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Dry Hands in Scleroderma

Including Studies of Sweat Gland Function in Healthy Individuals

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Complaints of dry hands were evaluated in 68 patients with generalized scleroderma (GS) and 66 healthy individuals (HI) for comparison. Studies included evaporimetry of the hands and forearms as performed under physiological conditions indicating sweat gland function. Complaints of dry hands were more frequent ($p<0.001$) in GS (71%) than in HI (32%) as was the use of emollients (68% and 32% respectively). Evaporimetry at eight different locations (flexor and extensor aspects of middle phalanx, proximal phalanx, hand and forearm) showed decreased evaporation ($p<0.01$ and $p<0.001$) in GS. However, there was no difference in evaporation between patients complaining of dry hands and patients without complaints. In a few locations the evaporation was negatively correlated (r from -0.287 to -0.376, $p<0.05$ and $p<0.01$) to the duration of GS and positively correlated to parameters of cutaneous thickening (ultrasound measurement skin thickness $r=0.252$, $p<0.05$; ring size $r=0.294$, $p<0.05$). In the group of healthy individuals complaints of dryness was more frequent ($p<0.05$) in females (39%) than in males (7%), and females also used emollients more frequently ($p<0.01$). HI complaining of dryness had similar evaporation as HI with no complaints. Physiological evaporation was negatively correlated to age, in particular in the palm and volar side of fingers (r from -0.424 to -0.454, $p<0.01$ and $p<0.001$).

In conclusion, the frequent appreciation of dryness of the hands of patients with GS appeared not to be secondary to sweat gland affection and decreased production of sweat in this disease. It is discussed whether dry hands in GS is rather attributable to epidermal atrophy, or may be a subjective appreciation solely. *Key words: Systemic; Evaporation; Evaporimetry.* (Received February 23, 1985.)

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It was a preliminary experience of the authors that many patients suffering from generalized scleroderma (progressive systemic sclerosis) complain of dry hands, and they also seem to use emollients more frequently.

Histological sections of scleroderma skin show sweat gland atrophy and periglandular fibrosis (1). In recent experiments on morphoea plaques, one of the authors showed that the sweat gland function, stimulated with pilocarpine as well as unstimulated, was decreased in every plaque studied (2). Furthermore, sweat glands of scleroderma skin more frequently showed 'fatigue' following pharmacological stimulation.

In this paper, results of a prospective study of dry hands and sweat gland function in scleroderma patients is presented. The study was performed under physiological conditions, and a detailed evaluation of sweat gland function in healthy individuals was included.

MATERIAL AND METHOD

The study included 68 patients (56 females, 12 males) with a definite diagnosis of generalized scleroderma (progressive systemic sclerosis) according to the American Rheumatism Association criteria (3). Their mean age was 54.1 years (range 24–80). The mean duration of scleroderma was 10.6

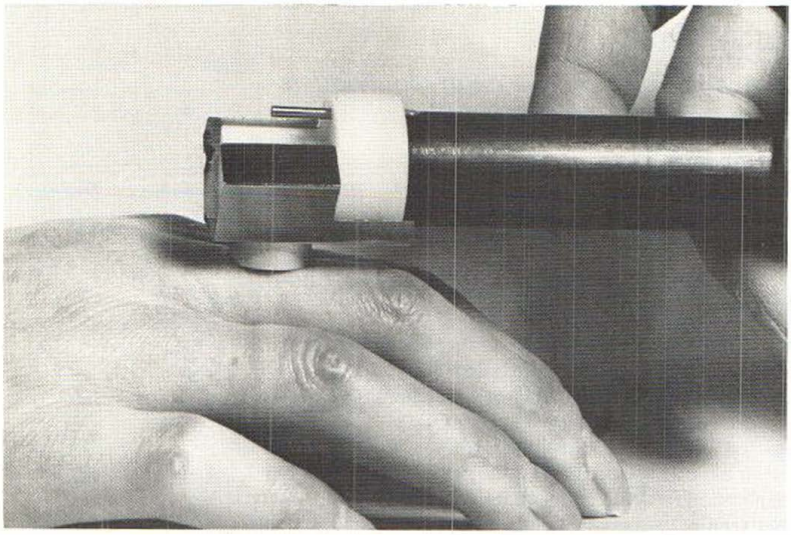

Fig. 1. Measurement of evaporation over the proximal phalanx by the evaporimetre of Servomed®.

years (range 1–27). The patients were treated with inhibitors of collagen synthesis as described by Asboe-Hansen (4). Fifty-two received penicillamine in combination with glutamine, 6 glutamine only, 1 hydralazine, 1 phenytoin, and 8 received no treatment at all. The mean duration of therapy was 4.6 years (range 1–25).

Sixty-six healthy individuals (51 females, 15 males) were studied for comparison. Their mean age was 48.4 years (range 18–81). They represented an even distribution with respect to age-grouping. Females and males were statistically similar in age as compared to the scleroderma patients.

Patients and healthy individuals were interviewed about appreciation of dryness of the hands. It was noted if they used emollients regularly and frequently.

The evaporation was measured on flexor and extensor aspects of the hand and forearm at four different regional levels (middle and proximal phalanges of the third finger, palm and dorsum of the hand, forearm). The evaporimetre of Servomed® was used (5). With this equipment the evaporation from a circular area 10 mm in diameter was measured (Fig. 1). Readings were performed after 10–12 sec. In case of any evidence of turbulence in the probe chambre measurements were repeated. Measurements were performed under standardized conditions with minimum air convection and a normal and constant relative humidity. Individuals who had had extraordinary physical performances within the latest hour were examined after a period of relaxation. Individuals had not applied an emollient for the latest hour before examination.

In the scleroderma patients ultrasound skin thickness measurements and ring size measurements were performed to assess the degree of scleroderma (6, 7).

Statistical analysis was carried out by the Chi-square test, the Student's *t*-test and the Spearman correlation coefficient. $p<0.05$ was considered significant.

RESULTS

Of 68 patients with scleroderma 48 (71%) complained of dry hands. Of 66 healthy individuals 21 (32%) complained of dryness. Fourty-six (68%) patients with scleroderma used an emollient for dryness of the hands while in 28 (42%) of healthy individuals (21 (32%) used an emollient in other locations). Both appreciation of dry hands and use of emollients were more frequent in scleroderma ($p<0.001$ and $p<0.01$).

Sweat gland function in scleroderma patients and healthy individuals as assessed by evaporimetry is shown in Table I. It appears from the table that the evaporation was significantly decreased in the scleroderma patients at all locations studied. Analysis of the relation between evaporation and the duration of scleroderma showed a tendency to

Table I. *Results of measurement of evaporation in patients with generalized scleroderma (n=68) in comparison with healthy individuals (n=66)*

	Evaporation (g/m²/h)			
	Generalized scleroderma		Healthy individuals	
	Flexor aspect	Extensor aspect	Flexor aspect	Extensor aspect
Middle phalanx				
Mean	29.9***	18.3**	40.4	25.2
SD	15.4	11.9	13.6	16.1
Proximal phalanx				
Mean	29.4***	11.8***	42.3	22.4
SD	14.0	6.0	14.0	15.8
Hand				
Mean	34.0***	7.5***	45.2	18.0
SD	17.4	4.5	15.5	13.3
Forearm				
Mean	7.3***	3.9***	17.2	7.9
SD	4.2	2.0	11.6	7.2

**$p<0.01$, ***$p<0.001$.

decreasing evaporation with increasing duration, and in the palm and on the flexor aspect of the proximal phalanx this relation was significant ($r=-0.287$, $p<0.05$ and $r=-0.376$, $p<0.01$). Analysis of the relation between ultrasound skin thickness measurements and ring size measurements in females with scleroderma to quantify skin affliction with scleroderma, and evaporimetre measurements on the same locations showed tendencies or significant positive correlations between increased thickening and evaporation (skin thickness over proximal phalanx versus evaporation, $r=0.252$, $p<0.05$; ring size middle phalanx versus evaporation, $r=0.294$, $p<0.05$).

A detailed analysis of evaporation in females with scleroderma complaining of dry hands in comparison with those with no complaints showed no significant difference between the two subgroups, and no special tendency.

In the group of healthy individuals, dryness of the hands was significantly ($p<0.05$)

Table II. *Relation between evaporation (g/m²/h) and age as evaluated in 66 healthy individuals (51 females and 15 males)*

	Correlation coefficient (percent)			
	Flexor aspect		Extensor aspect	
	Females	Males	Females	Males
Middle phalanx	−0.441**	−0.489	−0.198	−0.370
Proximal phalanx	−0.454***	−0.451	−0.336*	−0.518*
Hand	−0.424**	−0.312	−0.170	−0.394
Forearm	−0.143	−0.397	−0.115	−0.299

*$p<0.05$, **$p<0.01$, ***$p<0.001$.

more frequent in females (20 (39%) complaining of dryness) as compared to the males (1 (7%) complained of dryness). Consistently, emollients were more often used ($p<0.01$) by the females (27 (53%) users) in comparison with the males (1 (7%) users). Evaporimetre measurements in healthy females and males showed tendencies to a higher evaporation in females on flexor aspects and higher evaporation in males on extensor aspects, but differences were only significant ($p<0.05$) on the dorsum of the hand (males, mean 28.6 g/m^2/h, SD 18.8; females, mean 14.8 g/m^2/h, SD 9.4). However, in both females and males analysis of the relation between evaporation and age showed significant decreases in evaporation with increasing age, see Table II.

Analyses in healthy females of users of emollients and non-users showed no significant differences in evaporation between the two groups, and no special tendencies appeared.

DISCUSSION

The study confirmed initial impresions that scleroderma patients complain of dry hands and use emollients more often than normals.

In accordance with histological studies and studies of sweat gland function in localized scleroderma, evaporimetry, indicating physiological sweat gland function, showed a decreased function in scleroderma (1, 2). The negative correlation to the duration of scleroderma may be an effect of age, and the slightly positive correlation to parameters of skin thickening may reflect a slightly better sweat gland function in the initial hypertrophic state. Thus, from an initial consideration clinical data and evaporimetre data seemed in accordance.

However, in scleroderma patients as well as healthy individuals, analysis of the relation between appreciation of dry hands and evaporimetry showed no significant relation. Consequently, appreciation of dry hands in the scleroderma patients was not a direct consequence of the progressing affection and atrophy of sweat glands in this disease.

The epidermis of skin afflicted with scleroderma undergoes atrophy already in the initial state, as histological studies, stereomicroscopy and quantitative skin relief measurement show (1, 2, 8). As a result of this atrophy the palms and flexor aspects of fingers of scleroderma patients often look glossy. Appreciation of dryness is probably a sensation learned by experience and originating in the outermost part of the skin. Thus, epidermal atrophy might explain the frequent complaint of dry hands in scleroderma.

Evaporimetre measurements under physiological conditions included in this study showed a considerable variation as standard deviations indicated. For quantitation of sweat gland affection in scleroderma and follow-up measurements pharmacological stimulation of sweat glands in supposed to be preferable.

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