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# The Effectiveness of Wet Wrap Dressings Using 0.1% Mometasone Furoate and 0.005% Fluticasone Proprionate Ointments in the Treatment of Moderate to Severe Atopic Dermatitis in Children

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**Abstract: Various types of dressings have been used successfully in the treatment of atopic dermatitis. In this study we looked at the efficacy of two of the newer topical steroids when applied under wet wrap dressings for the treatment of refractory atopic dermatitis in children. Forty children with moderate to severe disease were randomized to receive either one-tenth-strength diluted 0.1% mometasone furoate ointment or one-tenth-strength diluted 0.005% fluticasone proprionate ointment. These were applied once a day over a 4-week period without wet wraps, or for 2 weeks without wet wraps followed by 2 weeks of application under wet wraps. There was a 2-week period for all patients when the topical treatment was standardized. At weekly follow-ups, patients were assessed by a single, blinded observer and objectively scored for disease extent and severity. A subjective score was also given for the impact of eczema on daily living. There was significant improvement in the disease severity from baseline during the first 2 weeks of the open application arm ($p = 0.043$), however, additional beneficial effects were limited after week 2. Wet wraps further improved the disease severity and extent after week 2 ($p < 0.05$), and were well tolerated. We concluded that both 0.1% mometasone furoate and 0.005% fluticasone proprionate ointments are effective in the treatment of atopic dermatitis, and that wet wraps are useful in further improving refractory disease in children.**

Atopic dermatitis can be difficult and persistent in children with moderate to severe disease. In our search for an effective second-line treatment, wet wrap dressings were found to be useful (1–4). In recent years, topical steroids with an improved therapeutic index have been developed with the aim of reducing

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systemic adverse effects without compromising clinical efficacy. These have been classified as grade III medium-potency corticosteroids, with the risk of adverse effects equivalent to that of a class I topical steroid (5–12) (grade I being the weakest according to the UK classification). We set out to investigate the effectiveness of wet wraps using two of these newer steroids, 0.1% mometasone furoate ointment and 0.005% fluticasone proprionate ointment, in the treatment of children with moderate to severe atopic dermatitis.

## METHODS

### Target Population

Forty patients with atopic dermatitis, as defined by the UK working party refinement of Hanifin and Rajka's (13) diagnostic criteria for atopic dermatitis, between the ages of 1 and 15 years were recruited from the pediatric dermatology outpatient clinic of the Prince of Wales Hospital. This is a teaching hospital in Hong Kong with a catchment population of a million and a referral center for difficult cases from outside the area. At the time of recruitment, written parental consent was obtained. The ethical committee of the Chinese University of Hong Kong approved the trial. To qualify for this study, patients had to have active disease despite being under conventional treatment with a moderately potent topical steroid of class II or above (UK classification, with class I being the weakest), as well as with soap substitutes and emollients.

The disease severity score was obtained by quantifying six signs of atopic dermatitis: erythema, edema/papulation, oozing/crusting, excoriation, lichenification, and dryness. Eight areas of the body—the head and neck, anterior trunk, back, genitalia, and the four limbs—were graded on a scale of 0–3 (0 = none, 1 = mild, 2 = moderate, and 3 = severe). The maximum score for any given area was 18 and for any given patient was 144. All patients were required to have a severity score of at least 40 to qualify for enrollment. Those with a score of less than 40 were considered to have mild disease.

A disease extent score was obtained by estimating the percentage of body surface area involved, using the rule of nines. The body was divided into eight areas: 9% each for the head and neck, right upper limb, and left upper limb; 18% each for the dorsal aspect of the trunk, ventral aspect of the trunk, right lower limb, and left lower limb; and 1% for the genitalia.

A questionnaire for subjective assessment of the impact of atopic dermatitis on daily life was also completed at each visit, with questions relating to the effects on school, work, play, social life, choice of clothing, sleep, sensations of itching, and pain. A scale of 0–3 was used. The higher the score, the more severe the social impact of the disease.

### Exclusion Criteria

Patients on systemic steroids, immunosuppressives, or Chinese herbal medicine during the previous 6 weeks, as well as those with other skin conditions or infections of any kind, or those on antibiotic treatment within the previous 6 weeks were excluded from the study.

### Run-in Period

At enrollment, patients and their parents were given a talk about proper skin care and the correct application of topical emollient and treatment medications. The topical treatment was standardized and included emulsifying ointment as soap, petrolatum as emollient, and 0.005% flucinolone acetonide cream applied twice a day to the affected areas. This regimen was started by patients 2 weeks before commencing the study. All creams and ointments were weighed at each visit.

### Randomization

Patients were randomized (Fig. 1) to receive either a diluted preparation (one-tenth strength) of 0.1% mometasone furoate ointment (Schering Plough, Canada) or diluted 0.005% fluticasone proprionate ointment (Glaxo Operation, UK). Randomization involved the use of 50 envelopes with X or Y written inside. Only the pharmacist distributing the ointment knew the treatment coding. The ointments were prepared using the aseptic technique and a sterile mixer. Petrolatum was used as a diluent to give the required diluted strength of one-tenth. After 2 weeks of open application, the patients were further randomized using a similar method to either continue to receive the same topical treatment for a further 2 weeks (groups I and II) or to use the same topical ointment under wet wraps for 2 weeks (groups III and IV). Patients were only entered into the second phase of the study if their disease had failed to improve by more than 50% after the initial 2 weeks.

### Treatment

The method of wet wrap dressings has previously been described in detail (1–4). Our patients were asked to apply medicated ointment to the affected areas after a bath. Petrolatum was applied to unaffected areas.

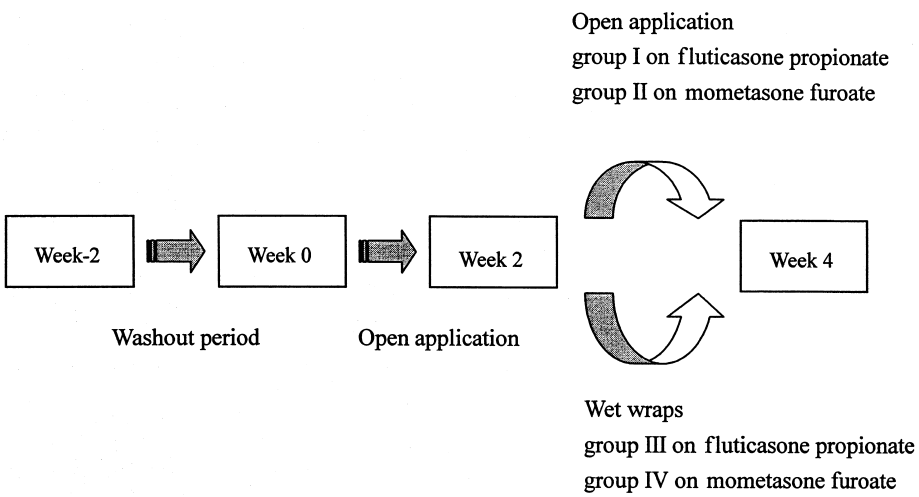


**Figure 1.** Time schedule of treatment.

Tubifast dressings (Seton Healthcare Group) soaked in warm water were placed over the affected areas of the body. A second layer of dry tubifast was placed over the wet layer. These steps were carried out in the evenings at bedtime and the dressings were kept on overnight before being removed in the morning (the dressing period was about 8 hours). For the duration of the study the same blinded observer saw all patients at weekly intervals and recorded and assessed the disease.

### Statistical Analysis

Baseline characteristics of the four patient groups were compared using the chi-squared test and the one-way analysis of variance (ANOVA). A Wilcoxon signed rank test was used to compare the disease scores at baseline with those at weeks 1, 2, 3, and 4 during treatment. The comparison of the corresponding change in the disease scores among the groups was made using the Mann–Whitney *U* test. P values were adjusted by Bonferroni's correction for multiple comparisons. A p value of less than 0.05 was considered statistically significant.

## RESULTS

A total of 40 patients were recruited. Demographic data were comparable among the groups. Twenty-one patients were randomized to receive fluticasone proprionate ointment and 19 to receive mometasone furoate ointment. Twenty-seven patients completed the study. Ten patients stopped before the end of the study because their eczema had improved more than 50% from the baseline. One child was unable to tolerate wet wraps in the fluticasone group and two stopped after the first week and dropped out of the study because they felt their eczema was static.

When the clinical effectiveness of mometasone furoate was compared with that of fluticasone proprionate, there was no statistical difference. The extent of disease score was $p = 0.846$, while the severity score was $p = 0.068$.

### Disease Severity Score

There was statistical clinical improvement in groups II, III, and IV (Table 1), but the clinical effect on disease

**TABLE 1.** *Disease Severity Score*

| | Group I | | Group II | | Group III | | Group IV | |
|---|---|---|---|---|---|---|---|---|
| | Median | p | Median | p | Median | p | Median | p |
| Week 0 | 36.50 (19.75–52.50) | | 41.00 (27.00–54.50) | | 40.00 (30.00–50.00) | | 60.50 (50.75–68.50) | |
| Week 1 | 39.00 (20.50–53.50) | .838 | 19.00 (5.50–42.00) | .021 | 28.00 (15.00–39.00) | .010 | 42.50 (27.00–50.25) | .007 |
| Week 2 | 41.00 (21.00–52.00) | .599 | 20 (8.00–32.00) | .043 | 22.00 (10.00–45.00) | .026 | 29.00 (20.75–59.00) | .013 |
| Week 3 | 36.00 (21.00–42.00) | .116 | 18.00 (10.00–27.50) | .043 | 17.00 (13.50–29.00) | .008 | 17.00 (10.00–34.50) | .011 |
| Week 4 | 30.00 (20.00–43.00) | .091 | 22.00 (18.00–53.50) | .078 | 16.00 (8.00–26.00) | .018 | 14.00 (7.25–33.75) | .050 |

Data as median score with interquartile range.
Group I = open application using fluticasone propionate; group II = open application using mometasone furoate; group III = wet wraps using fluticasone propionate; group IV = wet wraps using mometasone furoate.

**TABLE 2.** *Extent of Disease Score*

| | Group III | | Group IV | |
|---|---|---|---|---|
| | Median | p | Median | p |
| Week 0 | 54.00 (32.00–72.00) | | 70.50 (62.25–84.00) | |
| Week 1 | 42.00 (36.00–69.00) | .073 | 45.00 (33.00–71.25) | .014 |
| Week 2 | 36.00 (21.00–78.00) | .055 | 49.50 (30.75–75.75) | .050 |
| Week 3 | 42.00 (24.00–52.50) | .020 | 33.00 (19.50–49.50) | .011 |
| Week 4 | 24.00 (21.00–45.00) | .028 | 22.50 (18.75–37.50) | .025 |

Data as median score with interquartile range.

severity plateaued after week 2 for those who did not receive wet wraps. Patients who had wet wraps, however, continued to improve and finished the study with significantly less severe disease.

### Disease Extent Score

The extent of eczema (Table 2) did not change significantly for patients randomized to the open application groups, but improved clinically in those receiving wet wraps. Only patients who had wet wraps finished the study with less extensive disease.

### Subjective Index Score

Patients who received wet wraps had a statistically significant improvement in their subjective score (Table 3). The other patients also felt there was an improvement, although results were not significant.

## DISCUSSION

Different types of dressings for children with atopic dermatitis have been around for decades. We found wet wraps to be useful in our search for an effective second-line treatment for acute exacerbations and persistent moderate to severe disease.

It is thought that the gradual evaporation of water from the wet layer causes a slight cooling of the skin, which partly relieves the itching. The moisture in the dressing helps to soften the skin, allowing better penetration of the topical corticosteroid, while the two layers of dressing act as a mechanical barrier to scratching. The dressings were well tolerated and application was well managed by all parents involved. Only one child in the fluticasone group was unable to tolerate wet wraps and dropped out.

Mometasone furoate and fluticasone proprionate are members of a new generation of corticosteroids designed to achieve an improved therapeutic index with the required clinical efficacy but with decreased side effects. Studies showed slow and limited percutaneous absorption, with rapid transformation in the liver and low resorption in the circulation, resulting in negligible systemic activity (14–19). However, absorption is increased in inflamed skin with a defective barrier and also with occlusion and improved hydration. Since our study involves using an occlusive dressing on a pediatric population, the ointments were diluted in an attempt to decrease the amount of topical steroid used. It is interesting that clinical improvement appeared to plateau after week 2, when mometasone furoate ointment was applied without wet wraps. For patients who had wet wrap dressings in both the mometasone furoate and fluticasone proprionate groups, continued clinical improvement was seen in both the extent and severity (Tables 1 and 2). Patients also felt better according to the improved subjective patient index score (Table 3).

**TABLE 3.** *Index Score*

| | Group III | | Group IV | |
|---|---|---|---|---|
| | Median | p | Median | p |
| Week 0 | 17.00 (17.00–19.00) | | 20.00 (18.50–22.75) | |
| Week 1 | 19.00 (16.00–21.00) | .559 | 17.00 (16.00–18.75) | .010 |
| Week 2 | 17.00 (15.00–20.00) | .287 | 18.00 (16.00–20.75) | .036 |
| Week 3 | 16.00 (15.50–18.00) | .024 | 16.00 (14.00–19.50) | .012 |
| Week 4 | 18.00 (16.00–20.00) | .671 | 16.50 (14.50–18.75) | .011 |

Data as median score with interquartile range.

For atopic eczema, once a day application of 0.1% mometasone furoate has been found to be as effective as treatment with 0.05% betamethasone diproprionate and superior to treatment with other, less potent steroids such as 1% hydrocortisone or 0.05% clobetasone butyrate (5–7). Application of 0.005% fluticasone proprionate is as effective as 0.05% clobetasone butyrate and hydrocortisone-17-butyrate 0.1% (9,10,18,19). Although once a day application of fluticasone proprionate has been found to be as efficacious as twice a day application (20,21), the effect of diluted fluticasone proprionate ointment without wet wraps was not significant in this study. In our attempt to keep patients blinded and the use of ointments uniform, the diluted ointment was applied once a day only, rather than twice throughout the study. If fluticasone had been used twice, the efficacy might have been obvious.

Various topical steroids have been used for wet wrap dressings. Both betamethasone valerate (one-fourth strength) and 1% hydrocortisone have been used as short-term measures to avoid adverse systemic effects (3). Diluted beclomethasone diproprionate ointment (one-tenth strength) which has a shorter systemic half-life and therefore a better safety profile, has also been used (1). The newer generation of topical steroids with an improved therapeutic index is ideal for wet wraps. A dropout rate of 1 in 18 (5.5%) indicates that they were well tolerated and managed by both patients and parents. In this study, patients who received wet wraps did better as a group. They finished the trial with less extensive disease ($p = 0.011$) and less severe disease ($p = 0.028$).

Much of the clinical and subjective improvement seemed to occur within the first week of wet wrap treatment, which supports the idea of its usefulness during acute flare-ups. Further study is necessary to ascertain its role as a form of maintenance therapy, particularly to see if it has any significant effect on pituitary axis suppression (3,12,16,17). In conclusion, 0.1% mometasone furoate and 0.05% fluticasone proprionate ointments are effective in the treatment of moderate to severe atopic dermatitis, while wet wraps, as an intermittent and short-term measure, improve difficult disease.

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