

ORIGINAL ARTICLE

Fluorescent cream used as an educational intervention to improve the effectiveness of self-application by patients with atopic dermatitis

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Abstract

Objectives: The aim of the study was to assess if a fluorescent cream, in a self-application educational session, could increase the effectiveness of cream application in practice and serve as a therapeutic intervention. **Methods:** 30 adults with atopic dermatitis were enrolled. They applied a fluorescent test cream on two occasions. Effectiveness of application was checked under ultraviolet illumination. At baseline, the patients greased their skin as they normally do. After 2 weeks, the patients were instructed to grease the whole body area. The results were commented on and visualised to the patients on both occasions. **Results:** At the baseline visit, 29% of the target skin was untreated, and at the follow-up visit after education, this improved to 13.6% (mean values, $p < 0.05$). Women performed better than men at baseline; however, men performed similar to women at the follow-up visit. **Conclusions:** The Fluorescent-cream Educational Session (FES) is an educational instrument for therapeutic intervention based on interaction between patient and provider. It includes hard endpoints, that is, visualisation and measurement of treated area, time spend on treatment and amount of cream used.

Key words: compliance, skin disease, treatment

Introduction

Daily application of a moisturiser is considered mandatory in the long-term control of atopic dermatitis. Dryness of the skin with xerosis is a hallmark and at the same time the forerunner of active dermatitis (1). Daily, frequent and widespread applications are needed for the treatment to be effective. Moisturisers are as a non-medicinal treatment very much left for the patients themselves to decide and practice and incorporate in their daily routines (2). Education in proper application technique appears not commonly practiced (3). Proper application requires uniform spread of cream to any part of the target skin with no relevant part being untreated. Some anatomical sites are not easily accessible or covered by textiles. There is, obviously, a need for a practical tool that can be used in the clinic to improve the situation of the patients with active atopic dermatitis.

In a recent study we demonstrated, using a fluorescent test cream, that healthy volunteers instructed to perform their best would neglect treatment of 30% of the skin expected to be treated (4). The study took place in the hospital clinic. It is likely that routine application at home is less effective.

A fluorescent cream has been introduced as a training system to achieve more efficient application of protective hand creams in patients suffering from occupational hand eczema (5).

In the present study, we aim to extend our past experience with a fluorescent test cream in healthy volunteers to patients with atopic dermatitis. These patients are instructed to use a moisturiser applied regularly to a larger part of their skin. Our purpose was to confirm the usefulness of the test cream for education of this group of patients, who have already established their own treatment habits regarding moisturisers.

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Methods

Patients, women and men aged 18 years and older and with an established diagnosis of atopic dermatitis (6), were recruited from the outpatient clinic of the Department of Dermatology, Ryhov County Hospital, Jönköping, Sweden, in 2009. It was a requirement that the patients had chronic dryness of the whole skin and a long past treatment course in the clinic for their dermatitis. Thirty-two patients were enrolled. We consider the number of patients sufficient to achieve a significant difference as in our previous study significance was reached with 20 participants. The patients were invited by the dermatologists when visiting the outpatient department. They gave their informed consent. Information on study procedures was given both verbally and in writing. The study was approved by the local ethics committee of Linköping University Hospital, study code M86-08.

The test cream was a commercially available fluorescent cream (Dermalux Testlotion; KBD GmbH, Weinheim, Germany). The fluorophore is sodium fluorescein. The cream was validated in practical use in previous studies (4,7). It was used as supplied in 75 ml plastic tubes. The colour and consistency of the cream is similar in viscosity to the common cosmetic or pharmaceutical cream. The cream did not emit fluorescent light under room conditions but gave a white and blue fluorescence under ultraviolet illumination, the intensity of fluorescence depending on the amount of cream applied.

The study was performed at two study visits with 2 weeks in between. At the baseline visit, the patients were told to treat their skin with the study cream "like they normally would do" with their own moisturiser. The patient had the opportunity to inspect the treated and untreated areas and note the degree of fluorescence from the treated skin. The observers pointed out the untreated areas. At the follow-up visit, the patients were instructed to use the moisturiser over the total skin surface. Thus the patients were their own controls.

The two visits were performed in a similar way. Instructions were given by the investigators. The patients were informed to take the time they needed and to use the amount of cream they might wish. They were told that the cream was fluorescent, and fluorescence was later to be checked. Participants undressed except for the underwear. Application was conducted under relaxed conditions with a minimum of interference by the investigators. The room used was neutral with normal lightning. Participants had access to a chair. The two investigators registered time spent on application and the amount of cream used, which was measured by weighing the tubes.

Following application, the entire skin surface was inspected under illumination (Figure 1). Two ultraviolet radiation sources were used, each mounted with three tubes (Wood's light, tube TLD 36W/08, peak wavelength 365 nm). Mirrors were incorporated in the lamps. Two investigators independently sketched areas that did not fluoresce.

Photo of a case treated with the fluorescent cream is shown in Figure 1.

In the analysis of fluorescent skin sites, the non-fluorescent areas were registered as a percentage of the body regions. The sketches were divided into 10 cells (breast, back, anterior left and right arm, posterior left and right arm, anterior left and right leg and posterior left and right leg). Investigators concluded their observations as one common result. Comparison of sketches showed good agreement between the two observers (Cohen's K 0.75 and Spearman's 0.92).

We used the standards of the Psoriasis Area and Severity Index (8) for estimation of the relative size of anatomical regions relative to whole body skin. Head and neck constitutes 10% of total body area, trunk including armpit and groins 20%, upper extremities 30% and lower extremities including the buttocks 40%. We had excluded the head and neck and the underwear area from treatment, estimated to an average area of 20%. Thus our calculations were based on 80% of the total skin surface being the intended target of application in the present study.

Plastic tubes with cream were weighed on a laboratory balance before and after use, and the amount of cream used was calculated. The whole body skin area of test persons was estimated according to Bailey and Briars (9). The amount of test cream was calculated as gram per square metre.



Figure 1. Treated and untreated areas (back).

For statistical analysis, the T-test for independent samples was used in SPSS. For paired samples, $p < 0.05$ was significant.

Results

The study was completed by 30 patients, 16 men and 14 women. Their mean age was 45 years (range 19–76). Two patients had dropped out for personal reasons. All study participants were right-handed.

No fluorescence was detected in 29% of the skin surface at the baseline visit as compared with 13.6% at the follow-up visit ($p < 0.05$). Gender influenced application. No fluorescence was detected in 23.7% of women at the first visit versus 13.3% at the second visit. However, men showed no fluorescence in 34% at the first visit versus 13.9% at the second visit. Both men and women improved, but men improved significantly more ($p < 0.05$) than women.

Improvement was also significant for selected anatomical regions, that is, the breast, the back, the armpits, the arms and the legs. The skin nearby the underwear zone was systematically not treated.

The back being difficult to approach was not treated in 50% at the baseline, but at the follow-up only 35% was neglected, see Table I.

Mean amount of test cream applied was 5.9 g/m^2 (women 5.7 g/m^2 , men 6.5 g/m^2) at visit 1, and 9.5 g/m^2 (women 7.6 g/m^2 , men 11.5 g/m^2) at visit 2. Every patient used more cream at visit 2 and the difference was thus significant both for the whole group and for women and men as separate groups.

Mean time for application was 2.7 min (women 2.3 min, men 2.8 min) at visit 1 and 3.9 min (women 3.4 min, men 5.1 min) at visit 2. The difference was

significant both for the whole group and for women and men as separate groups.

Discussion

The study shows that the FES concept made patient's self-application more efficient. A larger area was treated, more cream was used and more time was spent on treatment. This indicates that the patients became more motivated and more disciplined and careful with applications.

The 2-week intercept is scheduled as a self-learning period where the patients can practise and improve their application and gradually develop a better technique, which is integrated with other daily routines. The FES concept is an educational program consisting of a baseline visit with unbiased self-application of fluorescent cream used to demonstrate spontaneously neglected treatment sites combined with a discussion on how to apply in the right way, a self-training period of 2 weeks as mentioned above and a follow-up visit with another self-application of the fluorescent cream and check of performance. Further visits can be added depending on the individual case. You could argue that this is a time-consuming procedure, but our data show that it takes less than 5 minutes to receive a concrete picture of the application behaviour for both the patient and the doctor or nurse.

It can be speculated why the FES as performed in this study made any change in adult patients who already had long experience and who already were encouraged by dermatologists and nurses to use moisturisers. The FES, however, goes a step further and addresses the practical act of self-application directly, that is, how to physically apply the cream by the

Table I. Non-treated anatomical regions at baseline compared with non-treated area at follow-up visit.

Anatomical regions	Mean baseline	Mean follow-up	Standard deviation (SD) baseline	SD follow-up	p
Back	5,8	3,5	3,61	2,06	0,004
Breast	3,8	1,4	3,43	1,03	0,001
Arm back left	2,3	0,6	2,48	0,87	0,001
Arm back right	2,3	0,6	2,58	0,83	0,001
Arm front right	2,0	0,4	2,63	0,79	0,002
Arm front left	1,9	0,4	2,34	0,70	0,001
Armpit left	0,7	0,4	0,44	0,47	0,028
Armpit right	0,7	0,4	0,43	0,46	0,011
Leg back left	2,5	1,4	2,24	1,72	0,036
Leg back right	2,3	1,2	2,24	1,25	0,028
Leg front right	1,8	1,1	1,89	0,91	0,070
Leg front left	1,9	1,1	1,85	0,86	0,036

patient himself on his own skin and with a result that can be seen directly checked the patient himself. The concept is individualised and interactive. We think that this method can be used for other groups of patients with skin diseases. Since our study was done in a small group of patients with atopic dermatitis, this has to be confirmed in other studies.

Widespread application of a fluorescent chemical to barrier-disrupted skin might be questioned to be hazardous. A review on the safety of fluorescein for dermatological purposes recently concluded that its use involves no special concern about local or systemic safety (10).

There is a strong need for effective interventions to improve patients' self-treatment with medicines, and the use of topical treatments are known to be especially diluted and scattered when it comes to practical use (11). One-third of dermatology patients do not redeem dermatologist's prescription on a new medicine, and 95% under-treat significantly with their cream or ointment and use too little (12). A Cochrane review showed that many interventions to improve the use of medicines and improve to medication have generally failed to work in practice (13). Lack of reality and closeness to the patient could be a major reason for this.

Conclusions

FES is an educational instrument for therapeutic intervention based on interaction between the patient and the provider. It includes hard endpoints, that is, visualisation and measurement of treated area, time spent on treatment and amount of cream used. The study shows that the FES concept made patient's self-application more efficient, indicating that the patients became more motivated and more disciplined and careful with applications.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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