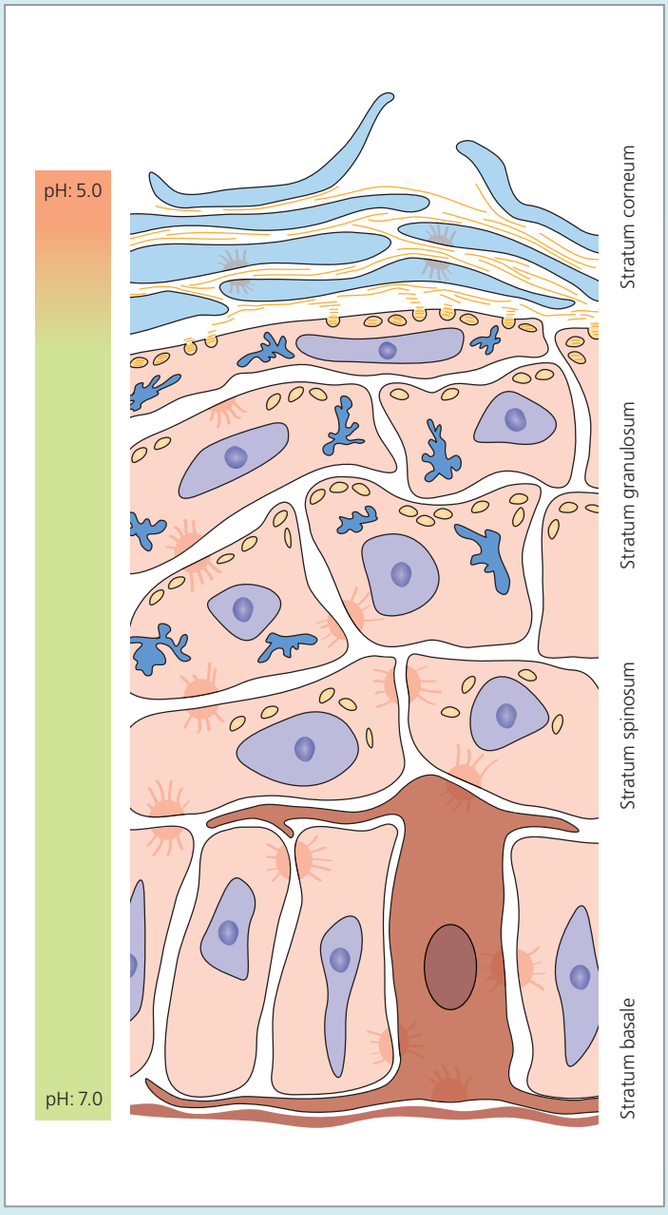


Fig. 1.2 Schematic structure of the epidermis.

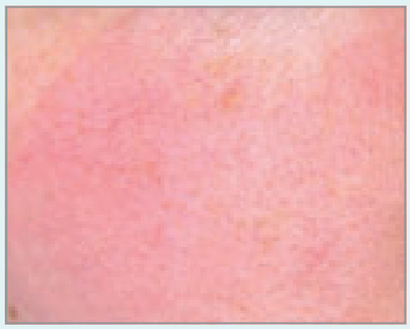
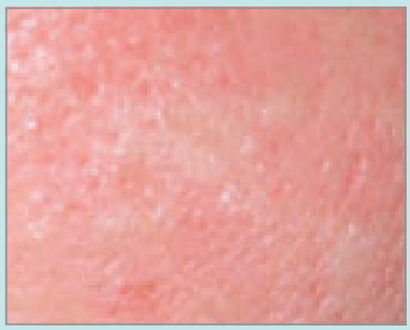
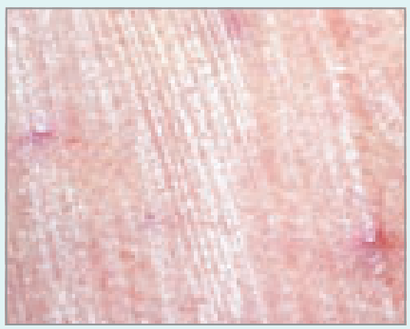
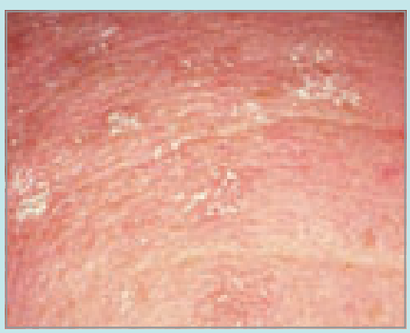
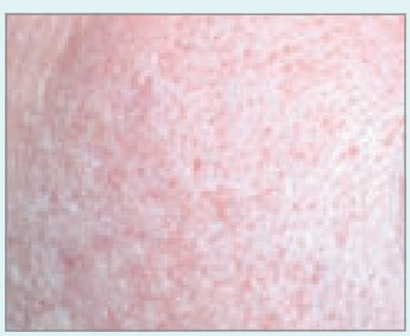
In the **stratum basale**, the keratinocytes are arranged in a single layer and are cubical in shape. The relevant stem cells have large, mitotically active cell nuclei. The basally located melanocytes lie in intracellular pigment stores, the melanosomes. Each melanocyte is in contact with about 30 keratinocytes via branched dendrites and supplies them with pigment. The melanocytes protect the skin from UV radiation in this way. The hemidesmosomes anchor the basal cells in the basal lamina. The stratum basale is in contact with the dermis, and thus also with the vascular system (the dermo-epidermal junction zone).

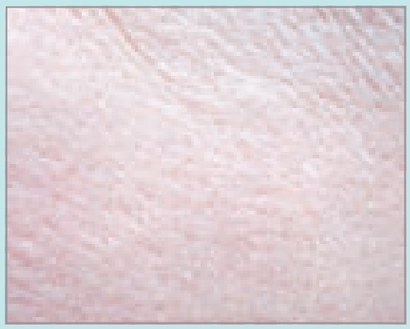
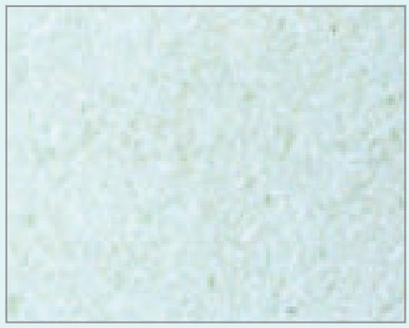
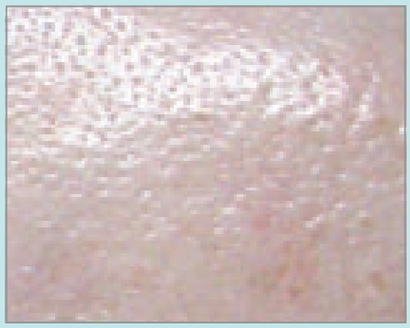
The single-layered basal cell line is followed by the multi-layered **stratum spinosum**. In these layers, the keratinocytes become increasingly polygonal in shape, while the cell nuclei become smaller and flatter. Spine cells (or prickle cells, the alternative name for cells of this differentiation stage), are attributable to an artifact caused by the histological work-up of tissue samples. Instead of mitotic activity, there is an increased synthesis rate in these cells, leading to an increase in cytoplasm volume and the cell organelles. Synthesis products such as keratins and lipids are stored in the cells. Desmosomes ensure intercellular cohesion. The stratum spinosum contains immunologically active Langerhans cells. Like the melanocytes, they possess branching dendrites, already ensuring rapid contact with any incoming foreign substances in the epidermis. The Langerhans cells capture foreign substances and present them on their surface in the form of processed peptide fragments.

In the **stratum granulosum** (also known as the granular layer), which follows on from the stratum spinosum, the metabolic activity of the keratinocytes is particularly high. The pyknotic cell nuclei have degenerated further and show marked flattening. The intracellular vesicular lipid stores (lamellar corpuscles) increase; in this layer, they are transported to the plasma membrane. The keratohyaline granules, which are not enclosed by a membrane, confer increasing strength to the keratinocytes and give the granular cells their name.

Differentiation takes place at the junction between the stratum granulosum and the **stratum corneum**. The cells are enzymatically transformed into hexagonal corneocytes. In their terminal stage, they are made up mainly of components of the keratohyaline granules and have a special protective shell (cornified envelope), which gives them an almost impermeable structure. Further sealing of the horny layer takes place via the build-up of an intercellular lipid matrix, which consists of the modified components of the lamellar corpuscles and undergoes exocytosis between the stratum corneum and stratum granulosum (see Fig. 1.3, p. 4).

Within the stratum corneum, cell cohesion is ensured by corneodesmosomes (among other structures). Until the outermost horny layers are reached, these are degraded by the proteolytic enzymes to allow desquamation to take place. Because of its bivalent function, the horny layer can be divided into a lower stratum conjunctum and the superficial stratum disjunctum.

Peel	Clinical endpoint	Appearance	Intended peel depth (grade)
AHA	Erythema		Superficial (A–B)
	Vesicles		Superficial to medium (B–C)
SA	Erythema with crystalline precipitate of the SA		Superficial (A–B)
Jessner's formula	Speckled frost (caused by resorcinol) on an erythematous base (caused by the AHA and SA); the Jessner's frost can have a greatly varyied appearance		Superficial to medium (B–C)
15 % TCA	Transparent frost (Level I)		Superficial to medium (B–C)

Peel	Clinical endpoint	Appearance	Intended peel depth (grade)
25 % TCA	Compact, delicate frost (Level II)		Medium (C–D)
35 % TCA	Compact, porcelain-like frost (Level III)		Medium (D)
Phenol (Baker-Gordon)	Greyish frost with peau d'orange skin (Grade E phenol frost)		Deep (E)

Tab. 2.2 Clinical endpoints of the standard peels and their grading according to the current classification systems.
The descriptions are terms chosen by the authors to illustrate the skin reactions that are produced. The classification into grades and levels is an aid but does not replace an individual, differentiated assessment of the circumstances in each case. Chapter 8 provides a more detailed presentation of the clinical course during and after the use of the classic peels.

2.1.2 Cleansing

To ensure that an active substance can penetrate the skin's layers as desired, the skin surface needs to be degreased. A thorough understanding of the relevance of degreasing is required as well as ensuring that the correct cleansing agent is used prior to the peel.

Detergents (soaps) and organic solvents (alcohol, acetone) are suitable. Aqueous solutions containing detergents are alkaline (pH 8 to 10) and allow the stratum corneum to swell up. The result is gentle degreasing of the skin's surface and, to a small extent, breakdown of the uppermost cell layers. The subsequently applied peel is better able to penetrate the horny layer pre-treated in this way and can act more uniformly, especially if the solution is hydrophilic. Ethanol and, in particular, acetone, degrease the skin surface by dissolving the fats from the sebaceous glands and the stratum corneum lipids. Using a cotton swab soaked in acetone, one can remove not only skin surface lipids, but also desquamated keratinocytes. The intensity of the cleansing that is needed depends on the chemical properties of the peeling solution, the quality of the patient's skin, and the goal of the treatment.

2.1.3 Effects of pre and post-peel formulae

Peels must always be seen in the context of adjunctive topical pre and post-peel therapy. The skin treatment pre and post-chemical peeling is carried out by the patient using preparations specially designed to support the regenerative effect of the treatment with regard to the patient's individual requirements. Depending on the depth of the peel and the condition of the skin, various active substances are used for topical treatment, to be applied by the patient for longer periods of time before and after the peel. The regular and

7.4 Anaesthetic Methods

The onset of pain during a chemical peel is dependent on several factors, including:

- the active substances used and their concentrations
- the depth of penetration of the peel
- the thickness of the skin in the area being treated
- individual sensitivity of the patient.

The aesthetic interventions needed range from the short-term application of local cold stimuli for superficial peels, through to regional nerve blocks, and all the way to sedation and oral analgesia with deep peels.

Superficial topical anaesthesia with topical agents or with infiltrative local anaesthetics is not recommended with peels. Split-face peels performed by L. Wiest have shown poorer results with the medium peel, where an anaesthetic cream was applied prior to the peel, compared to the side without any anaesthetic. Furthermore, the increased hydration from the use of a topical anaesthetic will affect the absorption of the acid, so it is best avoided.

7.4.1 General analgesia

Deep phenol peels and some deep TCA peels may require sedation and general analgesia with the help of the anaesthetist, or at least the use or oral or intramuscular analgesics alongside anti-anxiety medications. The desired effect of the analgesia is to ensure that it acts during the duration of the peel and for another 8 hours thereafter. Patients who are anxious or extremely sensitive should be offered sedation.

7.4.2 Nerve blocks

Regional anaesthesia can be used with medium TCA or combined TCA and deep phenol peels.

In general, it is sufficient to administer 0.5 to 1 ml of local anaesthetic per nerve (e.g. prilocaine 0.5 %, mepivacaine 0.5 %, bupivacaine 0.25 %).

Regional nerve blocks

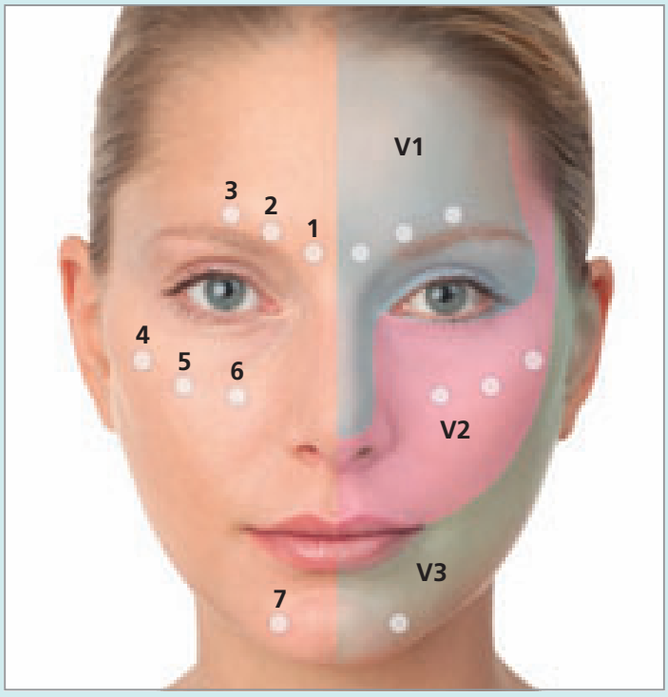


Fig. 7.5 Schematic representation of the corresponding areas of the face supplied by specific nerves, which can be blocked.
The innervated region supplied by the ophthalmic nerve (**V1**) is numbed by blocking its distal terminal branches including the supratrochlear nerve (**1**), as well as the medial (**2**) and lateral (**3**) branches of the supraorbital nerve. The region supplied by the maxillary nerve (**V2**) is numbed by blocking its terminal branches, including the zygomatico-temporal (**4**), zygomatico-facial (**5**) and infraorbital (**6**) nerves. Analgesia of the mandibular region (**V3**) is achieved by blocking the distal segment of the mandibular nerve, the mental nerve (**7**). There may be overlap between these 'blocked' regions when performing individual nerve blocks.

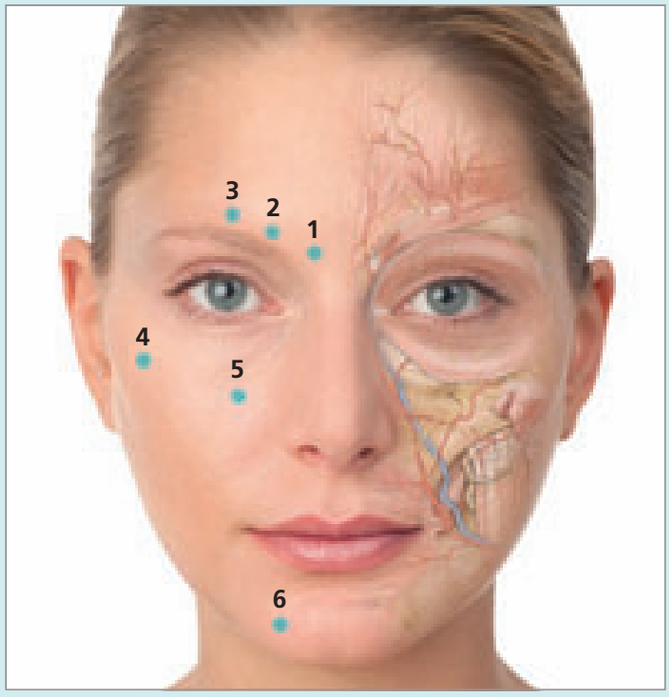


Fig. 7.6 Schematic representation of the injection sites in regional upper medial-facial analgesia.

1 Supratrochlear nerve block, access at the medial supraorbital margin.
2 Supraorbital nerve block, medial branch, access at the frontal notch.
3 Supraorbital nerve block, lateral branch, access at the supraorbital foramen.
4 Zygomatico-facial nerve block, access at the zygomatico-facial foramen.
5 Infraorbital nerve block, percutaneous access at the infraorbital foramen; in the intraoral technique, the needle is inserted into the upper gingivo-buccal sulcus of the oral cavity over the canine tooth and directed towards the palpated infraorbital foramen until bone contact is made.
6 Mental nerve block, extraoral access at the mental foramen.

Regional nerve blocks

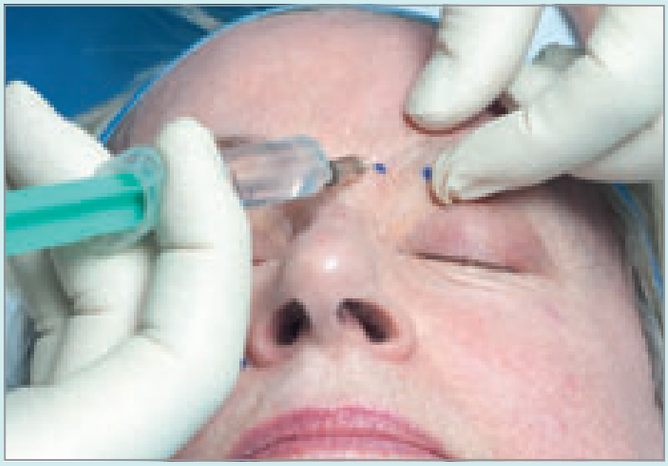
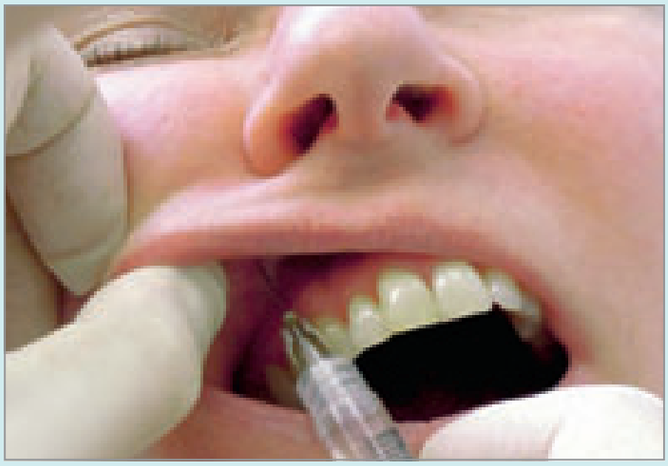


Fig. 7.7 Supratrochlear nerve block. The block is achieved by going in at the upper medial angle of the orbit.



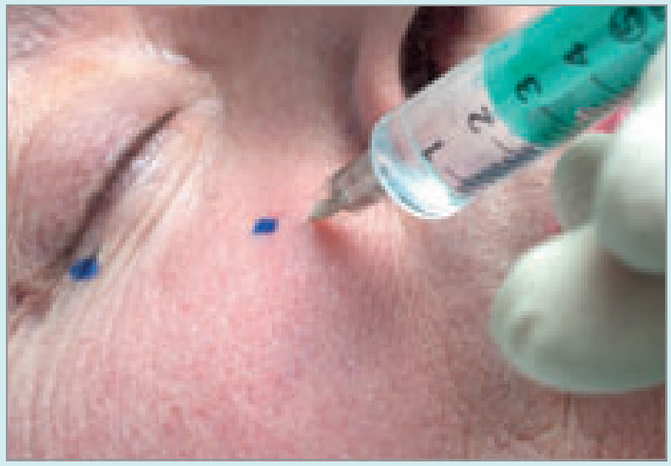
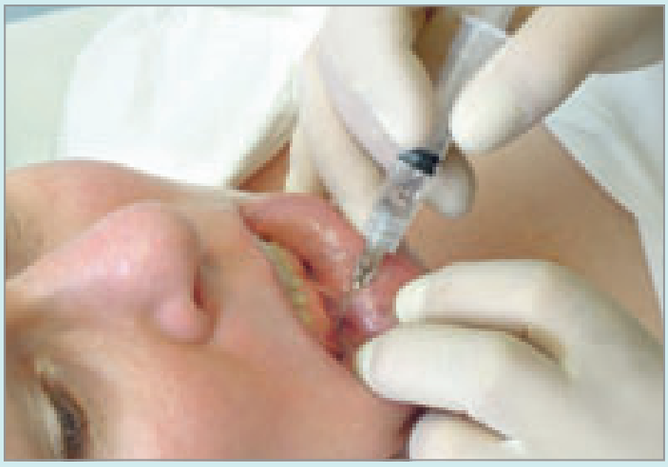


Fig. 7.8 Infraorbital nerve block: the intraoral method (left) is more elegant and less painful for the patient than the extraoral technique (right). For the intraoral technique, the needle is inserted into the upper gingivobuccal sulcus of the oral cavity over the canine tooth and directed towards the palpated infraorbital foramen until bone contact is made.



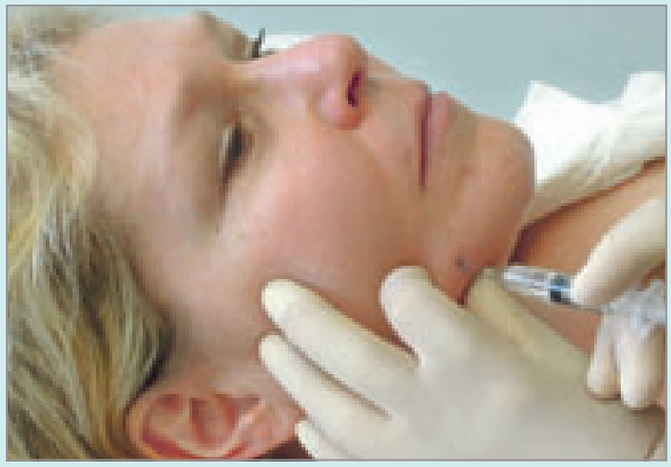


Fig. 7.9 For the intraoral **mental nerve block**, the needle is inserted into the lower gingivobuccal sulcus of the oral vestibule, close to the first and second premolars; in the extraoral technique, the needle is inserted laterally at an angle, directing it towards the palpated mental foramen.

7.4.3 Potential complications

The administration of a peripheral nerve block close to the treatment area requires knowledge, experience, and skill in local and regional anaesthesia. Injection-specific complications manifest mainly in the form of small hematomas and localised swelling, which usually subside after a few days. Nerve irritation caused by the needle itself is rapidly reversible. If the desired numbing is not achieved, this may be due to a poor injection technique or possibly due to anatomical variants in the nerves. Before a local anaesthetic is used, it will be necessary to rule out any known intolerance or allergy to the active substance and to the preservatives within the formulation; this is done whilst taking the patient's medical history. The preservative methyl 4-hydroxybenzoate is added to multiple-dose vials, and sodium disulfite is found as a preservative in vials and ampoules containing added adrenaline.

Warning signs of an allergic reaction include skin erythema, restlessness, anxiety, and dyspnoea. The following may also occur: erythema, urticaria, fall in blood pressure, tachycardia, nausea, vomiting, abdominal pains, bronchospasm, respiratory arrest with hypoxia, or circulatory arrest. The full clinical picture of this allergic reaction is known as anaphylactic shock.

Intoxication can occur if the local anaesthetic is accidentally administered into a blood vessel or at an excessive dose. Cardiac intoxication is preceded by subjective sensations such as dizziness, a metallic taste in the mouth, tinnitus, confusion, persistent word repetition, restlessness, and tremour. These warning signs must always be taken seriously. Administration of the local anaesthetic must be stopped as soon as the first symptoms appear. Central nervous system excitation manifests as irregular breathing, muscle tics, nausea, vomiting, generalised seizures, and increased pulse rate and blood pressure. Severe intoxication can lead to loss of consciousness, respiratory arrest, bradycardia, a fall in blood pressure, and finally cardiac arrest.

Note

For the treatment of these complications, the reader is referred to the recommendations given in the current anaesthesiological literature (see Morgan and Mikhail, 2013), amongst other local current guidelines. The practitioner should also keep a crash kit on hand at all times and check regularly it to ensure it is complete, up to date and functional.

7.5 Ground Rules

The various peels differ with regard to: the primary treatment goals for which they are used; their application techniques; the post-treatment clinical course; and their adjunctive topical treatments. Nevertheless, certain ground rules apply to chemical peels, and the practitioner needs to be familiar with them, regardless of whether the peel is superficial, medium, or deep.

Even if the peeling solution is designed for a specific penetration depth, the clinical outcomes can vary considerably. It is important to appreciate that the pre-treatment approach, quality of skin, and the application technique can all affect the clinical outcome significantly for any given peel (see Fig. 2.10, p. 28/see section 2.1.1 *Clinical outcomes of peeling*).

It is important that the practitioner acquired thorough and sufficient experience of the different peels, in order to be able to them master and accomplish individual, tailored treatment goals. To be able to peel safely and effectively, the practitioner needs to know:

- which active substances are being applied
- the potential invasiveness of the formula used
- the nature of the skin surface being peeled (pre-treatment and cleansing of the skin)
- how the penetration depth shows up on the skin
- how application can be controlled accordingly (see section 7.6 *Application Techniques*)
- what sort of clinical post-peel course can be expected
- how the post-peel treatment should be implemented and managed should complications arise
- the likely results of the peel.

The clinical treatment goal and a suitable way of achieving it need to be planned in advance. The practitioner needs to decide which peeling solution is optimal and should the patient detailed instructions on the pre and post-peel treatment plan. The subsequent treatment course should be adjusted individually. The clinical appearance of the skin surface during the peel should be monitored carefully, as it shows the practitioner how the peel is working and when the procedure needs to be stopped. This requires cautious observation of the skin reactions throughout the peel treatment. In the words of Dr Mark Rubin: "Never leave the room during the peel!"

7.5.1 Cleansing and degreasing

A peel, whether superficial, medium or deep, works better on a thoroughly cleansed and degreased skin surface. The patient should remove all makeup prior to cleansing with a detergent, and where necessary, degreasing of the skin with an organic solvent (acetone and/or alcohol) takes place as the first step of the treatment. This very thorough step can take up to 2 mins and is adjusted according to topographic and individual features and according to the planned peel. 'Chemical' cleansing can be very time consuming in a seborrhoeic patient, or one who has used camouflage makeup. The significance of this cleansing must not be underestimated. A superficial AHA peel applied to poorly prepared skin has little or no effect. A medium peel, if performed on insufficiently degreased skin, can lead to a patchy uneven absorption of the peeling solution and an unsatisfactory result.

7.5.2 Pre and post-peel treatment

The daily topical therapy with specifically tailored products should start no later than 2 weeks prior to the (first) peel and should continue for an appropriate time after the peel (see section 7.7 *Superficial Peels*). In the case of superficial peels, it has a decisive influence on the clinically visible effect and on the achievement of the aesthetic goals.

With medium and deep peels, the topical preparations are used to prepare the skin for the peel, to accelerate wound healing, as well as to optimise the end-result. Side-to-side comparison trials have shown that topical skincare before and after a medium TCA peel appears to create a more uniform peel with more rapid healing (Hevia et al, 1991; Humphreys et al, 1996; Kim et al, 1996).

The selection of adjunctive topical products is varied and should be tailored to the requirements, which depend on the:

- peel
- skin type
- tolerability of the skin
- clinical indication.

Significance of pre-treatment when performing a Jessner's + TCA combination peel

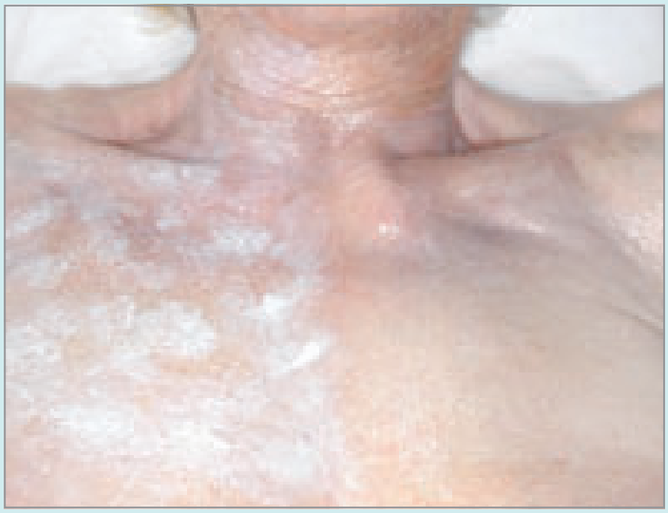


Fig. 7.10 Starting point of a side-by-side comparison to analyse the significance of the pre-treatment ointment base for the outcome of a TCA combination peel. On the patient's right side, the base was was not applied accurately and thoroughly over this area (compare with uniform application on the patient's left side).

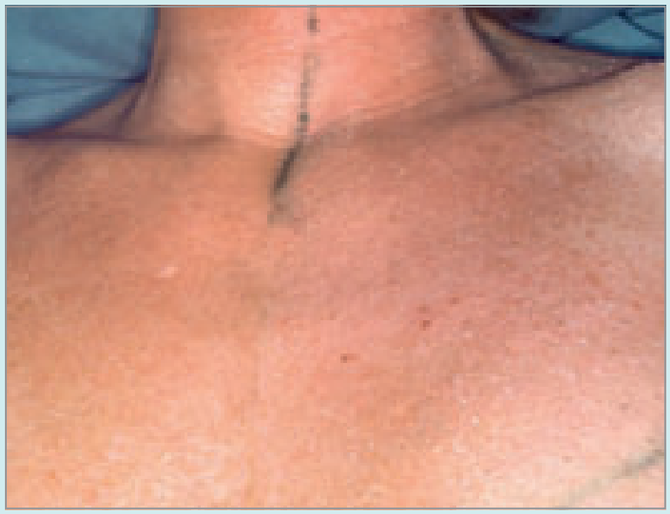


Fig. 7.11 Endpoint of Jessner's peel approximately 2 weeks after the start of the pre-peel treatment. After a uniform peel application technique on both sides, it is noticeable that the Jessner's frost develops differently on the right side of the patient's décolletage as compared to the left where more frost patches are visible.

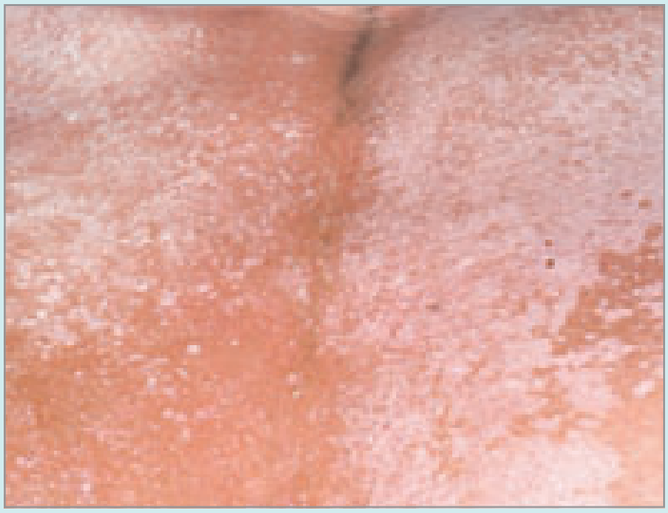


Fig. 7.12 Frost level I to II following the application of 20 % TCA after Jessner's. On the patient's left side, a uniform frost forms virtually throughout the décolletage. In contrast, the right side of the patient's décolletage tends to show isolated white frosting patches on an erythematous base.

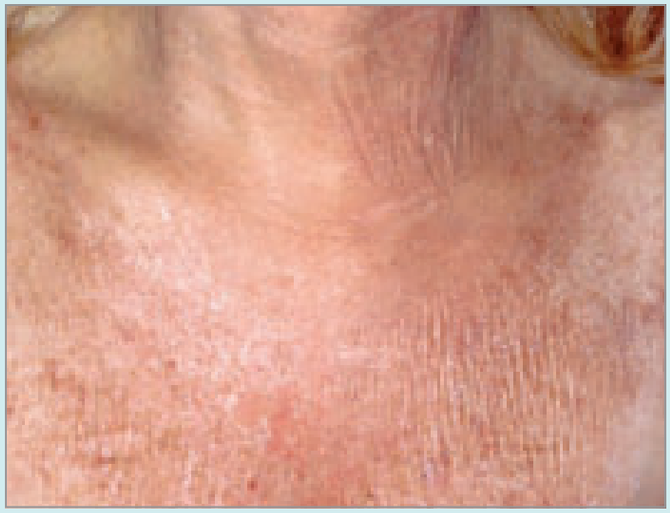


Fig. 7.13 Repair phase, days after the peel. On the patient's left side, the skin of the neck shows uniform brown discolouration and appears to be healing evenly and without complication. On the patient's right side, the desired discoloration is only partly apparent; on the right side of the neck, down to the infraclavicular area, the peel appears to have had hardly any effect and no exfoliation is taking place. The side-to-side comparison has shown that superficial TCA peels act less uniformly on poorly prepared skin.

Application

Jessner's solution should be applied with a brush, gauze or cotton swab. Erythema initially appears on the skin, which some time later is followed by a very characteristic speckled frost. The peel should be stopped when the appropriate anticipated endpoint is reached, which may be erythema, a speckled frost or a wispy more confluent frost.

Combination peel comprising Jessner's and TCA

In combination with a Jessner's peel, TCA solutions are able to penetrate more uniformly and deeper into the pre-treated skin. Therefore, similar peel grades can be achieved either by making use of a combination peel comprising Jessner's + TCA, or by applying TCA alone in a higher concentration or with a more aggressive application technique. The authors' experience has shown that the risk of scarring and pigmentary changes possible with medium grade D peels can be minimised with the use of the combination peel of Jessner's + 35 % TCA.
Combination peels comprising Jessner's formula with a lower TCA concentration (15 % to 20 %) are commonly used by the author L. Wiest to carry out a lighter medium peel with a frost level I to II, requiring only a few days for complete healing. Since this sometimes can be done over a long weekend (from Thursday to Monday) –the author has personally termed this the 'weekend peel'. This peel appears appealing since it does not entail extensive downtime but at the same time allows for a significant peeling effect. The post-peel skin reaction, usually starting from day 2, comprises a few days of moderate erythema and flaking, followed by a visibly refreshed appearance. In some cases, the patient might not need to take any time off work if the peel is done on a Thursday. Even though this peel can be carried out at any time of the week, patients seem to find the idea of a weekend off attractive, and a good use of their valuable time.

Fig. 7.24 A gauze swab *(left)*, soaked in the solution and squeezed out so that it does not drip is suitable for the **application** of Jessner's solution. Alternatively, the Jessner's solution can be applied with a large Q-tip *(right)*.

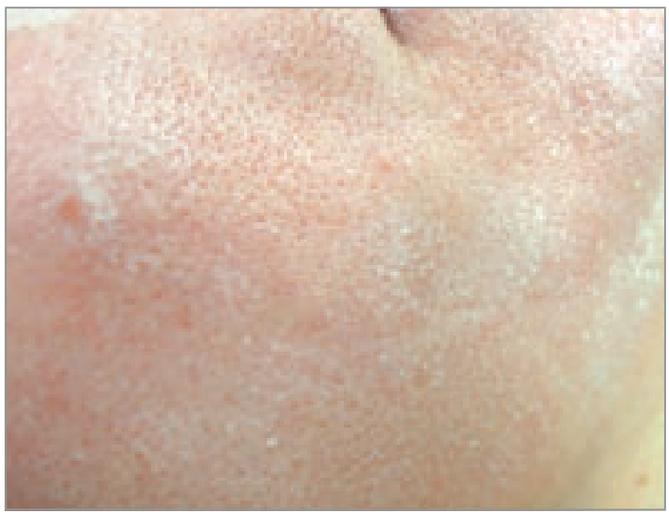


Fig. 7.25 Application of Jessner's solution leads to erythema and, at the endpoint, to a **patchy delicate frost**, which can appear very different depending on the patient's skin.

Anaesthesia recommendations:

A fan (manual or electric) may be suitable for cooling during the treatment. Dry cool packs can also be used afterwards if required. Given that SA crystals can be redissolved and subsequently reactivated after contact with water, cooling with damp clothes or oil/water emulsions is not recommended after peels containing SA such as Jessner's.

7.8 Medium Peels

7.8.1 Trichloroacetic acid (TCA) peel

TCA represents the classic agent for medium peels. However, depending on its concentration, the pre-peel treatment, and the application method, it can be used for very distinct peel grades from superficial to medium (grade B to D). The deeper the peel penetrates into the skin the more intense the frost appears on the surface. This enables the practitioner to control the peel grade they wish trying to attain. In using e.g. a lower concentration of TCA (15 to 20 %) and/or a lighter application technique, it is possible to peel down to a frost level I to II associated with a minimal peeling effect of grade B to C. On the other hand, using 35 % TCA and a respective stronger application technique (quantity of solution used, pressure of application and number of coats), it is also possible to peel to a compact level III frost (grade D peel), with a healing phase lasting several days. Some authors prefer to use TCA in combination peels, after a suitable pre-peel e.g. with Jessner's (see section 7.7.3 *Jessner's peel*) since this makes it easier to achieve a more homogenous frost level with a gentle application technique alongside a reduced risk of complications, as advocated by Monheit, 1996.

The following section explains and illustrates the procedure involved, using a medium TCA peel (frost level II to III) as an example.

Indications for a medium TCA peel include:

- photoageing (Glogau type II to III)
- melasma
- shallow acne scars
- zones of deeper hyperpigmentation, lentigines.

The post-peel phase after a medium TCA peel can be associated with persistent erythema, oedema, and brown discolouration of the skin. The risk of side effects and complications increases the deeper the peel penetrates, and may need to be addressed with adjunctive topical therapy and medical care during the healing phase.

Note

According to Rubin (1995), the TCA frost is divided into three levels:

- **Level I: transparent frost, grade B to C peel.**
- **Level II: compact, delicate frost, grade C to D peel (extending into the upper stratum papillare).**
- **Level III: compact white frost, grade D peel (extending into the stratum papillare).**

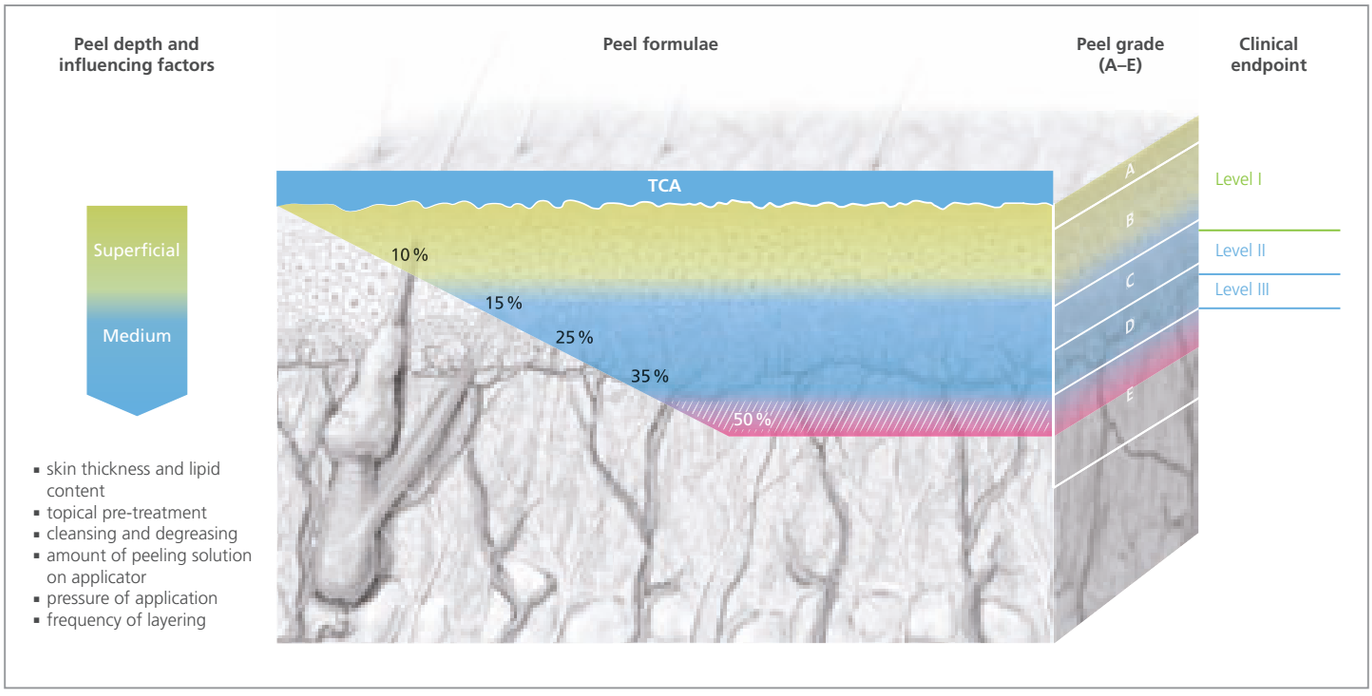


Fig. 7.26 Summary of TCA peels. The picture illustrates the different peeling options with TCA, their expected peel grades and clinical endpoints. TCA is most commonly used to achieve a medium peel depth. Depending on the concentration of the peeling agent and the application technique used, the peel can achieve either a transparent frost (level I) indicating a superficial peel, a delicate frost (level II) of a light medium grade C to D peel or to a compact, porcelain white frost (level III) of a medium grade D peel penetrating the papillary dermis. Theoretically, in higher concentrations (e.g. 50 %), TCA can also reach a deeper peel grade (shown in pink). However, the authors do not recommend this, because there is a high risk of scarring with TCA peels used in concentrations greater than 35 %.

8.2 Salicylic Acid (SA)

8.2.1 Indications and options

Repeated superficial peels with SA (usually from 10 % to a maximum of 30 % in pure solution), accompanied by appropriate pre and post-peel topical treatment, are frequently used as adjunctive treatments for acne comedonica and papulopustulosa as well as to improve the overall appearance of the skin. The alcoholic solutions of pure SA can cause irritation on the face but are particularly suitable for a back peel. Given the proportionally greater percutaneous absorption of SA when considering treating a large skin area such as the back, this requires a thorough discussion with the patient to ensure they are fully informed of the procedure, have no contraindications and are aware of the correct re-treatment advice. Patients should be directed to drink about a litre of water before undergoing a large-surface SA peel, e.g. acne on the back. For facial treatments, many manufacturers offer combined SA and GA solutions, which are well tolerated.

8.2.2 Peeling

Pure SA solutions (e.g. the authors recommend 15 % SA) are generally used for grade B peels. To achieve this, the solutions should be applied until slight or, in some cases, severe erythema is produced (Figs. 8.15 and 8.16, right side of the face). SA is dissolved in alcohol, which evaporates on contact with the warm surface of the skin. This causes the SA to crystallise along the brush strokes during application. The endpoint of a superficial SA peel can therefore be described as an erythema with white crystalline precipitate (Fig. 8.13), which should not be confused with a frost. Since broader brushes are used for a back peel, application of the SA solution produces a coarse pattern of white crystals (Fig. 8.14). The endpoint of the peel is achieved when erythema develops below the crystals. The erythema in this region is generally less severe than with a comparable facial peel.

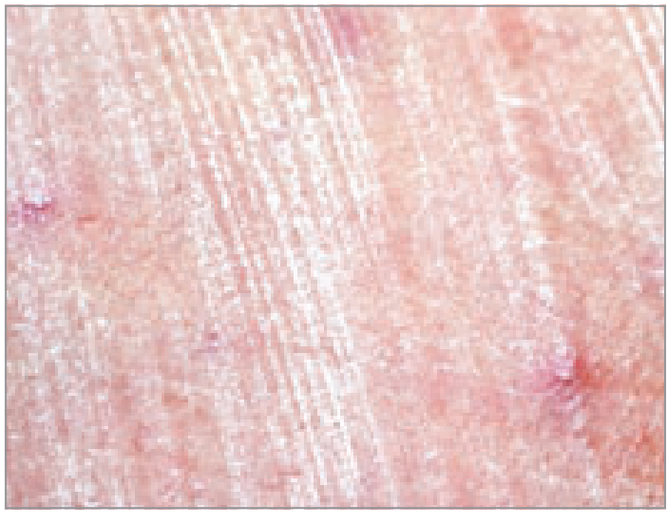


Fig. 8.13 Crystalline precipitate left behind by a SA peel. Whilst this phenomenon may resemble a frost, it is not due to protein denaturation, but to the crystallisation of SA on the skin's surface.

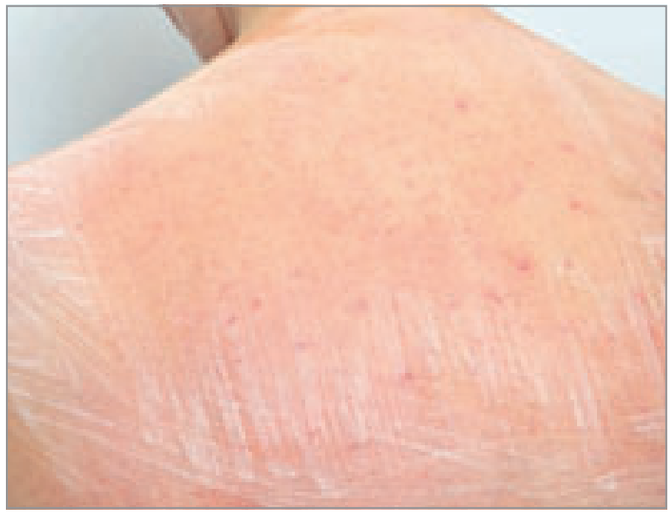


Fig. 8.14 15 % SA peel on the back.

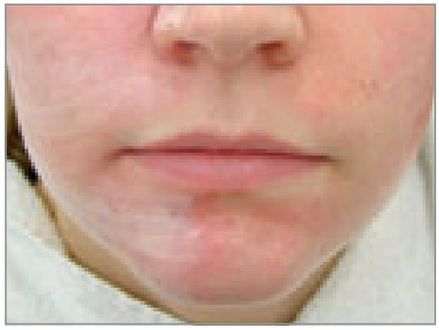


Fig. 8.15 Side-to-side comparison.
Patient's right side: skin reaction at the endpoint of a 15 % SA peel.
Patient's left side: skin reaction following the application of 20 % GA.

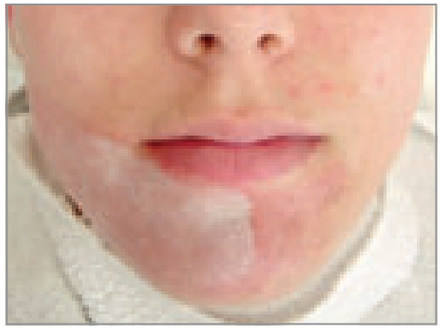


Fig. 8.16 Side-to-side comparison.
Patient's right side: skin reaction after a 30 % SA peel.
Patient's left side: reaction following a 35 % GA peel.

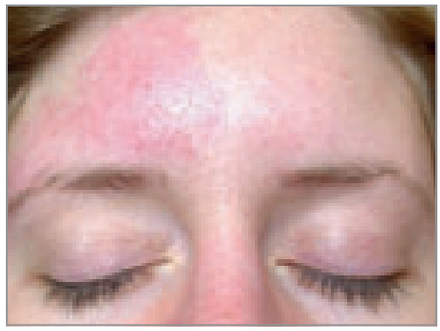


Fig. 8.17 Side-to-side comparison 60 min after the peel. The right half of the face treated with 15 % SA shows more intense reddening than the left half treated with 20 % GA. The final clinical outcome on both sides was comparable.

8.2.3 Post-peel

Immediately after the peel, the patient should not apply anything wet on the treated area for some hours as the SA could be reactivated when in contact with water. The SA crystals can be rinsed off with water by the patient a few hours after the peel. Facial erythema with SA can persist longer than with an AHA peel (Fig. 8.17). Then 24 hours after the SA peel, the skin will generally have returned to its original clinical state. In some cases, it may still be mildly irritated in places where the SA solution was able to penetrate deeper (e.g. in sites of acne lesions).

8.3 Jessner's Formula

8.3.1 Indications and options

A Jessner's peel alone can generally reach grade B to C. It is most commonly employed as part of a combination peel with TCA. The lighter variant of a medium combination peel (also called the 'weekend peel' by L. Wiest) with Jessner's + 15 % to 25 % TCA may be used to treat acne and superficial skin changes such as pigmentation abnormalities and the first signs of skin ageing. These peels are also suitable for medium treatments of grade B to C in regions of the integument with a low appendage density, such as the neck and décolletage region, where slower re-epithelialisation is to be expected.

When used on the face, a 'weekend peel', according to L. Wiest, leads to a refreshed appearance. As a combination peel with 35 % TCA, Jessner's formula can be used for a medium (grade D) facial peel to treat shallow acne scars and moderate skin ageing with actinic keratoses and elastosis.

8.3.2 Peeling

Jessner's solution is a mixture of various active substances (14 % resorcinol, 14 % SA and 14 % lactic acid), of which only resorcinol causes coagulation and therefore a frost. Application of Jessner's solution first leads to erythema and then to a highly characteristic, usual speckled frost on an erythematous background whose intensity may resemble a TCA level I frost. However, the appearance of the Jessner's frost may vary considerably (Figs. 8.18 to 8.21), depending on the patient, the skin area to be treated, the pre-treatment, as well as the application technique. The skin reaction can be anything from a few to numerous whitish frost patches on an erythematours background, and in a few rare cases, a uniform, transparent frost may appear.

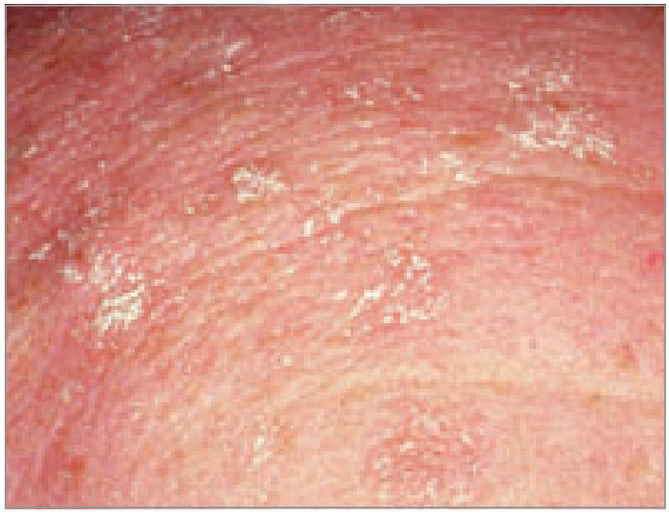


Fig. 8.18 Endpoint of the Jessner's peel on the actinic keratoses on the forehead. The isolated white speckles on an erythematous background are characteristic of the frost appearance in this specific formulation.

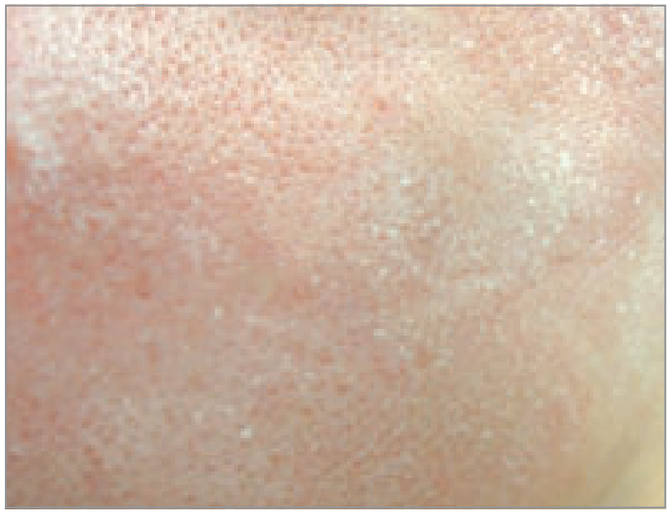


Fig. 8.19 More uniform, transparent Jessner's frost with single small, intense white patches on the cheek.

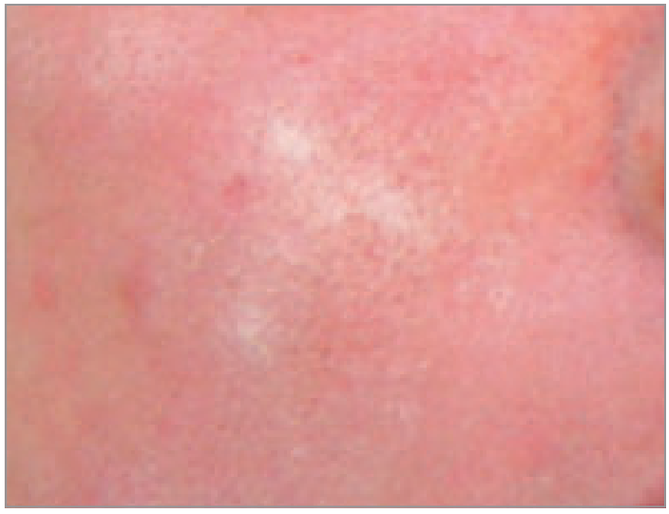


Fig. 8.20 Larger focal frost areas on an erythematous background after Jessner's peel on the cheek of another patient.

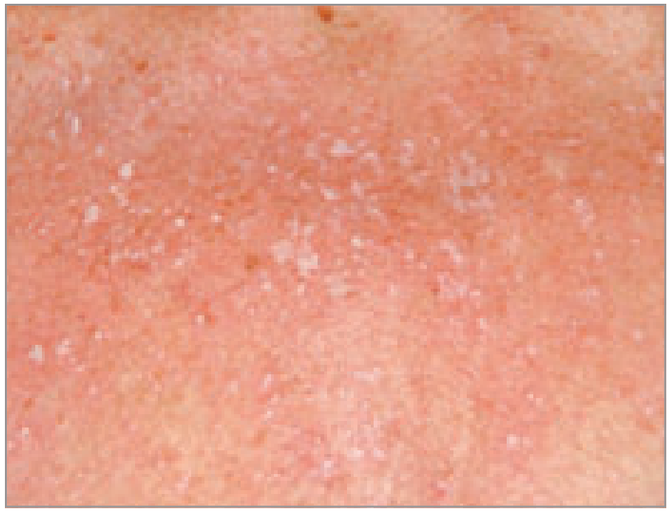


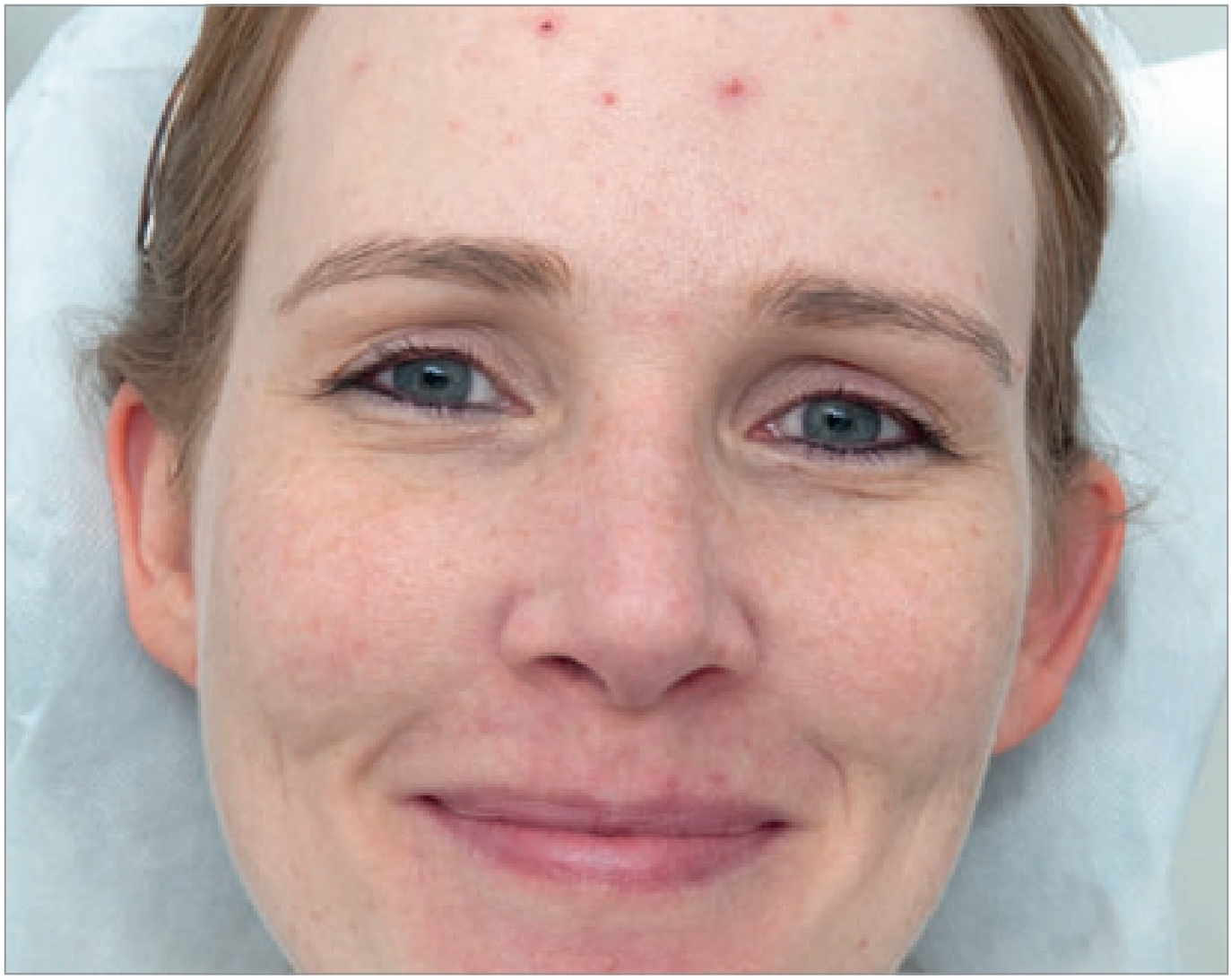
Fig. 8.21 Characteristic speckled Jessner's frost on the décolletage area.

8.3.3 Post-peel

A Jessner's frost begins to fade a few minutes after the peel application. The erythema may persist for 2 to 3 more days thereafter. Mild oedema develops after the peel, depending on the treatment area. The next day, the superficially denatured skin takes on a brownish discolouration and parchment-like consistency (see section 8.4 *Trichloroacetic Acid (TCA): FACE*). The feeling of tension increases as the oedema subsides. Desquamation of the denatured skin layers usually lasts 2 to 3 days, but on occasion it can take longer.

9 Indications

9.1 Excoriated Acne (Face)



Findings			
Age and gender	28-year-old female.		
Patient's medical/ aesthetic concerns and requests	*Skin findings*	*History*	*Request*
	• Ongoing acne since puberty on the forehead. • Slight irritations periorally, otherwise no skin lesions on the rest of the face.	• Successful professional leading a lifestyle of health and sustainability (LOHAS). • Otherwise healthy. • Wears makeup during daytime.	Prefers 'natural treatment' and no 'chemicals' to achieve complete resolution of the active lesions as well as at least partial resolution of the acne scarring left behind.
Objective assessment by practitioner	*Fitzpatrick skin type*	*Glogau type*	*Detailed skin assessment*
	II	I	Excoriated papules and pustules primarily on the forehead, with the rest of the face unaffected.

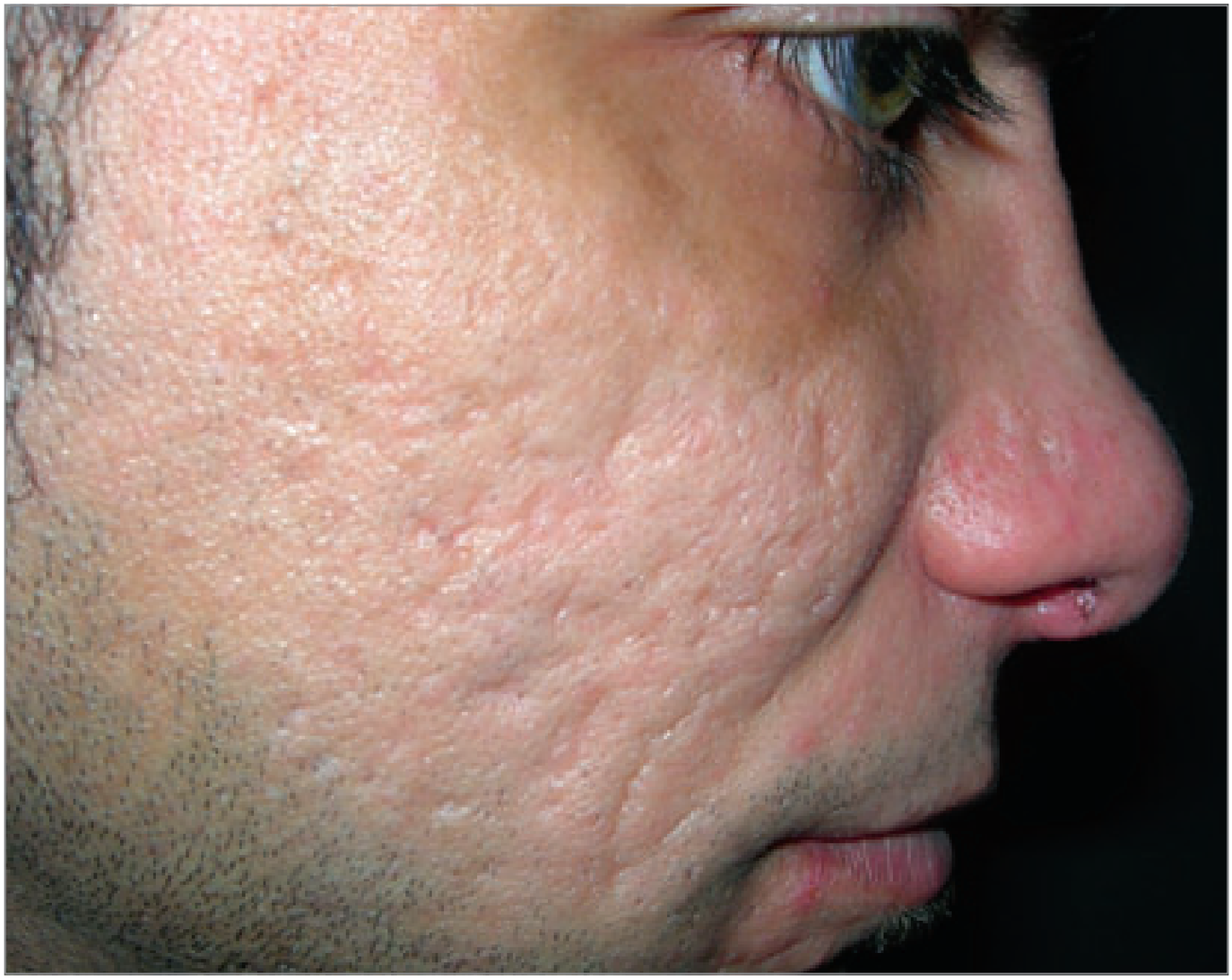
Treatment plan		
Peel options	Acne pustules and papules respond well to repeated superficial peels with AHA or SA. Given that this patient is a 'LOHAS', it is likely that she is going to prefer a treatment with AHA as these chemicals have the common reputation to be more nature-based than others. Even if this statement cannot be confirmed by the authors, repeated AHA peels (20–70 %) might be the first option in this patient even if SA peels (15 %) are supposed to have a comparable clinical outcome. Also with regard to the adjunctive homecare, the practitioner should make sure to prescribe formulae containing ingredients that at least are not synthetic. Other adjunctive acne treatment modalities such as benzoyl peroxide (BPO) are also to be considered if not expressly declined by the patient previously, as it has been the case with this patient.	
Chosen treatment plan		
Peel	Repeated primarily superficial AHA peels (20–70 %).	
Treatment region	Full face with primary focus of the forehead.	
Peel formulae	Start with the lowest AHA concentration available, i.e. 20 %. For the second peel, no sooner than 2 weeks after the first peel, a higher concentration, i.e. 35 %, can be used and so on.	
Intended peel grade	A–C	
Application technique	Apply gently with a brush and wait for initial erythema to evolve (1–5 mins). On average 2 ml is sufficient for a full face treatment. Apply as much to keep the skin moist until neutralisation. *Note:* In sites of acne lesions, AHA will more easily penetrate the stratum corneum and must be neutralised sooner than in the rest of the face where the skin surface is intact. A sodium bicarbonate (neutraliser) submerged Q-tip may be used for that purpose.	
Clinical endpoint	Full face showing patchy erythema and vesicles around acne lesions.	
Pre-peel adjunctive skincare	*Substances*	*Duration & frequency*
	AHA-containing products with a pH of approximately 4.0.	Once to twice daily over 2–4 weeks.
Post-peel adjunctive skincare	*Substances*	*Duration & frequency*
	AHA-containing products with a pH of approximately 4.0.	Once to twice daily until the next peel.
Duration and frequency of peel treatment(s)	• Estimate of about 5–6 peels for significant improvement. • 3–6 months (5–6 peels every 2–4 weeks).	
Long-term advice	• Continue with homecare products with a pH of approximately 4.0; if there should be a relapse, advise patient to return to the office for another set of AHA peels. The number of peels should be adjusted to the patient's needs. Long-term breaks are recommended also 'for the sake of the patient's wallet'. If they can afford and are willing to return to the office on a regular basis, they may do so. • Advise patient to avoid picking the active spots, to avoid pigment changes and scarring.	
Discussion	Regular AHA peels should not intrude deeper than grade C. Thus their range of risks is limited as is the possible clinical outcome regarding skin rejuvenation within a set of five to six peel treatments. If the treatment plan is going to be carried out over several months to years, a significant improvement not only of acne pustules and papules is to be expected, but also of skin ageing changes. A possibility of improving the clinical result could be achieved with adjunctive topical treatments, such as with BPO, if the patient agrees. If the patient has no personal preference for peels conducted with AHA, comparable results are likely to be achieved with repeated 15 % SA peels also.	

9.13 Elastosis (Face, Fitzpatrick Skin Type II–III)

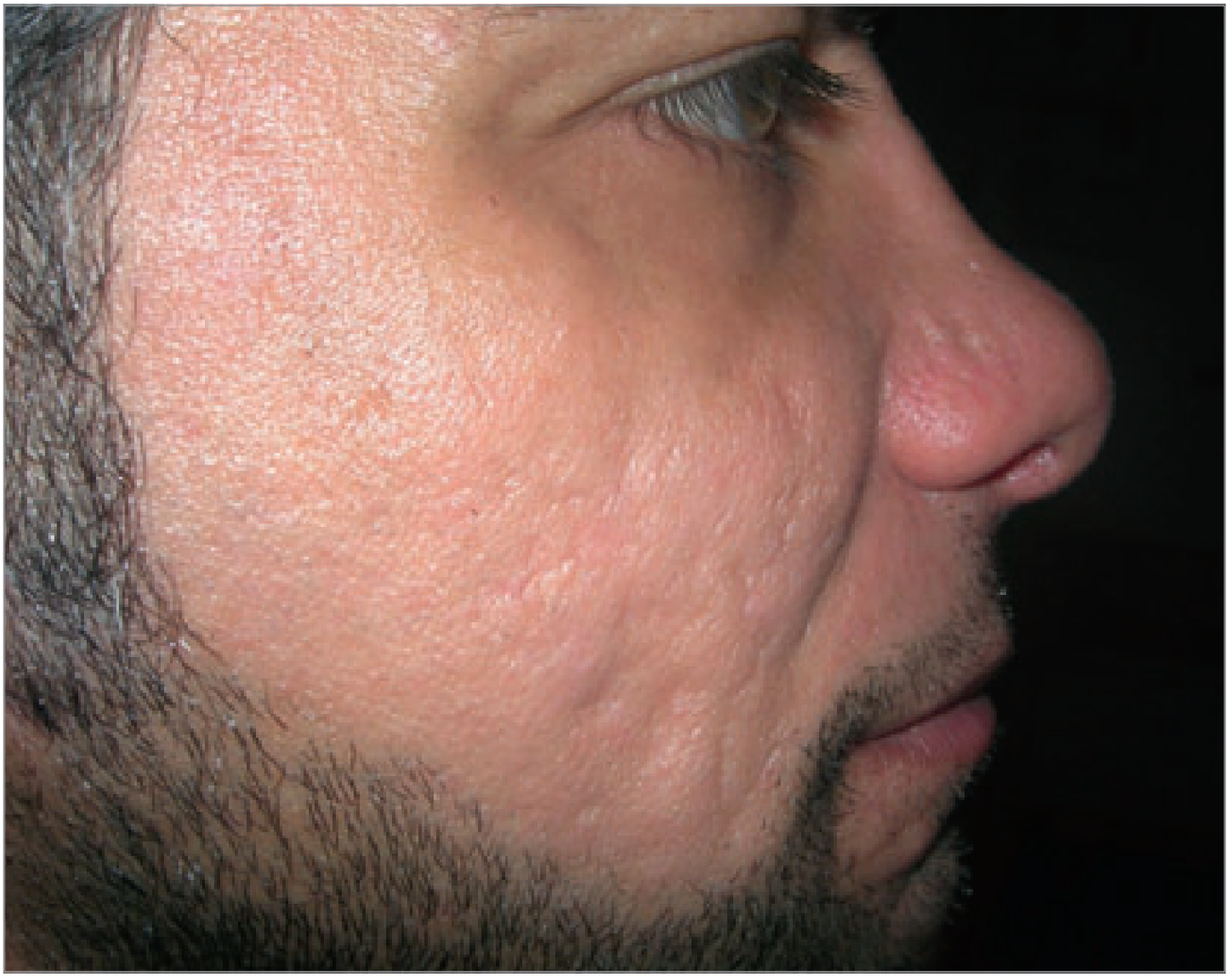
Findings			
Age and gender	63-year-old female.		
Patient's medical/ aesthetic concerns and requests	*Skin findings*	*History*	*Request*
	• Age-related facial elastosis with particularly pronounced wrinkling on the forehead, the periorbital and perioral region. • Sensitive and oily skin.	Treated with botulinum toxin type-A for many years.	• Reduction of wrinkles, in particular the marionette lines. • Does not want to take much time out post-treatment.
Objective assessment by practitioner	*Fitzpatrick skin type*	*Glogau type*	*Detailed skin assessment*
	II–III	• Cheeks: Glogau II. • Glabella, periorbital and perioral region: III.	• Forehead and periorbital region: severe forehead lines, crow's feet, glabella lines, and infraorbital hollowness. • Cheeks: fine wrinkling, severely sunken lower portions of the cheeks and nasolabial folds. • Perioral region: moderate to severe lip wrinkles and marionette lines.

Treatment plan		
Peel options	In order to reduce the severe wrinkles and elastosis in the perioral and periocular regions, a deep phenol peel reaching grade E would be the most effective treatment option. However, the patient does not wish to have a long downtime and therefore a deep phenol peel. Alternatively, the periocular and perioral regions can be treated with a medium grade D peel, e.g. Jessner's + 35 % TCA combination peel. For the rest of the face, the practitioner can use a lighter medium peel, e.g. a combination of Jessner's + 25 % TCA to diminish the required post-peel care and downtime as desired by the patient. It is important to explain to the patient prior to the treatment that they should not expect optimal clinical improvement of the wrinkles given the gentler peel utilised as per request. Adjuvant minimal-invasive methods are to be proposed in that respect (see discussion). Regarding the topical adjuvant pre and post-treatment, a formula with 2–4 % hydroquinone is appropriate to avoid pigment changes in this Fitzpatrick II–III type.	
Chosen treatment plan		
Peel	Mosaic peel: Medium combination peel with Jessner's + 35 % TCA on the periocular and perioral regions, alongside a lighter medium *('weekend peel')* with Jessner's + 25 % TCA on the rest of the face.	
Treatment region	Perioral and periocular.	Forehead and cheeks
Peel formulae	Jessner's + 35 % TCA.	Jessner's + 25 % TCA.
Intended peel grade	D	C
Application technique	Apply Jessner's solution on the thoroughly cleansed skin until a confluent frost has appeared on an erythematous base. After the Jessner's frost has evolved, work 35 % TCA onto the periocular and perioral skin, preferably using a cotton tip, until an even white porcelain frost is achieved.	On the rest of the face, apply 25 % TCA with a cotton ball and/or cotton tip until a uniform, delicate frost has evolved.
Clinical endpoint	• Jessner's: speckled frost on erythematous background. • 35 % TCA: porcelain white frost, level III.	• Jessner's: speckled frost on erythematous background. • 25 % TCA: delicate frost, level II.
Follow-up visits	As long as the skin is inflamed and re-epithelialisation is in progress, the patient should be advised to come to the clinic every 1 to 2 days for a review, and particularly to manage the topical wound care treatment. If the practitioner and the patient wish, a professional debridement of the peeling skin can be carried out as part of these clinic visits (see Chapter 7). With the restoration of the uppermost skin layers, the clinic visits should be continued once to twice per week. Keep in mind that even after complete re-epithelialisation, dermal remodelling and collagen synthesis have just been activated. Hence you should see the patient on and off for 6 months after the treatment to assess the full extent of the clinical improvement.	
Pre-peel adjunctive skincare	*Substances*	*Duration & frequency*
	Hydroquinone (2 %) and tretinoin-containing topical products.	Twice daily > 4 weeks.
Post-peel adjunctive skincare	*Substances*	*Duration & frequency*
	• Herpes simplex oral prophylaxis treatment should be initiated on the day of the procedure and continued over 5 days. • The topical post-peel treatment regimen correlates with the healing course, i.e. application of O/W or W/O and/or antibiotic containing emulsions. • Saline compresses to hydrate and petroleum jelly to protect the inflamed skin are recommended in the first days post-peel. • Hydroquinone and possibly tretinoin-containing products are indicated after re-epithelialisation; daycare should include broad-spectrum high SPF UVA and UVB.	Duration and frequency of application must be aligned to the healing stage, as well as given preferences for O/W or W/O emulsions during the healing stages. The treated skin and its topical management should be controlled for at least several months. See Chapters 7 and 8 for more specific information.
Duration and frequency of peel treatment(s)	• Single treatment, which can be repeated if required. • The peel itself may take 60 mins, however post-peel visits, i.e. wound care, possible debridement and psychological support, should also be taken into consideration. The better the first peel works out, the more likely a second peel will be considered by the patient.	
Long-term advice	Continuous use of broad-spectrum high SPF is required (recommended amount: 2 mg/cm^2).	
Discussion	The mosaic peel employing Jessner's + 35 % TCA and Jessner's + 25 % TCA was chosen owing to the patient's desire for minimal downtime. Otherwise, a deep phenol peel would have been the optimal treatment choice. During the consultation it is essential to highlight to the patient this particular issue, to ensure they are fully informed on the realistic clinical outcomes with the final chosen treatment. Importantly, it should be emphasised that the medium peel approach will also require considerable post-peel care and the downtime shall only be 2–3 days shorter than with the deep peel, and yet the clinical outcome with the deeper peel shall be considerably better. The authors would further recommend the use of botulinum toxin type-A prior to the peel in areas heavily affected by muscular dynamics, in particular in a patient desiring a medium peel to treat advanced elastosis. A further combination of this treatment with focally injected dermal fillers can simultaneously optimise the treatment result. In terms of follow-up treatments, ongoing superficial AHA peels can be performed alongside a pH 4.0-skincare regimen.	

10.8 Acne Scars (Face)

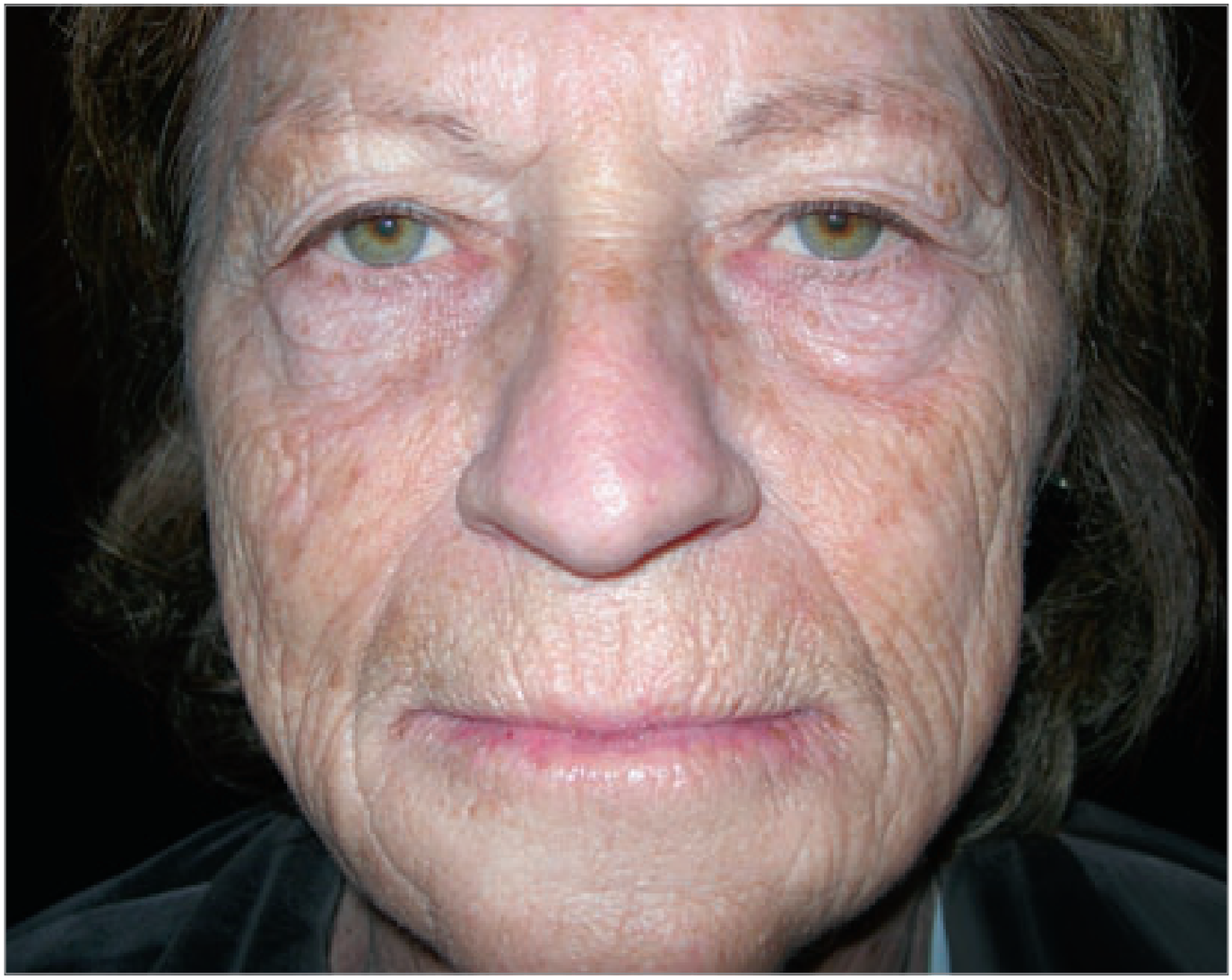


Findings	
Fitzpatrick skin type	III
Glogau type	II
Indication	Multiple deep, pitted scars on the cheeks.



Treatment	
Treatment region	Full face.
Intended peel grade and treatment goal	Grade E to improve appearance of acne scars.
Peel used	Single Baker-Gordon peel.
Pre-peel treatment	Tretinoin 0.1 % and hydroquinone 4 % on the whole face to enhance the peeling effect, the wound healing and to prevent post-inflammatory hyperpigmentation. To be initiated 4 weeks prior to the peel and applied once in the evening.
Post-peel treatment	Tretinoin 0.1 % and hydroquinone 4 % on the whole face, continued after re-epithelialisation for about 4 months. Daycare including broad-spectrum high SPF UVA and UVB.
Timing of the photo documentation	2 years post-peel.

10.15 Elastosis (A dvanced – Face)



Findings	
Fitzpatrick skin type	II
Glogau type	IV
Indication	Elastosis, hyper- and hypopigmentation zones, solar lentigines, wrinkles (on the whole face and particularly pronounced in the periorbital region).

Treatment	
Treatment region	Full face.
Intended peel grade and treatment goal	Grade E peel to treat elastosis.
Peel used	Single Baker-Gordon peel.
Pre-peel treatment	Tretinoin 0.1 % and hydroquinone 4 % to enhance the peeling, the wound healing and to prevent post-inflammatory hyperpigmentation. To be started 4 weeks before the peel, applied daily on the whole face, once in the evening.
Post-peel treatment	Tretinoin 0.1 % and hydroquinone 4 % continued after re-epithelialisation for about 6 months. Daycare including broad-spectrum high SPF UVA and UVB.
Timing of the photo documentation	1 year post-peel.