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Letter to the Editor

Lactic acid sting test does not differentiate between facial and generalized skin functional impairment in sensitive skin in atopic dermatitis and rosacea

The “sensitive skin” (SeSk) concept, i.e. the propensity to develop abnormal SeSk reactions such as stinging, pricking, burning, itching and pain to cosmetics and exogenous environmental factors [1], has gained broad attention in the scientific community. SeSk syndrome is related to abnormal sensory reactions. In addition, SeSk is a common symptom in skin diseases like atopic dermatitis (AD), rosacea, perioral dermatitis, seborrheic dermatitis, and psoriasis.

Objective criteria and standardized tests for assessing patients reporting SeSk are still missing. The lactic acid sting test (LAST) has been proposed as a suitable test to identify SeSk subjects and to assess the severity of their condition. LAST is based on the patient-based perception of stinging caused by facially applied topical lactic acid [2]. Many questions on the use of the LAST in diagnosing SeSk skin remain unanswered: Are common skin inflammatory skin disorders associated with higher rates of sensitive skin? Do SeSk patients, identified by LAST, show impaired skin barrier functions? Do rates and severity of SeSk assessed by LAST match those of self-reported symptoms? The present study addresses these questions by comparing the outcomes of LAST, self-assessment and biophysical skin investigations in patients with AD or rosacea compared to healthy controls.

28 subjects with erythemo-telangiectatic rosacea, 31 patients with active mild-to-moderate AD, and 32 age and gender-matched healthy volunteers were recruited. The volunteers reported self-perception of skin sensitivity by visual analog scale (VAS) assessment ranging from “0” for “non-sensitive” and “10” for “very-sensitive” skin. LAST was performed by applying 10% lactic acid solution or distilled water (control) with a cotton bud to the nasolabial folds. Skin stinging was evaluated by a 4-point scale (0 – absence of stinging; 1 – weak stinging; 2 – moderate stinging; 3 – strong stinging) 2.5, 5 and 8 min after the application. LAST was positive (“stinger”) when the total LAST score was 3 or higher.

Epidermal barrier function and SC hydration were assessed by non-invasive biophysical measurements following published guideline recommendations [3,4] at the middle third part of the volar forearm and the nasolabial fold.

1. Sensitive skin is more common in atopic dermatitis and rosacea patients

The rates of subjects with SeSk, i.e. LAST-positive subjects, were significantly higher in AD and rosacea compared to healthy subjects (2) (Table 1). The LAST scores were similar in AD and rosacea patients but significantly higher ($p < 0.0001$) than healthy subjects.

2. Sensitive skin is linked to impaired epidermal barrier function

LAST-positive and LAST-negative subjects did not show significant differences in age, gender and skin phototype (data not shown). LAST-positive subjects showed increased nasolabial fold TEWL compared to LAST-negative subjects (23.9 ± 8.4 vs 18.5 ± 7.3 g/m² h; $p = 0.0001$) (Fig. 1a). The nasolabial fold capacitance (SCH) showed a trend for lower values in LAST positive as compared to LAST-negative subjects (16.7 ± 8.1 vs 20.1 ± 9.2 AU) ($p = 0.085$). At the volar forearm no difference was observed in the capacitance values ($p = 0.371$) (Fig. 1b).

Patients with AD showed higher TEWL ($p < 0.001$) and lower SCH ($p < 0.001$) at both nasolabial fold and volar forearm in comparison to healthy subjects ($p < 0.001$). Rosacea volunteers had significantly higher TEWL and lower SCH at the nasolabial fold ($p < 0.001$) compared to healthy subjects, but not to AD subjects. No difference in both parameters at the volar forearm skin was noted between rosacea and healthy subjects, suggesting that skin physiology impediment in rosacea, in contrast to AD, is limited to the nasolabial fold, i.e. face.

3. Sensitive skin rates and severity as assessed by LAST correlate with self-assessment

The extent of SeSk assessed by LAST (LAST scores) showed a significant correlation with self-assessment results (Spearman's $\rho = 0.275$, $p = 0.008$), i.e. subjects with higher LAST values also showed higher scores on the VAS for self-perceived skin sensitivity.

The list of underlying skin disorders in SeSk patients includes acne, AD, contact dermatitis, seborrheic dermatitis, psoriasis, perioral dermatitis and rosacea [5]. Although the exact mechanisms of sensitive skin development are unknown, possible common pathways include impaired skin barrier function, increased transcutaneous penetration, hyperreactivity of the blood vessels, neuronal inflammation and variation in the number and the stimulation response in the neurosensory fibers [6].

Higher baseline TEWL values measured on the face and lower capacitance values were reported in subjects with SeSk

Table 1

Distribution of the study volunteers according to the diagnosis and the result of the lactic acid sting test (LAST): “stingers” – LAST score ≥ 3 ; “non-stingers” – LAST score < 3 .

Subject group	LAST-positive subjects		LAST-negative subjects	
	Number	Percentage (%)	Number	Percentage (%)
Atopic dermatitis	15	48.4	16	51.6
Rosacea	16	57.1	12	42.9
Healthy	2	6.3	30	93.7

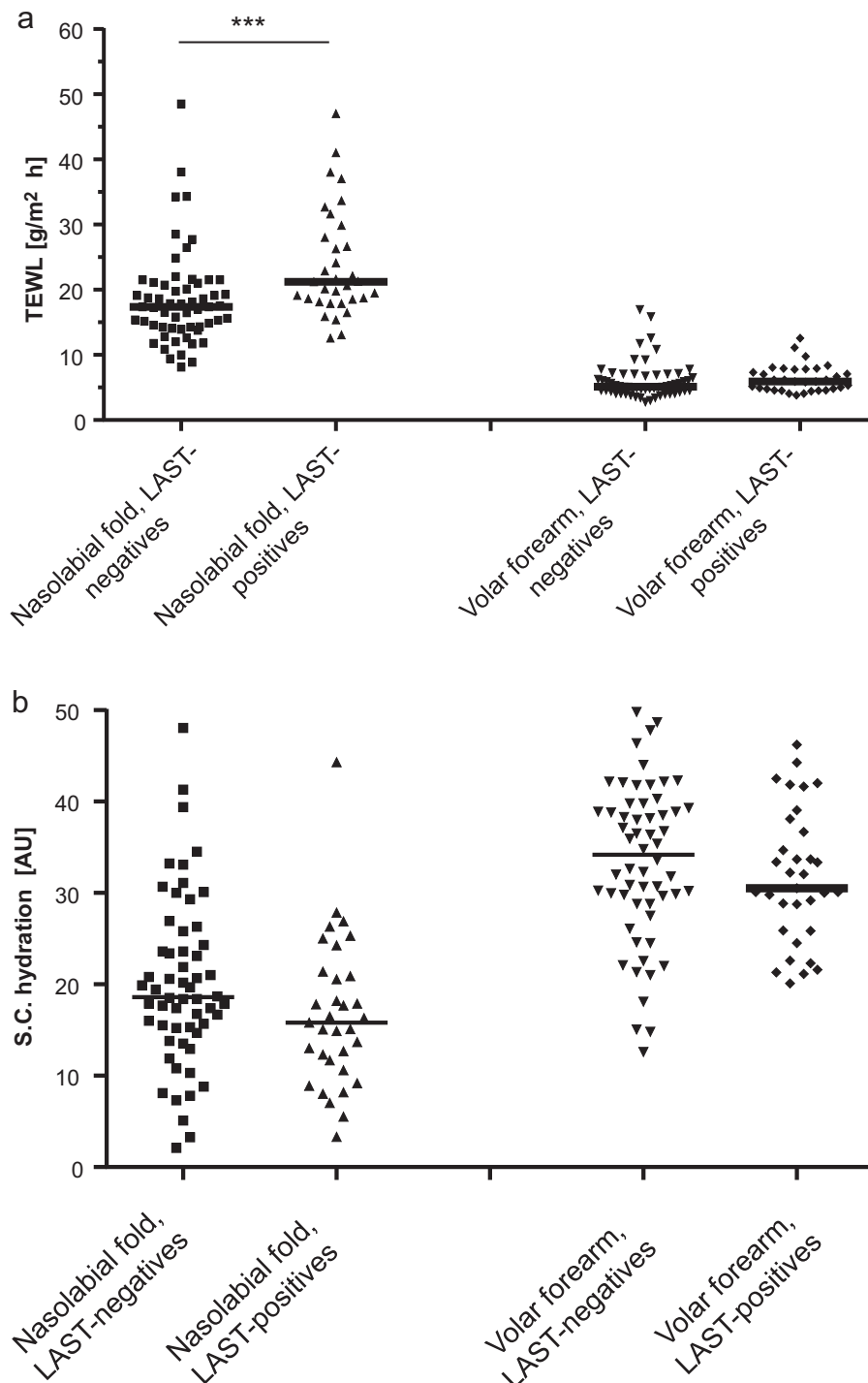


Fig. 1. Panel A: transepidermal water loss (TEWL) expressed in g/m² h under basal conditions at the nasolabial fold (■ – LAST-negatives; ▲ – LAST-positives) and the volar forearm (▼ – LAST-negatives; ◆ – LAST-positives). Significant difference observed only at the nasolabial fold between LAST-positives and -negatives (***) $p < 0.0001$. Panel B: stratum corneum hydration (SCH) in corneometric arbitrary units under basal conditions at the nasolabial fold (■ – LAST-negatives; ▲ – LAST-positives) and the volar forearm (▼ – LAST-negatives; ◆ – LAST-positives). Slightly lower corneometric values for LAST-positives and -negatives. The differences did not reach statistical significance.

[7,8]. Subjects with higher TEWL and lower skin hydration had a shorter onset time of stinging, with a negative correlation between the baseline capacitance values and the LAST score at 5 min in a 3% lactic acid test [8]. Morphological studies confirm this connection, as thinner SC with reduced corneocyte surface area with irregular skin surface microrelief and reduced ceramide quantity have been reported in subjects with hyperreactive skin [6,9].

Our results confirmed the formerly described skin physiology abnormalities. We showed that these disturbances were limited to the facial skin both for AD and rosacea patients. On the other hand, the impaired skin physiology in subjects with AD was generalized – observed both at nasolabial fold and volar forearm. Both disease groups were characterized by increased skin sensitivity witnessed by positive reaction in LAST. Hence, LAST

cannot distinguish between facial and generalized impairment of epidermal barrier function in SeSk. Increased stinging in AD and rosacea is associated with impeded barrier function at the nasolabial fold; however, this test cannot be predictive for the generalized barrier impairment observed in AD only. Once the patients are identified as “stingers” with increased TEWL values additional measurements on the forearm might help to differentiate between AD and rosacea in terms of skin physiology.

We showed correlation between the severity of the self-reported skin sensitivity and the LAST score. Our findings indicate that LAST is useful for detecting a population of sensitive skin subjects which might be further differentiated assessing TEWL between localized and generalized barrier impairment.

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