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The influence on skin care of the use of emollients for skin lesions during the course of atopic dermatitis

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ABSTRACT

Background/objective. In this paper, we discuss the principle of skin care with emollients in patients with atopic dermatitis.

Patients and methods. The study included 22 patients with features of atopic skin. The indicator of atopic dermatitis (W-AZS), and the Eczema Area and Severity Index (EASI) indicator were used to measure the condition of the skin, and a questionnaire about methods of care for the skin was evaluated.

Results. The mean value of the W-AZS indicator in patients using emollients was 34.42 ± 20.64, but in the group of respondents who did not use moisturising-greasing preparations it was 75.95 ± 11.58. The differences were statistically significant ($p < 0.005$). Furthermore, respondents who used emollients several times a week showed statistically significantly higher values of W-AZS indicator than respondents who used emollients twice a day or more often. These values of W-AZS were as follows: 65.13 ± 10.72 (SD) for people who used emollients several times a week, 17.13 ± 7.34 in patients who used emollients twice a day, and 8.66 ± 1.26 for patients who used emollients several times a day. The W-AZS indicator values due to frequent use of 'leave-off' type of emollients were as follows: 10.75 ± 2.49 (SD) for warm water and 12.05 ± 6.43 for cold water. Respondents who used hot water for their bath (over 38°C) received significantly higher values of W-AZS indicator.

Conclusions. The study showed the significant effects of emollients, with a particular emphasis on frequency of use. It also stressed the importance of water temperature for bathing with emollients. The EASI indicator is less precise than the W-AZS indicator.

Key words: atopic dermatitis, emollients, W-AZS indicator

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Introduction

It is indisputable that atopic skin pathophysiology is based on defects of the epidermal barrier. Disturbances of the corneous layer integrity result from a reduction of lipids content, especially ceramides, cholesterol and free fatty acids. The epidermis barrier disturbance and decreased lipids biosynthesis cause an increased level of transepidermal water loss (TEWL) from 3.9 to 15 g/m^2/h [1]. Undermined homeostasis of the corneous layer via increased water vaporisation results in inhibition of the enzymatic activity of the exfoliation process, which in turn contributes to improper corneocytes adherence and optically shows dry, exfoliating skin. Skin dryness due to breaking desmosomal junctions increases inflammation, creating a vicious circle [2]. It causes a low threshold of skin irritation and contributes to deeper penetration of irritating factors such as soap, detergents, and hard water, and results in exacerbation of atopic dermatitis symptoms as a consequence [3].

The state of skin humidity conditioning proper skin function depends not only on the amount of water delivered from outside and inside, but also on the ability to accumulate it. Therefore many authors have assumed that atopic skin care is inseparably connected to the use of emollients. The mechanism of emollients action results from the synergic effect of occlusion, binding and maintenance of water in the corneous layer and from supplementation of lipid components that are absent in atopic skin. Lipid components fill the cracks between

corneocytes that provide a smooth skin texture, thereby increasing elasticity and softness. Protective film formation on the skin surface through emollient action has a protective effect on the skin against the action of aggressive external factors. Forms of emollients used comprise preparations of a 'leave on' type that remain on the skin: for example, creams, balsams, and cleansing skin preparations of a 'wash-off' type: supplements for bath, micellar emulsions, and soap substitutes [4]. Baths with the addition of emollients constitute an essential element of skin care in patients with atopic dermatitis, because they permit the removal from the skin surface of factors intensifying pruritus, such as for example sweat, and horny epidermis. They also increase skin absorptiveness for greasing preparations.

Aim of the study

The aim of this study was to:

1. Assess emollients' influence and the frequency of their use in relation to the value of two indicators, W-AZS and EASI, in people with atopic dermatitis
2. Find out whether water temperature for baths with 'wash-off' type emollients has an influence on the value of the W-AZS indicator.

Patients and methods

The study included 22 patients with diagnosed atopic dermatitis. The EASI indicator (Eczema Area and Severity Index) was used for an initial diagnosis of atopic skin. Analysis with the EASI indicator consisted in an assessment of the skin inflammation intensity in four regions: head/neck, trunk, upper and lower extremities. Each of these four regions was analysed with a four-point assessment (0–3 points), each considering four types of eruptions: erythema, infiltration/papules, erosions/excoriations, and lichenification. Evaluated eruptions were correlated with the body surface expressed in a seven-point scale. The W-AZS indicator was used for more accurate assessment of clinical state. This indicator contained analysis of subjective symptoms such as the evaluation of pruritus and sleep disorders, and also objective symptoms such as the extent and intensity of skin lesions in all possible locations. The W-AZS indicator analysed: sleep disorders (0–12 points), skin pruritus (0–22 points), inflammation (0–3 points), and the extent of skin lesions (0–3 points). This questionnaire also evaluated the manner of skin care with the use of emollients. This study was approved by the Bioethical Committee at CM NCU, and each patient gave her/his informed consent for participation. Statistical analysis was performed with the use of Excel 2000 and PQstat.

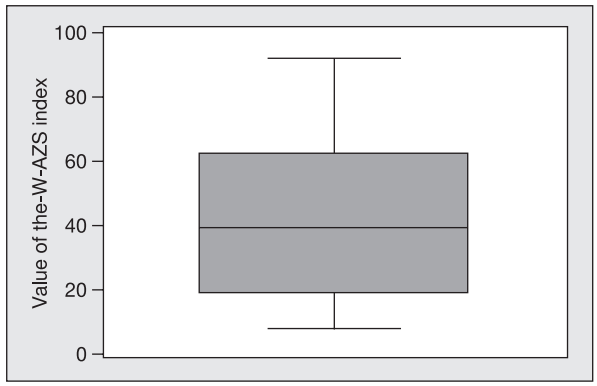

Figure 1. Mean values of W-AZS indicator [point] in the study group

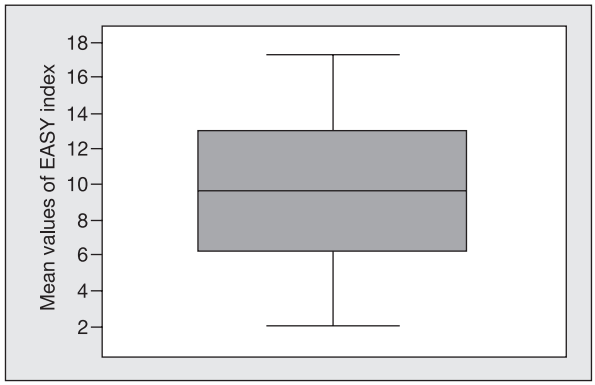

Figure 2. Mean values of EASY indicator in the study population

Results

Of the 22 people included in the study, there were 14 women and eight men aged from 2.5 to 43 years (mean age 16 years ± 10.15 SD). The maximal value of scoring indicator W-AZS in the performed study was 92.6. The lowest noted value of the W-AZS indicator was 7.5 (median was 39.1; Fig.1). However, the mean value of the EASI indicator was 9.63 ± 7.68 points, with a minimal value of 0.5 points and a maximal value of 25.6 points (Fig. 2).

The mean value of the W-AZS indicator in people using emollients was 34.42 ± 2.64 SD (standard deviation), but in the group of respondents who did not use moisturising-greasing preparations, it was 75.95 ± 11.58. Statistical analysis showed that there were differences concerning the values of the W-AZS indicator in people who use emollients compared to those who do not use them. The value of the Kruskal-Wallis test was 7.89 and exceeded the level of statistical significance ($p < 0.005$) (Tab. 1 and Fig. 3). However, using the EASI indicator, the Kruskal-Wallis test did not achieve statistical significance.

Table 1. Effects of emollients on the severity of skin lesions according to the W-AZS indicator

Patients using emollients (n = 18)			Patients not using emollients (n = 4)			H	p
Mean value W-AZS	**SD**	**Median**	**Mean value W-AZS**	**SD**	**Median**		
34.42	20.64	34.8	75.95	11.58	72.6	**7.891**	**0.0049**

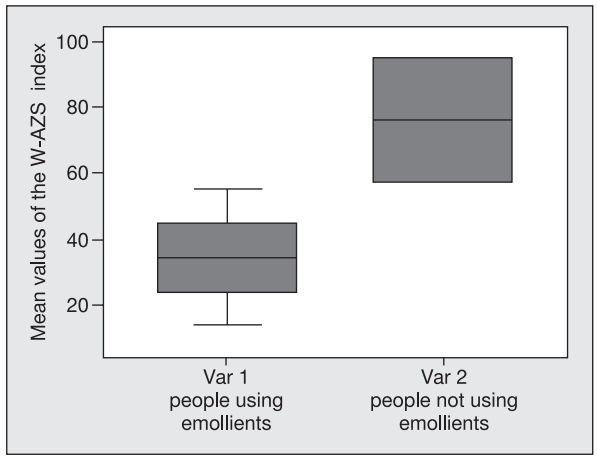

Figure 3. Comparison of mean values of W-AZS indicator in patients using emollients and patients not using emollients

emollients twice a day, and 8.66 ± 1.26 for patients who used emollients several times a day (Tabs. 2 and 3).

The influence of water temperature for baths in relation to intensity of the skin lesions was analysed according to the W-AZS indicator due to frequent use of the 'leave-off' type of emollients. The lowest values were noted in a group of patients who used warm water (30–35°C) and cool water (below 30°C). W-AZS values were as follows: 10.75 ± 2.49 SD for warm water and 12.05 ± 6.43 SD for cool water. It was proved with the use of the Kruskal-Wallis ANOVA test with subsequent Dunn's analysis *post hoc* that the results of the W-AZS indicator for cool, warm and hot baths were different to a statistically significant degree ($p < 0.005$) and test value was $H = 16.22$. Post–hoc analysis allowed us to establish that respondents who used hot water for their baths (over 38°C) received higher results of W-AZS indicator to a statistically significant level (Tabs. 4 and 5).

Table 2. Statistical analysis of the impact of frequency of application of emollients to W-AZS indicator

Patients using emollients (n = 18)									
Several times a week (n = 3)		Every day (n = 8)		Two times a day (n = 4)		More than two times a day (n = 3)		H	p
Mean W-AZS	**SD**	**Mean**	**SD**	**Mean W-AZS**	**SD**	**Mean**	**SD**		
65.13	10.72	41.2	8.16	17.13	7.34	8.66	1.26	**15.21**	**0.00165**

Table 3. The values of statistical significance for multiple comparisons — analysis of *post hoc* (Dunn)

	Several times a week	Everyday	Two times a day	More than two times a day
Several times a week	–	0.768	**0.028**	**0.0034**
Every day	0.768	–	0.399	0.051
Two times a day	**0.028**	0.399	–	1
More than two times a day	**0.003**	0.051	1	–

The frequency of emollients use was analysed so as to make a more precise assessment of their influence on skin state. Kruskal-Wallis ANOVA with subsequent Dunn's *post hoc* analysis revealed that respondents who used emollients several times a week showed statistically significantly higher results of the W-AZS indicator than respondents who used emollients twice a day and more than twice a day. These values were as follows: 65.13 ± 10.72 SD for people who used emollients several times a week, 17.13 ± 7.34 SD in patients who used

Discussion

It was pleasing that as many as 82% of respondents declared emollients use. Statistical analysis unambiguously revealed lower values of W-AZS indicator in the group of patients who used emollients. However, the frequency of their use can be worrying. Only 14% of respondents used them more than twice a day. Performed *post hoc* analysis showed that respondents who used emollients several times

Table 4. Effect of temperature on the value of the W-AZS indicator

Water temperature for bath (n = 22)							
Cool: below 30°C (n = 2)		**Warm: 30–38°C (n = 4)**		**Hot: over 38°C (n = 3)**		**H**	**p**
Mean W-AZS	**SD**	**Mean**	**SD**	**Mean**	**SD**		
12.05	6.43	10.75	2.49	79.6	11.29	**16.22**	**0.001**

Table 5. The values of statistical significance for multiple comparisons — analysis of the *post hoc* (Dunn) — water temperature

	Cool: below 30°C	**Warm: 30–38°C**	**Hot: over 38°C**
Cool: below 30°C	–	1	**0.018**
Warm: 30–35°C	1	–	**0.002**
Hot: over 38°C	**0.019**	**0.002**	–

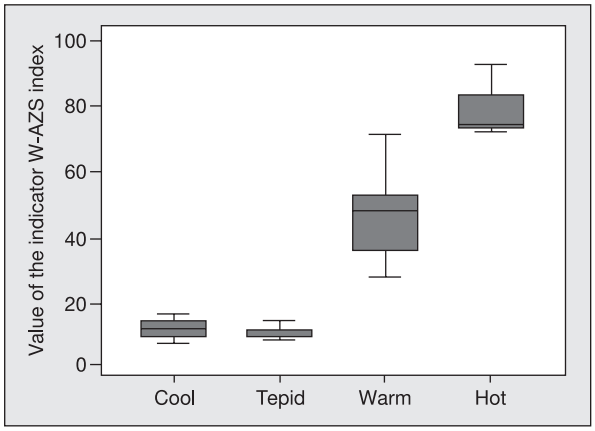

Figure 4. Effect of temperature on the value of the W-AZS indicator

a week revealed statistically significantly higher results of W-AZS indicator than respondents who used emollients twice a day or more than twice a day. Many researchers have emphasised that the action of the above-mentioned preparations remains in the skin for about 4–6 hours, and that repeated application of preparations during the day is necessary [4–6]. Earlier reports on the use of instrumental analysis (corneometer) also confirm the significance of emollient use in the care of atopic skin [7]. Decreased W-AZS indicator from 24.5 ± 29.8 to 15.5 ± 16.4 ($p < 0.001$) was observed in the cited study after two weeks' use of emollients. Simultaneously decreased TEWL (transepidermal water loss) from an initial value of 15.4 ± 8.4 g/m^2/h to 10.35 ± 3.4 g/m^2/h ($p < 0.001$) after four weeks of preparation application was found on the basis of corneometric analysis. It is also noteworthy that many authors have emphasised the advantageous effect of the use of emollients in patients who use corticosteroids [8, 9]. Patients who chronically use corticosteroids and do not use emollients often have reversible epidermis thinning that damages the epidermis barrier, decreases TEWL, and causes easier penetration of harmful external factors as a consequence [8]. Moreover, glucocorticosteroids decrease skin volume through a diminished amount of hyaluronic acid in the skin, and in the same way decrease the amount of water. Dry skin can be a result of this action. Therefore the above-mentioned authors suggested the use of an interrupted therapy called 'alternating' in another way [5, 8, 9]. This consists of locally applied corticosteroids and also moisturising and greasing substances (emollients) alternately. This not only prevents the side effects of glucocorticosteroids but also, based on the tachyphylaxis phenomenon, increases therapy efficacy [5].

The components of INCI emollients were not considered in this study — patients used emollients that were universally available in pharmacies. This could have a considerable influence on the result of the study, because many publications have emphasised the division of emollients into those containing natural lipids such as ceramides, and free fatty acids, and emollients containing only non-physiological lipids such as paraffin, mineral oils, and lanolin [10–13]. Emollients containing ceramides can break the cycle of antigen — inflammatory reaction — itching of the skin [11]. Emollients containing only non-physiological lipids do not penetrate below the corneous layer, and cause only a mechanical closure of the barrier. The action of the second group of emollients does not close the corneous layer, but results in an increased participation of a lipid pool delivered for biosynthesis of lamellar corpuscles, and in this way stimulates skin for spontaneous barrier regeneration. It is possible to state, on the basis of the data of others, that repair of the protective barrier with the use of physiological lipids lasts longer, but is more efficient. Approximately 15%

of barrier repair was obtained within 45 minutes, and 90% of repair within eight hours, whereas in the case of non-physiological lipids within 45 minutes as much as 50% of the barrier repair was obtained, but within eight hours the barrier was supplemented only in 40% [14]. This action shows a chronobiological effect. It is possible that this is the source of slight divergences concerning the frequency of emollient use. For example — according to some authors it is recommended to use emollients 4–6 times a day [4, 6], but others recommend twice a day [9, 15]. The effectiveness of their use through improvement of the SCORAD indicator value and decrease of TEWL value has been proven by several authors [10, 11].

Considering the context of studies concerning skin care, it is not possible to omit the issue of bath water temperature. Statistical analysis has established that respondents who used hot water for baths received higher values of the W-AZS indicator, to a statistically significant level. Hot water can cause stimulation of the sweat glands and in this way activate the irritating action of sweat on the skin. Its consequence is stimulation of the pruritus mechanism. Many authors who are involved in this area share this opinion [9]. Also, the results of tests that prove a strong correlation between pruritus and hot baths reflect this point of view [16]. Regarding literature data, a bath water temperature of 27–30°C is recommended [9]. There is also no doubt that a bath without emollient addition decreases the degree of hydratation of the epidermis corneous layer. Liquids for therapeutic baths most often contain soya oil, arachidonic oil, liquid paraffin and a mixture of fatty acids esters. The action of active compounds of the 'leave-off' type of emollients is based on the formation of an oil layer on the skin. This helps to decrease the rinsing from the corneous layer of the natural factors that maintain humidity. Additionally, liquid paraffin softens the epidermis, reducing the irritation of dry, itching skin. Moreover, many researchers have suggested the following application outline: a softening agent for the bath and an emollient used directly on the skin just after the bath [9, 17]. Study results have shown increased skin moistening with monotherapy by 91.4% and increased moistening by 141% [17] when the bath is associated with the addition of a softening agent and following emollient use — this unambiguously indicates that synergic use of 'leave-off' and 'leave-on' type emollients has an advantageous effect. It allows the binding of water that remains on the skin surface owing to the presence of highly hygroscopic substances — humectants such as: urea, hyaluronic acid, sorbitol, propylene glycol, and glycerol. The subsequent use of a proper occlusive preparation will guarantee the maintenance of water content in the corneous layer over a longer time.

Conclusions

1. Data obtained from questionnaires indicates distinct, statistically significant, lower values of W –AZS indicator in people who use emollients.
2. The use of emollients more frequently than twice a day decreases the value of W-AZS indicator to a statistically significant degree.
3. Bath water temperature that is too high (over 38°C) with the use of emollients has a significant influence on the development of skin dryness. This is expressed via an increased W-AZS indicator.
4. The EASI indicator is less precise than the W-AZS indicator and does not allow all the hypotheses in this study to be proved.

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