Therapeutic cosmetology treatments for dry skin (xerosis)

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Abstract

Xerosis cutis is the medical term for dry skin, which is one of the most common symptoms of skin disorders such as psoriasis, atopic dermatitis and skin ageing. Therapeutic cosmetology has a wide range of professional products and procedures that can support dermatologic therapy of these problems, prolong remissions and improve the quality of life of patients. The most important group of skin care products are emollients.

Key words: xerosis, emollients, therapeutic cosmetology

Introduction

Xerosis is common in humans. The condition is induced by many extrinsic and intrinsic factors. The former include detergents, peelings, exposure to UV radiation, low temperatures and air humidity, as well as hot climate while the latter are a genetic predisposition or natural ageing. Xerosis is associated with some skin diseases, e.g. eczema, psoriasis, atopic dermatitis (AD) [1-3]. In xerosis cases, appropriate skin care is essential to improve the epidermal barrier, thus improving the quality of life of the affected individuals. The field of therapeutic cosmetology offers a wide variety of methods and products that support the therapy of dermatological diseases, cosmetic defects and skin manifestations in systemic and organ-specific diseases, such as diabetes mellitus or hypothyroidism.

The aim of the present review is to discuss the complexity of xerosis, insufficient care strategies and options aimed at designing holistic medical and cosmetological treatments for dermatological patients of various ages.

Xerosis and epidermal barrier function

The stratum corneum and keratinocyte differentiation are essential for proper functioning of the epidermal barrier. Lipids of the intercellular cement, the components of the natural moisturizing factor (NMF) and the corneocyte lipid envelope (CLE) ensure the integrity of the barrier and appropriate levels of epidermal hydration, i.e. about 20%. Increased transdermal water loss (TEWL) and depletion of epidermal lipids, especially ceramides of the intercellular cement, which are mainly composed of linoleic acid (belonging to indispensable unsaturated fatty acids - IUFA) and the components of NMF, such as lactates, amino acids and urea, lead to many severe sequel [1,3]. The enzymatic function of proteases, glycosidases and phosphatases, involved in keratinisation of the epidermis, is impaired and the epidermal barrier functions deteriorate, resulting in an increased risk of permeation of extrinsic chemical substances, water and pathogens, as well as skin dehydration (below 10%) and disorders of skin mechanical properties [1].

The role of aquaporins (AQPs) should be particularly emphasised; AQPs are the membranous proteins which form water channels supporting hydration of the epidermis. AQP3 predominates on the membranes of living epidermal layers and is involved in intercellular transport of water, glycerol, urea and hydrogen peroxide driven by an osmotic
gradient; hence, it regulates cell proliferation and migration, skin hydration and proper skin barrier properties, wound healing and carcinogenesis. Furthermore, the uptake of hydrogen peroxide is responsible for T lymphocyte migration and epidermal immune response. The level of AQP3 decreases with age and is lower in dry and diseased skin, which manifests as a characteristic clinical picture of the excessively keratinised, flaccid, and desquamating skin susceptible to stretching, itching (pruritus) and breaking, inflammations and infections [3,4].

**Skin and individuals over the age of 65**

The incidence of xerosis is going to increase due to population ageing in developed countries. According to estimates, in the United States alone, the number of people over the age of 65 years will increase by 7% in the years 2010-2030. Moreover, the majority of them will suffer from at least one skin problem and will be at risk of depression associated with it [3,5]. The growing group of seniors will require targeted care of skin dryness, irritations and pruritus resulting from impaired keratinisation of the epidermis, reduced contents of lipids and urea in the stratum corneum, i.e. decreased integrity of the epidermal barrier, proneness to injuries, impaired healing of wounds and chronic inflammations. The tendency to develop allergic reactions and skin infections results from the impaired function of the immune system. Moreover, the symptoms of physiological and post-sun ageing of the skin should be considered as well as coexisting chronic diseases and pharmaceutics, which can also cause allergic reactions [3,5,6].

According to the available sources, xerosis affects about 75% of individuals >65 years and occurs mainly on the face, lower legs, forearms and dorsal hands. The common accompanying manifestation is senile pruritus transmitted via thin C fibres in the skin, also called pruritus receptors, and A delta neurons with free nerve endings. Pruritus intensifies the mechanical injuries to the epidermis due to scratching, which can lead to irritation-associated eczema. Moreover, the condition is likely to point to some diseases (e.g. of the thyroid gland, pancreas, kidneys or liver), which cause skin manifestations, or even to neoplasms of the internal organs [6,7].

The strategies for healthy skin should involve the prevention and treatment of its problems. It is essential to focus on premature skin ageing resulting mainly from chronic exposure to sunlight, which causes wrinkles, skin dryness and roughness, hyperpigmentation, telangiectasias and is associated with the risk of melanoma. The key element of prevention is effective photoprotection [5]. The group of patients >65 years of age also develops allergic diseases, psoriasis and xerosis. Xerosis becomes more severe due to hospitalisations and hygienic procedures with soap, which deteriorate the condition of dry skin. Left untreated, the condition can cause xerotic eczema over the lower limbs. Therefore, the following rules should be observed in everyday life: (1) use mild washing agents which do not remove the lipid layer of the epidermis, (2) avoid air-conditioners and additional heaters, (3) use air humidifiers or leave wet towels on the heaters, (4) apply emollients and humectants (to be discussed later), (5) ensure safety and protection against slipping when emollient oils are used for baths [3,5,6].

Al-Nuaimi et al. [5] have demonstrated a lack of protocols regarding skin care in the elderly. Moreover, the awareness of the risk of contact allergies is vital, especially after using perfumed products containing lanoline and having topical anaesthetising effects [5]. Situation in Poland is similar and engagement of cosmetologists in the care of this group of patients is almost not exist.
Atopic Dermatitis (AD)

Dermatological diseases, such as AD, are likely to be associated with impaired synthesis of ceramides, natural moisturizing factor (NMF) and free amino acids, which results in disturbed keratinisation of the epidermis and increased risk of inflammatory reactions. The disorders result from the mutation of filaggrin-encoding gene, which is responsible for aggregation of keratin fibres, synthesis of NMF and the corneocyte envelope and combined effects of a variety of extrinsic factors [1-3,8]. Moreover, Guo et al. have demonstrated that enhanced expression of AQP3 in AD inhibits the expression of filagrin in favour of tumour necrosis factor alpha (TNF-α) [4]. Patients with AD have reduced levels of pyroglutamic acid (PCA) and amino acids of NMF [3]. Moreover, according to Thyssen et al., xerosis in AD patients increases the risk of eczema within the palms, which is likely to result from the use of various cosmetic products for dry skin that secondarily induce the symptoms of allergy [2]. Although the above hypothesis requires further studies, great caution should be exercised when selecting home care products for these patients.

Atopic dermatitis is a chronic and recurrent inflammatory skin disease with symmetrically located eczema and pruritus, lichenization and dryness of the skin [1, 9, 10]. It results from qualitative and quantitative disorders of the components of the epidermal barrier and increased expression of protease, leading to premature corneodesmolysis, i.e. improper desquamation of the epidermal cells. The activity of protease increases due to detergents and topical corticosteroids and the disease becomes chronic [1]. In general, therapy involves anti-inflammatory drugs, such as topical glucocorticosteroids and calcyneurin inhibitors combined with moisturizing agents, which support the treatment of eczema symptoms and prolong the asymptomatic periods [9,10]. The above strategy is important as skin dryness and micro-injuries accompanying it provide a portal of entry for pathogens, allergens and irritants, which deteriorates the course of AD [10].

Psoriasis

Another chronic and recurrent autoimmune disease with skin dryness is psoriasis vulgaris. The disease is characterised by the presence of papules forming the erythematous scaly patches, a shortened cell cycle in the epidermis (to about 4 days), and excessive proliferation as well as parakeratosis of the epidermis, i.e. relocation of keratocytes from the basilar membrane to the stratum corneum without losing a cell nucleus. Moreover, excessive mitotic activity of the inflammatory cells and enhanced angiogenesis of the dermis are observed [11,12]. Skin lesions are predominantly located within the knees, elbows and hair-bearing scalp. The lesions are often accompanied by pruritus, especially when new eczemas emerge and on the hair-bearing scalp. Furthermore, thickened corny masses and epidermal cracks are found on the skin of hands and feet, which is usually accompanied by pain [12].

The development of psoriasis is triggered by intrinsic and extrinsic factors; the former include genes, stress, dermatological diseases, excessive activation of the immune system while the latter include sunlight, discontinuity of the epidermis, improper body hygiene. Noteworthy, care of psoriatic skin should be an important element of the therapeutic process, lengthening remissions and improving the quality of life and well-being of the affected individuals [12]. This aspect will be discussed in detail below.

Agents and methods of therapeutic cosmetology

Dry skin is mainly treated with the mixture of biocompatible lipids with epidermal constituents. The holistic approach to skin care involves not only hygienic and cosmetic procedures but also the
maintenance of mental health, proper nutrition, physical activity and avoidance of harmful factors, such as tobacco smoking and exposure to UV radiation. Moreover, the supply of dietary indispensible unsaturated fatty acids (IUFAs), which are the precursors of epidermal barrier lipids are of importance. The above strategies improve skin metabolic functions and regeneration, prolong remissions and have anti-ageing effects. There are several important body hygiene-associated rules to follow: (1) take cool water baths, do not use sponges, (2) avoid alkaline soaps and other irritating factors, (3) apply moisturising emulsions and emollients within 5 minutes after a bath to minimise irritation and transepidermal water loss (TEWL), (4) avoid rough towelling not to damage the impaired epidermal barrier, (5) wear loose clothes made of natural fibres to limit friction and avoid impairment of skin circulation; wash them in sensitive skin-friendly laundry detergents.

The active components that cosmetologists should recommend for dry skin care are divided into 4 groups: (1) natural ingredients, (2) hydrating substances and “passive humectants, (3) anti-pruritic and (4) regenerating ingredients. The first group of choice includes natural components, such as cholesterol, ceramides and fatty acids, which are extremely effective for restoration of epidermal barrier lipids. They do not cause occlusion, easily penetrate the stratum corneum, restore the cornification balance and are derived from plants (oils). The second group of choice (Barco [1]), contains hydrating substances, e.g. amino acids, urea and other components of NMF, hyaluronic acid, glycerol, propylene glycol, combined with “passive” humectants, such as xanthan gum, vaseline or silicones. The former are actively involved in moisturising the skin while the latter form the protective film, improve the epidermal elasticity independent of lipids. Anti-pruritic treatments are important as they prevent scratching, i.e. the mechanical damage to the epidermal barrier. The substances used are glycine, which inhibits the release of histamine by the mast cells, and polidocanol, alpha-bisabolol, glycercitine acid and others [1,13]. Furthermore, regeneration of the epidermis, including stimulation of cell proliferation and lipid synthesis, is provided by such substances as dexpanthenol [1]. The above substances used for dry skin are also recommended by other authors who stress that they should be applied every 4 hours. In cases of more severe symptoms, including pruritus, pharmacotherapy or phototherapy is likely to be required [6,12].

The composition of the above groups of active components ensures effective and holistic care of dermatologically altered skin. These active components are found in multi-functional moisturizing agents, which increase water binding and hydration of the epidermis and improve its barrier functions. Weber et al. [3] carried out the study regarding such cosmetic formulations, i.e. oil-in water (O/W) emulsions of light and richer consistency. In both cases, glyceryl glucoside, NMF components (urea, lactates, amino acids, pyrrolidonicarboxyl acid, inorganic salts, sugars) and ceramide 3 were used. Moreover, the O/W formulations enriched with 5% urea and 10% urea were tested. The application of the products twice a day improved the skin condition already after one week in the study group, as compared to controls. Furthermore, emulsions reduced transepidermal water loss, improved hydration (the hydration level almost doubled after 5 days of application of richer consistency emulsions and remained the same when applied less frequently than once a day), epidermal barrier functions and its condition, especially the symptoms of dryness and roughness. The products created a suitable environment for self-regeneration of the skin. They were well tolerated by healthy individuals, diabetic and AD patients. Positive effects were achieved when both the emulsions of
basic and urea-enriched compositions were used[3]. Åkestrom et al. [9] tested the moisturising O/W product with 5% urea, sodium lactate and lactic acid, which improves the skin barrier functions by reducing TEWL and proneness to irritations after the use of detergents and delays the recurrences of allergic eczema. The authors have pointed out that the effects of the product with urea depend on the stability of the substance as well as the presence of other substances, such as emulgators, lipid composition, pH regulators and preservatives, which can affect the urea penetration into the skin and the functioning of the tissue itself. However, according to them, there is no sufficient evidence proving the efficacy of the products with urea available on the market for the treatment of AD [9].

The innovative study carried out by Park et al.[10] focused on the effects of an emollient with Lactobacillus sakei in a rabbit model and in the group of AD patients. The rabbit group did not show the symptoms of intolerance after 24, 48 and 72 hours. The group of AD patients demonstrated the improvement of skin condition and reduction in TEWL during 4 weeks of treatment. Moreover, the authors have pointed to the involvement of L. sakei in the maintenance of balance between the populations of Th1 and Th2 lymphocytes, which are associated with the stimulation of the immune reaction, inhibition of Staphylococcus aureus multiplication and improvement of the epidermal barrier properties which, however, requires further research [10]. However, the above issues require further studies. According to another study [14], this probiotic applied orally has been found effective in patients with AD, which raises hopes for synergy of action of topical and systemic probiotic products.

With suitable emollient cosmetics, cosmetologists can design new therapeutic procedures to widen their offer. Based on the holistic philosophy, the impact on senses should be taken into consideration, i.e. hearing via music, sight using colour therapy, touch using massages, taste using infusions, and smell, where great caution should be exercised due to the risk of allergic reactions to natural scented agents. Cosmetologists should start with the following: (1) cosmetological history taking to obtain information regarding the development of dry skin disease, its course, exacerbating factors, pharmacotherapy and care currently used; (2) skin inspection using a lamp - a magnifying glass to search for the symptoms of disease in the area to be treated. Generally, whenever eczemas are present, the treatment cannot be applied. The treatments and cosmetic products that can irritate the skin and favour recurrences or exacerbations of lesions are strictly contraindicated. The treatments include diamond and corundum crystals microdermabrasion, coarse-grained peelings, AHA and BHA exfoliation, wax and sugar paste depilation, manual skin cleaning, microneedle mesotherapy, laser procedures, and chemical compounds, such as vitamin A, etheric (essential) oils, alcohol, salicylic alcohol, hydrogen peroxide solution. Once contraindications have been excluded, the procedures should be selected individually considering the skin needs and the well-being of the patient. Subsequently, (3) the skin is cleansed using a cleansing milk or emollient gel and (4) the epidermis is exfoliated using enzymatic or cavitation peeling. In order to grease the skin, improve its condition and relax the patient, classical massage based on a cream or emollient oil can be performed. The permeation of the biocompatible active components can be improved (6) using sonophoresis or needle-less mesotherapy. Finally, (7) a nourishing mask strengthening the epidermal barrier or a pure alginate left for 20 minutes followed by a barrier cream could be applied. An essential and inseparable element of skin care procedures should be post-procedure follow-up to monitor the treatment effects and remote skin
resections, as well as to assist with home skin care or to dispel possible doubts [12].

Summary and conclusions

Dermatological problems are not only associated with the pathological processes affecting the skin but also its ageing. The predominant symptom, i.e. xerosis, is complicated by proneness to irritations, allergies, infections, etc. Therapeutic cosmetology which supports the therapy of various dermatological problems should also focus on the issue of dry skin; it is essential to recommend the suitable care products and therapeutic procedures, ensure pro-health education of the society and improve of the quality of life of patients. The analysis presented above leads to the following conclusions:

1. Xerosis is caused by the effects of intrinsic and extrinsic factors on the tissue.

2. The condition can be transient (e.g. seasonal) or chronic (e.g. dermatological and systemic diseases).

3. Cooperation of dermatologists and cosmetologists regarding the specialist care for the diseased skin can lengthen remissions and improve the quality of life of patients (a holistic approach).

4. Therapeutic cosmetology offers a variety of emollients of multi-directional effects on the skin and procedures which are a relevant element of prevention and alleviation of symptoms of xerosis.

5. An individual and holistic approach to xerosis patients is required, taking into consideration an individual predisposition to irritations or allergic reactions, possible interactions with drugs and susceptibility to depressive disorders.

6. It is essential to increase the awareness of patients regarding systematic skin care, available agents and methods of their application to prevent skin dryness as they grow older or during dermatoses.

7. The involvement of cosmetologists in professional care of the elderly is a relevant and promising direction for the development in the cosmetic field and the medical care in ageing societies. To extend their competences, it is important to educate cosmetologists in the field of care for the elderly. In this way, it will be possible to extend the medical care system with a new group of specialists, which is important in the society, where the number of older people grows year by year.

References


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