Of Youth and Age - What are the Differences Regarding Skin Structure and Function?

INTRODUCTION
The skin is often regarded as the largest organ of the human body, fulfilling a variety of tasks. It forms a boundary between the inside of the body and the usually dryer and cooler environment, provides protection against mechanical and chemical threats, participates in innate and adaptive immune defences, enables vitamin D production, acts as a sensory organ, and has important psychosocial functions. From birth until death, the skin and subcutaneous tissues grow, mature and age.

SKIN AGEING AND CLINICAL CHALLENGES
The physiologic cause of skin ageing is often called ‘intrinsic’ ageing. This is a time-dependent, stochastic process. Intrinsically aged skin has a lax appearance with decreased elasticity and fine wrinkles. Continuous and repeated exposures to environmental factors, such as ultraviolet radiation, air pollution, and smoking, lead to ‘extrinsic’ skin ageing. This type of skin ageing results in course wrinkles, increased thickness, and dyspigmentation.

In addition to these morphological changes, skin and tissue ageing leads to the loss of functional capacity. The skin is less able to cope with external stresses and is more susceptible to a wide range of age-related conditions, diseases, injuries, and wounds. For example, altered lipid content and reduced water, sebum production, and natural moisturizing factors of the stratum corneum may cause dry skin and pruritus. Empirical evidence suggests that dry skin (xerosis cutis), including cracks and inflammation (eczema craquelé), is one of the most frequent skin conditions in the elderly (Fig. 1). The prevalence varies between 6% and 77% in outpatient settings and between 30% and 85% in long-term care. There is a clear association between dry skin and pruritus, which is one of the most distressing and burdensome skin symptoms in the elderly. Across all care settings, the prevalence of pruritus ranges from 1% to 36%. Severely dry skin leads to a high risk of secondary infection.

An impaired acidification of the skin surface leads to decreased stratum corneum cohesion, disturbed skin barrier recovery, and increased susceptibility to pathologic colonization and infection. Due to diminished immune responses, aged skin reacts more slowly to irritants and allergens but is more susceptible to infections. Fungal infections of the feet, especially between the toes and of the nails, are also very frequent in the elderly populations. The prevalence of tinea pedis ranges from 18% in home care to 34% in nursing homes.

The flattening of the dermalepidermal junction increases the risk for shear-type injuries, such as skin tears, and bullae formation. There is substantial evidence that chronological age is an independent predictor for the reduced strength of the dermoeipidermal adhesion. Due to a loss of collagen and extracellular matrix proteins, the dermis becomes thinner. Aged skin is less elastic and less deformable, increasing the susceptibility to deformation injuries, such as pressure ulcers. Decreases of dermal vessels and capillary loops lead to impaired thermoregulation. A selection of age-related changes and associated risks and conditions is shown in (Table 1). A pronounced loss of functional and protective capacity may result in extreme fragility, leading to lacerations, nonhealing atrophic ulcers, and dissecting hematomas.

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Table 1. Selected age-related skin and subcutaneous tissue changes and clinical relevance

<table>
<thead>
<tr>
<th>Changes</th>
<th>Risks and conditions</th>
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<tbody>
<tr>
<td><strong>Skin surface</strong></td>
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<tr>
<td>• Increase of pH</td>
<td>• Pathologic colonization and infection</td>
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<tr>
<td>• Reduced cohesion of the stratum corneum</td>
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<td><strong>Epidermis</strong></td>
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<td>• Reduced stratum corneum hydration</td>
<td>• Xerosis cutis, pruritus</td>
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<td>• Altered intercellular lipid composition and corneocyte morphology</td>
<td>• Increased susceptibility against physical, chemical, and biological insults (“immunosenescence”)</td>
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<td>• Reduced barrier function</td>
<td>• Increased risks for actinic keratosis and tumors</td>
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<td>• Reduced number and function of melanocytes and Langerhans cells</td>
<td>• Delayed epithelialization and barrier recovery</td>
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<tr>
<td>• Dysregulation of cytokine function</td>
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<td>• Change in number and function of antimicrobial peptides</td>
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<tr>
<td>• Reduced activity of basal cells and reduced epidermal turnover</td>
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<td><strong>Dermo-epidermal junction</strong></td>
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<tr>
<td>• Flattening</td>
<td>• Increased risk for shear-type injuries (skin tears) and blister development</td>
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<td><strong>Dermis</strong></td>
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<tr>
<td>• Reduced number of dermal papillae</td>
<td>• Increased risk for injuries (e.g., due to heat) and ulceration</td>
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<td>• Reduced sensory perception</td>
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<td>• Reduced dermal circulation and PIV</td>
<td>• Delayed wound healing</td>
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<tr>
<td>• Reduced collagen production</td>
<td>• Altered thermoregulation</td>
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<tr>
<td><strong>Subcutis</strong></td>
<td></td>
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<tr>
<td>• Atrophy</td>
<td>• Increased risk for injuries and pressure ulcers</td>
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Abbreviation: PIV, pressure-induced vasodilatation.
SKIN CARE IN THE ELDERLY

Preventive strategies play a major role in maintaining and enhancing skin tissue integrity and health in elderly individuals. These strategies include not only well-known approaches to preventing specific conditions, such as diabetic foot or pressure ulcers, but also general health promoting skin care strategies, including healthy lifestyles and appropriate cleansing and skin care. The current evidence supporting skin care practice in the elderly is poor. One reason is that the elderly populations are frequently excluded from clinical trials, especially in skin research. However, based on recent systematic literature reviews and clinical experience, selected best practice recommendations include:

- Limit exposure to water and alkaline soaps. Use slightly acidic, mild cleansers. Avoid cleansing products containing anionic surfactants, are found in traditional soaps.
- Avoid or limit immersion in water, such as full baths.
- Keep the water temperature cool. Do not use hot water.
- Dry the skin carefully and gently but thoroughly, especially in areas of skin-to-skin contact.
- Apply moisturizers with a high content of lipids regularly for dry skin.
- Do not apply moisturizers in sun folds or the skin between the toes.
- Avoid skin exposure to urine, stool, and other body fluids. Use a skin protectant if urine or stool comes in contact with the skin.

OUTLOOK

Despite the above-mentioned risks, skin ageing per se is not a disease that must be treated. Ageing is a normal biological process affecting every organ and biological system. However, compared to the skin of youth, aged skin is compromised in many ways. Besides physiologic skin and tissue alterations over time, aged skin may also be negatively affected by other circumstances common in the elderly, including general functional impairments (e.g., immobility, incontinence), chronic disease (e.g., diabetes mellitus), and medications commonly used in geriatric care. Thus, preventive skin care strategies are of the utmost importance to maintain skin integrity in the increasing elderly population.

REFERENCES