

Successful Treatment of Dyshidrotic Hand Eczema Using Tap Water Iontophoresis with Pulsed Direct Current

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The efficacy of tap water iontophoresis in treating palmoplantar hyperhidrosis has been sufficiently documented and has led to its extensive use in clinical practice. In order to test the efficacy of this treatment modality in cases of dyshidrotic hand eczema, 20 patients were treated with tap water iontophoresis in addition to two-sided steroid-free topical therapy in a randomized half-side-study. A special score for dyshidrotic eczema including objective and subjective criteria was developed to document the success of the therapy. Only those sides treated with tap water iontophoresis showed significant improvement. This significant effect of iontophoresis indicates the efficacy of this treatment in cases of dyshidrotic hand eczema. *Key words: dyshidrosis; score; therapy.*

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Tap water iontophoresis represents a suitable therapy option in treating hyperhidrosis (1-6).

The treatment of dyshidrotic hand eczema is extremely difficult, and the disease is characterized by a high rate of relapses. To date, there have not been any studies published on therapeutical intervention in cases of dyshidrotic hand eczema using tap water iontophoresis with pulsed direct current. Therefore, the objective of this study was to test the efficacy of this form of therapy in cases of dyshidrotic hand eczema.

MATERIALS AND METHOD

The subject group consisted of 20 patients with bilateral dyshidrotic hand eczema (13 males and 7 females, aged 18-30 years). Seven of the 20 patients were atopic and suffered from allergic rhinitis; one of them had allergic asthma. Nine patients suffered from allergy to nickel sulphate, and 4 of them were also atopic. A nickel-free diet was not enforced during the iontophoresis treatment. Eighteen of the 20 patients were smokers.

The 20 patients with bilateral dyshidrotic hand eczema were subjected to tap water iontophoresis in a randomized one-side comparison with pulsed direct current (Hidrex PSR, high-frequency phase direct current of 9 V with a frequency of 9.8 kHz and ripple voltage on the direct current side of 18 V. Amperage varied according to the individual electrical skin resistance of the patient, showing only small variations between the patients). Independent from the unilateral additional iontophoresis, basically all patients received additional topical steroid-free therapy with Tinctura Arning (alcoholic solution containing tar) and Pasta exsiccans (zinc oxide paste containing bismuth) once daily on both palms. The time interval between application of the topicals and iontophoresis therapy was at least 12 h. In total, 20 iontophoresis applications of 15 min each were carried out within 3 weeks. The electric circuit was closed on the ipsilateral foot. Any existing minor erosions were covered with petrolatum.

A special score including both subjective and objective evaluations of the skin manifestations was developed to facilitate the assessment of the initial clinical findings and the success of the therapy (Table I). The score results from the sum of the score points of the level of severity were multiplied by the score points of the affected area, with a maximum of 60 points being possible for each hand. This newly developed score allows a systematic assessment of the condition of the hand both before and after the therapy. The dyshidrotic hand eczema was graded as: mild (0-15 points), moderate (16-30) and severe (31-60). Only patients who were poorly responsive to conventional steroid-free topical therapy in a stable phase with mild to moderate dyshidrotic hand eczema were included.

Each hand was given an individual score. The decrease of score points on the iontophoresis-treated side was compared with the decrease of score points on the untreated side. The evaluation of significant differences was analyzed by means of the Wilcoxon test. Scoring was performed by a second investigator, who did not know which side had been treated with iontophoresis.

RESULTS

Seventeen of the 20 patients showed a decrease in score points on the hand receiving additional iontophoresis. On average the more marked decrease of total score points on the iontophoresis-treated side compared to the non-treated side was statistically significant (Table II).

The parameters "itching" and "vesicle formation/cm²" showed significantly lower scores after iontophoresis treatment compared to the non-iontophoresis-treated side (Table II).

Redness and desquamation were not significantly influenced by the iontophoresis therapy compared to the untreated side. The results of this study indicate a therapeutical efficacy of tap water iontophoresis in dyshidrotic hand eczema.

Table I. *Dyshidrotic eczema Area Severity Index score for the dyshidrotic hand eczema*

The score results from the sum of score points of the level of severity were multiplied by the score points of the affected area, whereby a maximum of 60 points is possible for each hand. Affected area score: 1: 0-20%,

2: 21-40%,

3: 41-60%,

4: 61-80%,

5: 81-100%.

Total score: Severity score points (V+E+D+I)* area score point

Severity				
Score points	Vesicles/cm ² (V)	Erythema (E)	Desquamation (D)	Itching (I)
1	<2	Mild	Mild	Mild
2	2-8	Moderate	Moderate	Moderate
3	>8	Severe	Severe	Severe

Table II. Significant decrease in total score points, pruritus score points and vesicle score points on the handsides receiving additional iontophoresis compared to the non-iontophoresis-treated sides

	Treatment with iontophoresis <i>n</i> = 20		Treatment without iontophoresis <i>n</i> = 20		Difference δ_2	Difference δ_1/δ_2
	Before	After	Before	After		
	Median	Minimum	Maximum	Median		
Total score points	16	8	16	15	1	<i>p</i> = 0.001
	8	3	5	0		
	40	20	45	45		
Pruritus score points	2	1	2	2	0	<i>p</i> = 0.043
	1	0	1	0		
	3	2	3	3		
Score points for vesicle-formation/cm ²	3	1	2	2	0	<i>p</i> = 0.038
	1	0	0	0		
	3	3	3	3		

DISCUSSION

In this randomized half-side study, 20 patients with dyshidrotic hand eczema were treated with tap water iontophoresis with pulsed direct current in addition to bilateral steroid-free topical therapy. A special score, including objective and subjective criteria, was developed to document the success of the therapy. Only the sides treated with tap water iontophoresis showed significant improvement.

Iontophoresis is a procedure in which a transfer of ions through the skin is induced in a complex process by way of a galvanized electric current. Copper sulphate iontophoresis was first described as a physiotherapeutic procedure for the treatment of hyperhidrosis by Freis (1) in 1946 and by Bouman & Grunewald-Lezner (2) in 1952. Since the introduction of this procedure into practical dermatology by Levit (3), numerous publications have confirmed its efficacy in hyperhidrosis. To date, only pathophysiological models exist concerning the reasons for the efficacy of tap water iontophoresis in hyperhidrosis. It has often been assumed that the ducts of eccrine sweat glands are closed by the process (7). Extensive histological and electron-microscopic investigations, however, have failed to confirm that an obstruction of the sweat ducts is caused. Nowadays scientists assume that a post-synaptic functional disturbance of sweat gland secretion is induced by iontophoresis (8). There is no established role of sweat glands in dyshidrotic hand and foot eczema (9); however, hyperhidrosis is often connected with dyshidrosis (10). Moreover, it is well known that changes in the skin caused by eczema tend to become more severe in the case of pronounced sweat production and dampness. The reduction of sweat secretion induced by tap water iontophoresis has been confirmed in numerous publications (4–6, 8) and could therefore be one of the reasons for the efficacy of this treatment also in the case of hand eczema. Another possible cause for the efficacy of iontophoresis could be the induced increased absorption of substances used in the therapy.

Furthermore, psychical factors can have an impact on the disease activity but a side-different improvement cannot be explained by that. Biofeedback training methods improve dyshidrotic hand eczema (11); therefore, it cannot be excluded that the "tingling" sensations in this manner could induce a stimulus for the efferent vegetative nerves. But it is unknown whether this psychovegetative effect occurs unilaterally at all. Otherwise it could also be explained as a form of placebo effect. As iontophoresis therapy is always connected to subjective sensations, it can never be controlled by double-blinded trials, and placebo effects can never be totally excluded. On the whole it must be assumed that tap water iontophoresis has a direct local effect on the disease. The lack of significant effect of steroid-free topical therapy alone corresponds in this therapy-resistant, clinical picture to the results documented in the literature (10).

In this context a therapeutical intervention with tap water iontophoresis is of definite interest, not least because of the minimal side-effects (5).

In this study a new technique for the generation of pulsed direct current was used, reducing subjective sensations of discomfort such as formication and discrete paresthesia ("tingling") as opposed to iontophoresis with non-pulsed direct current, which was customary in the past. This study dealt only with patients exhibiting mild to moderate eczema as in

the case of pronounced erosive changes to the skin structure these sensations are much more apparent during tap water iontophoresis treatment, even in its pulsed form. Any existing minor erosions had been covered with petrolatum.

The significant improvement obtained in our group of patients using tap water iontophoresis as a therapy for dyshidrotic hand eczema leads to the conclusion that this method is effective as an adjuvant therapy for this disorder.

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