

The Skin Barrier in Patients with Lichen Simplex Chronicus in the conditions of A COVID-19 Pandemic

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ABSTRACT

Background: The primary role of the skin is to protect the body from environmental factors. The intact skin is a barrier to the uncontrolled water loss, proteins and plasma components from the organism. Frequent hand and body wash has a negative impact on skin ecosystem by removing lipids which naturally preserve and protect it.

Objective: The purpose of this study is to evaluate changes in barrier functions of skin in the condition of repeated body and hand wash in Lichen Simplex Chronicus (LSH) patients.

Materials and Methods: Transepidermal Water Loss (TEWL) and Hydration (H) of epidermis in healthy and damaged skin were measured in 36 non-hospitalized LSH patients. The results were compared with those from a similar study but in patients before the COVID pandemic recommended hygiene regimen.

Results: The results reported in the present study showed significantly more pronounced skin barrier disorders compared to those announced in LSH patients before the COVID pandemic.

Conclusion: All the reported and analyzed results indicate that disorders of skin barrier are connected with severity and duration of LSH. The frequent washing regime act as an additional reduction of the barrier function of the skin and thus worsens the parameters of the disease.

Keywords: Frequent body wash, Hydration, Lichen Simplex Chronicus, Skin Barrier Evaluation, TEWL.

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I. INTRODUCTION

The main function of the skin is to serve as a physical barrier, protecting the body from toxic substances and act as a shield against the external environment [1]. LSH is one of the inflammatory skin disorders with decreased barrier function and latest studies suggest that the complex response of epidermal cells to barrier disruption may aggravate, enhance, or trigger it [2]. Furthermore, frequent washing changes the skin-lipid structure [3], [4]. Thus the combination of allergens, irritants and skin pathogens is eased by skin barrier disrupter and leads to altered immunoregulatory process [5]. This study explores the possible correlation or predomination of changes in skin barrier function and characteristic of LSH disease. The article focuses on skin barrier disorders as a result of altered water-lipid matrix of the skin.

II. MATERIAL AND METHODS

A. Settings and Sample

The study was conducted among 36 non-hospitalized patients 24 (66.8%) female and 12 (33.2%) male; mean age 59.35 years; range 39-74 years) who visit dermatology unit in

medical center “Medeia” between January 2020 and July 2021. Patients have the following inclusion criteria: one or more lichen plaques, highly pruritic, accumulation of normal skin lines, excoriations. Diagnosis was based on clinical observation and data from patient’s history. In addition, patients stated that washed their hands more than six times a day and bathed twice daily. The characteristics connected to the disease (duration and severity) are shown on Table I and Table II.

TABLE I. DIVIDING TO THE DURATION

Disease duration in months	Frequency(%)
12	38.8
13-24	27.7
25-36	22.2
37 more	11.13
Total	100

TABLE II. DIVIDING TO THE SEVERITY

Stage of disease severity	Frequency(%)
Stage 0	0
Stage I	22.22
Stage II	58.33
Stage III	19.45
Stage IV	0
Total	100

B. Skin Barrier Assessments

We used instrumental methods, including, measuring H and TEWL in healthy and damaged skin to evaluate the functioning of Stratum Corneum (SC). The degree of H was measured with a capacitance meter (Corneometer CM 825), and the TEWL was determined using a measurement instrument Tewameter® TM 300. The areas examined were closely and in distance of the pathologic lesions.

The severity of the disease was evaluated by EASI score. (Eczema Area and Severity Index) [6]. According to these scale patients were divided in 5 groups. Stage 0 without skin changes; Stage 1 up to 29% of skin surface is damaged, Stage 2 up to 49% of skin surface is damaged, Stage 3 up to 69% of skin surface is damaged, Stage 4 more than 69% of skin surface is damaged.

C. Statistical Analysis

The statistical analysis was performed with SPSS v.21.0 for Windows. Hypotheses were tested using χ^2 -criteria (for the descriptive profile data). Construct validity was tested by factor analysis. Results with $p < 0.001$ were interpreted as statistically significant.

D. Control Group

For the purpose of comparing the data with those of patients without the appropriate hygiene regime, we referred to the results published by [7].

III. RESULTS

The results obtained from measuring TEWL in healthy skin show that the levels were slightly higher (20.63 g/m²/h range from 5.00 g/m²/h to 27.97 g/m²/h) in comparison to healthy skin of the control group (15.09 g/m²/h range from 8.32 g/m²/h to 17.08 g/m²/h). Higher median TEWL value was found in damaged skin in LSC patients in COVID-19 pandemic hygiene regimen (38.76 g/m²/h range from 29.88 g/m²/h to 87.43 g/m²/h) than in control group (28.76 g/m²/h range from 19.88 g/m²/h to 37.43 g/m²/h) (Fig.1).

We further investigated associations of TEWL values with the duration of the disease. The pathological changes for both groups were more visible in patients with duration of LSH 25-36 months; specifically, mean 37.30 g/m²/h for LSC patients in COVID-19 pandemic hygiene regimen and mean 47.30 g/m²/h for control group ($p=0.003$). TEWL values were significantly positively associated with the severity of the disease. In control group of patients, the results were as follow: stage II TEWL was mean 31.22 g/m²/h, while in group stage I TEWL was mean 16.23 g/m²/h ($p=0.005$). In LSC patients in COVID-19 pandemic hygiene regimen the measure of TEWL showed: for stage II TEWL mean 51.32 g/m²/h, for stage I TEWL mean 26.73 g/m²/h ($p=0.007$). As a second criteria for the interruption of skin barrier function we measured the levels of H. The results showed that in healthy skin of LSC patients in COVID-19 pandemic hygiene regimen, the levels were lower (15.03/ range from 8 to 28.) in comparison to the healthy skin of the control group (26.07/ range from 20 to 30). The levels of H in damaged skin were low (23.32/ range 10 - 30 in control group and 11.67 range 7 - 18 for other group) (Fig.1). Also we compare the H dividing patients according to the duration and to the stage of the

disease. The results from measuring TEWL and H for both groups according to the duration is shown in Fig.2 and according to the stage in Fig.3.

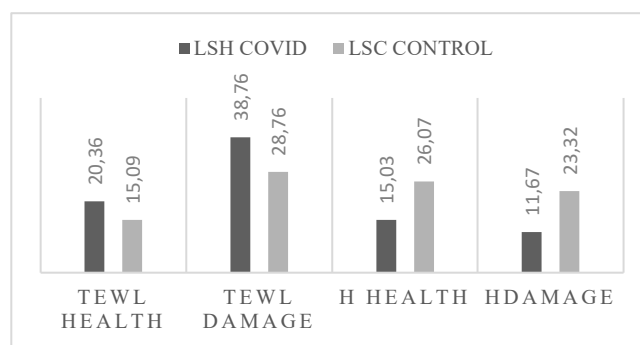


Fig 1. The results from measuring TEWL and H for both groups.

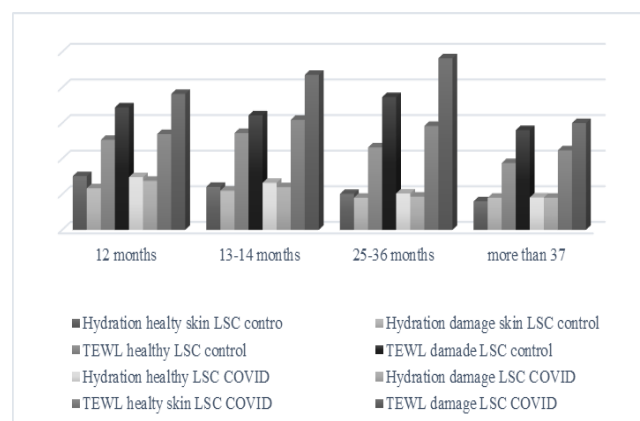


Fig.2. The results for TEWL value and H for both groups according to the duration.

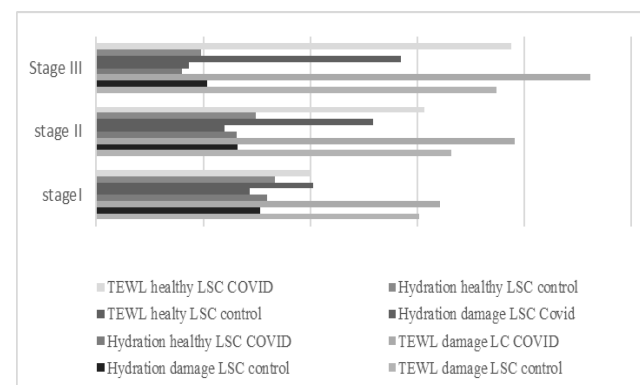


Fig. 3. The results for TEWL value and H for both groups according to the stage.

IV. DISCUSSION

The main finding of our study on LSC patients in COVID-19 pandemic hygiene regimen is that most of them have compromised skin barrier function, indicated with elevated TEWL values (>25 g/m²/h) and H values below physiological levels (>5.5). Reference [8] conducted a study involving 440 health care workers during COVID-19 pandemic. The authors reported skin problems at average of 90.2%, with predomination of dryness, itching, cracking, burning, flaking, peeling and lichenification. In a recent study by [9] reported the increased skin barrier damage in healthcare workers due to the intense hand hygiene regimen implemented during the COVID-19 pandemic (TEWL values (>25 g/m²/h)). At the

same time clinical picture of LSC is represented by areas with dry, itchy skin [10]. Furthermore, many authors pointed out that in dermatoses with a clinical picture of extreme dryness and scratching there are the changes in skin barrier [11], [12]. Although direct comparison is difficult, it should be noted that in the literature there are few studies (mainly among participants with high work-related exposures to skin hazards) which underline that the increased hand hygiene compromised skin barrier [8], [13], [14]. The results reported in our study give us reason to assume that frequent washing further impairs the state of skin barrier function in LSC patients in COVID-19 pandemic hygiene regimen.

V. CONCLUSION

TEWL values in a control group were significantly lower in comparison to LSC patients in COVID pandemic hygiene regimen. As the trend for correlations with the duration and severity of the disease were preserved. The results obtained from measuring H in a control group showed higher levels in comparison to LSC patients in COVID pandemic hygiene regimen.

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F. Georgieva was born in 1968. After graduating with a gold medal, she studied medicine from 1987 until 1993 at the Medical University in Varna. As an excellent graduate, she was awarded a clinical residency and began her career at the Department of Dermatology and Venereology at MU Varna. In 2001 she acquired a specialty in skin and venereal diseases and continued to work as an intern at the Clinic of Dermato-Venereology until 2011. In 2012 won a competition for an assistant at the Clinic of Dermatology and Venereology. In 2016 defended a dissertation for the scientific-educational degree "Doctor" on the topic: "Condition of the ANS, changes in the indicators of the skin barrier and psycho-emotional aspects in patients with Lichen simplex chronicus." The dissertation of Dr. Filka Georgieva is an in-depth, intelligent and significant modern study of vegetative changes, functional features of the skin barrier and psycho-somatic in patients suffering from Lichen simplex chronicus. In 2021 she won a competition for academic position of "Associate Professor in Dermato-Venereology".

The total scientific production of Dr. Georgieva is represented by a total of 65 scientific papers, of which: 1 author's monograph, reviewed and printed with ISBN 978-619-221-072-4 (MU-Varna, 2016), 1 author's scientific book, printed with ISBN 978-3-330-07407-1 (Lambert Academic Publishing, 2017). Dr. Georgieva has co-authored two textbooks in dermatology and venereology for students of medicine, dentistry and pharmacy. She is the author of 37 full-text publications.