

ORIGINAL ARTICLE

Efficacy and problems associated with using a wet-wrap garment for children with severe atopic dermatitis

KAM-LUN ELLIS HON^{1,2}, KIN-YEE WONG², LAI-KING CHEUNG², GLADYS HA²,
MAN-CHING ADRIAN LAM², TING-FAN LEUNG², CHUNG-MO CHOW²,
YUK-MING WILLIAM TANG¹, NAI-MING TOMMY LUK¹ & ALEXANDER K.C. LEUNG³

¹Dermatology Research Centre and ²Department of Paediatrics, The Chinese University of Hong Kong, Prince of Wales Hospital, Shatin, Hong Kong, and ³Department of Paediatrics, The University of Calgary, Calgary, Alberta, Canada

Abstract

Use of a wet wrap for short-term relief of itch in children with severe atopic dermatitis has been advocated but objective determination of its efficacy has been difficult and many issues associated with its use are yet to be defined. We tested a new garment for the wet-wrap procedure in six patients with atopic dermatitis and objectively determined whether a 3-day usage could indeed relieve the distressing symptom of itch using a wrist motion monitor. The garments were effective in the short-term improvement of itching, severity of atopic dermatitis and quality of life in these children. Many issues associated with its use were identified. Clear instructions and individualized regimes (such as the choice of emollient, bathing ointment and topical corticosteroid) are essential for optimal outcome.

Key words: *Atopic dermatitis, garment, itch, wet wrap*

Background

Use of the wet-wrap procedure for short-term relief of itch in children with severe atopic dermatitis (AD) has been advocated (1–4) but objective determination of its efficacy has been difficult and many issues associated with its use are yet to be defined. In this pilot study, we tested a new garment (Tubifast; Mölnlycke Heath Care AB, Goteborg, Sweden) for the wet-wrap procedure and objectively determined whether a 3-day usage could indeed relieve the distressing symptom of itch.

Methods

The inclusion criteria for wet-wrap treatment were moderate-to-severe AD despite existing treatment, parental request for alternative treatment, and reliability of the parents in following instructions and reporting outcomes. Patients were excluded if they were younger than 1 year of age or older than 14 years (garments too small for older children). Six children with moderate-to-severe AD despite standard and alternative treatment modalities treated

with a Tubifast garment were evaluated. With the aid of a standard video programme, the children and their parents were instructed on day 1 by the principal physician on the wet-wrap procedure with the Tubifast garment (Table I). Over a 5-day-period, the patients were instructed to wear a wrist motion monitor (DigiTrac[®]; IM Systems, Baltimore, MD, USA) (5) starting at 10:00 pm to document nocturnal scratching movements (Appendix). Wrist activities were expressed in units of the average value of acceleration (g/min). We previously documented that wrist activities for the first 3 hours are a good indicator of eczema severity, nocturnal itch and sleep disturbance in children (5). As itch is difficult to document objectively, the DigiTrac monitor is helpful in monitoring its intensity and frequency before and following treatments.

On days 2 to 4, the patients wore the Tubifast garment as per the instruction protocol (Table I; Figures 1A–C). On days 1 and 5, the AD severity was evaluated with the SCORing Atopic Dermatitis (SCORAD) score and a validated Chinese version of the quality of life score Children's Dermatology Life Quality Index (CDLQI) (6,7) (Appendix). SCORAD

Table I. Exact instructions for bathing, emollient, and topical steroid application to be given to every patient prior to the wet-wrap procedure.

Step 1	Review and optimize current medications.
Step 2	Evaluate whether bathing is appropriately performed. We advise that bathing should take 5–10 minutes with warm water.
Step 3	A soft towel should be used to pat the skin dry, and rubbing discouraged.
Step 4	A mild-to-moderately potent topical corticosteroid cream can be applied to inflamed areas.
Step 5	An emollient must be applied within 3–5 minutes to the whole body in a rostral-to-caudal manner in the direction of the hair.
Step 6	The Tubifast garment should be soaked in lukewarm water (squeeze out the excess water) and put on the whole body. A second dry garment is then put on top of the first garment.
Step 7	A light cotton pajama may be put on in case parents are concerned about the cold.
Step 8	During the hot summer months, adjust the air-conditioning temperature to 25°C if air-conditioning is used in the patient's room.

is a clinical score widely used in Europe for the assessment of AD severity. It measures both the objective (extent and intensity) and subjective (pruritus and sleep loss) aspects in AD patients over the preceding 3 days. It is a weighted index, with less weight on the extent (by multiplying by a factor of 0.2) but more emphasis on the intensity (by a factor of 3.5) and symptomatology of pruritus and sleep loss (by a factor of 1). Scratching and sleep disturbance are subjective symptoms that have been difficult to study. A modified objective SCORAD index (without the pruritus and sleep-loss components) is more scientific and accurate in defining AD severity. The CDLQI

measures how much a skin problem has affected the life of a patient. It contains 10 questions relating to six headings: (i) symptoms and feelings; (ii) daily activities; (iii) leisure; (iv) work and school; (v) personal relationships; and (vi) treatment. Each question is scored 0–3, where 0=the subject matter being 'not affected', 1='a little'; 2='a lot'; and 3='very much' affected.

Any practical problems associated with the wet-wrap procedure and the Tubifast garments were evaluated during the assessment on day 5. Serial recording of wrist activity in the six patients are shown in Figure 2.



Figure 1. The wet-wrap procedure. (A) Bathing in warm water with emollient; (B) topical corticosteroid on inflamed areas followed by a generous application of emollient; (C) wearing two garments. One Tubifast garment should be soaked in lukewarm water. A second dry garment is then put on top of the first garment.

Case series

Case 1

An 11-year-old girl with AD since infancy had been treated with emollients, topical corticosteroids, topical tacrolimus, traditional Chinese medicine, oral antihistamine, oral antibiotics, oral corticosteroids and wet wrap with a Tubifast bandage. She presented to us with intense itching despite treatment with once-daily topical mometasone furoate for 4 weeks and a course of oral cloxacillin. Her AD was severe, with a total SCORAD of 63.5, objective SCORAD of 47.5, and CDLQI of 13. Following a 3-day wet-wrap procedure with the Tubifast garment, her AD improved (total SCORAD 53.1, objective SCORAD 40.1, and CDLQI 9). Itching, as documented by the DigiTrac wrist monitor, was reduced from 234 g/min before the wet wrap (day 1) to 83.2 g/min (day 4) (Figure 2).

Case 2

A 6-year-old girl had had AD since 2 years of age. Treatment had included aqueous cream, baths with herbal ingredients, once-daily topical mometasone furoate for 6 weeks, topical tacrolimus, traditional Chinese herbal medicine, courses of systemic antibiotics, and oral antihistamines. Despite this, her AD had deteriorated and her mother requested additional treatment to relieve her itch and misery.

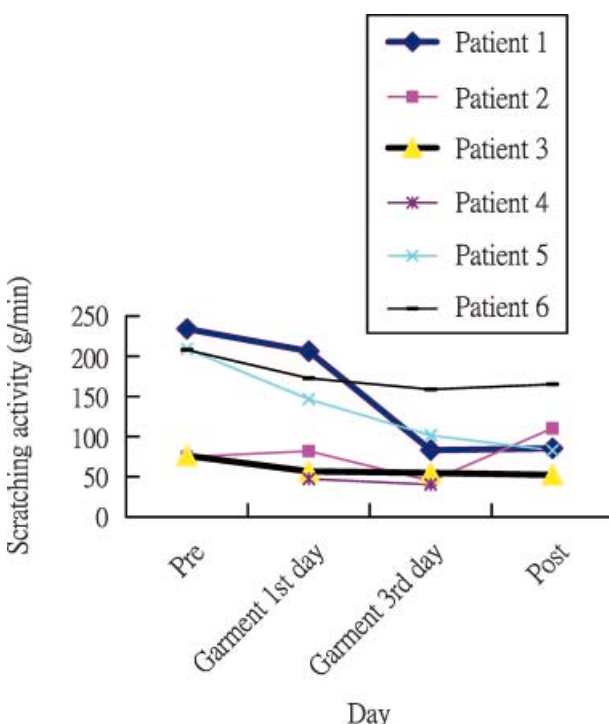


Figure 2. The DigiTrac motion monitor was worn on the dominant hand before bed resting. It continuously recorded wrist movements until the next morning.

Compliance with emollient usage had been an ongoing problem. We took the opportunity to re-educate the family on the bathing procedure. The child's AD was severe with a total SCORAD of 68.4, objective SCORAD of 54.4, and CDLQI of 15. Following the 3-day wet-wrap procedure with the Tubifast garment, her AD improved (SCORAD 37.3, objective SCORAD 32.3, and CDLQI 10). Itching, as documented by the DigiTrac wrist monitor, was reduced from 75.0 g/min before the wet wrap (day 1) to 44.8 g/min (day 4) (Figure 2).

Case 3

The mother had heard about wet wrap for the treatment of AD and requested to try this on her 15-year-old girl who had a long history of AD. Treatment in the past had included use of emollients, topical corticosteroids, traditional Chinese medicine, and oral antihistamines. Since the onset of puberty, itching had been bothersome. Her AD was moderate, with a total SCORAD of 46.3, objective SCORAD of 35.3, and CDLQI of 18, despite treatment with once-daily mometasone furoate for 5 months. Following the 3-day wet-wrap procedure with the Tubifast garment her AD improved (SCORAD 19.8, objective SCORAD 14.8, and CDLQI 6). Itching, as documented by the DigiTrac wrist monitor, was reduced from 76.3 g/min before the wet wrap (day 1) to 54.7 g/min (day 4) (Figure 2).

Case 4

The protracted AD of an 8-year-old girl had become worse recently despite courses of oral cloxacillin. Treatment in the past had included the use of various combinations of emollients, topical and oral corticosteroids, systemic antibiotics, topical and oral traditional Chinese medicine, topical tacrolimus and pimecrolimus, and oral antihistamines. The mother had been wet wrapping her limbs with bandages, and mometasone furoate 0.1% cream mixed 1:10 with Vaseline had also been used in the past 2 months. Her AD was severe, with a total SCORAD of 94.7, objective SCORAD of 74.7, and CDLQI of 21. Following the 3-day wet-wrap procedure with the Tubifast garment, her AD improved (SCORAD 60.4, objective SCORAD 48.4, and CDLQI 16). Itching, as documented by the DigiTrac wrist monitor, was reduced from 47.3 g/min (day 2) to 40.2 g/min (day 4). The patient did not wear the wrist monitor on days 1, 3 and 5 (Figure 2).

Case 5

A 3-year-old boy was admitted to the hospital with exacerbation of his AD despite daily use of topical betamethasone valerate 0.1% (once-daily for the past 5 months), fusidate sodium 2%, and pimecrolimus 0.1% cream. He had had AD since 1 week of age. Treatment in the past had included the use of emollients, topical

corticosteroids and antibiotics, traditional Chinese medicine, topical tacrolimus, and oral antihistamine. The mother had tried wet wrapping with bandages but abandoned the tedious and poorly-tolerated procedure after a few days. His AD was severe on the limbs and spared the face and trunk, with a total SCORAD of 69, objective SCORAD of 53, and CDLQI of 21. Heavy growth of *Staphylococcus aureus* was isolated from multiple sites. Following a 3-day wet-wrap procedure with the Tubifast garment in hospital, his AD improved (SCORAD 36.2, objective SCORAD 26.2, and CDLQI 10). Itching, as documented by the DigiTrac wrist monitor, was reduced from 209.1 g/min before the wet wrap (day 1) to 101.5 g/min (day 4) (Figure 2).

Case 6

A 6-year-old Chinese boy had a long history of severe atopic dermatitis. At the age of 1.5 years, he also developed renal biopsy-confirmed focal segmental glomerulosclerosis (FSGS) which was treated with corticosteroids and cyclosporine A by the nephrologists. Despite these two potent medications that were supposed to be efficacious for AD, the child continued to be miserable and bothered by intense skin dryness and itching. When referred to our clinic at the age of 7 years, he was on cyclosporine (30 mg three times daily) and prednisolone (7.5 mg on alternate days) for FSGS, and emollients, topical corticosteroid (once-daily 0.1% mometasone furoate for 5 weeks), traditional Chinese medicine, and oral antihistamine for AD. His AD was severe, with a total SCORAD of 84.5, objective SCORAD of 67.5, and CDLQI of 12. Following a 3-day wet-wrap procedure with the Tubifast garment, his AD improved (SCORAD 72.2, objective SCORAD 58.2, and CDLQI 11). Itching, as documented by the DigiTrac wrist monitor, was reduced from 207.7 g/min before the wet wrap (day 1) to 158.6 g/min (day 4) (Figure 2). The mother did not apply the topical corticosteroid for the procedure because the child was already on alternate-day prednisolone for his renal disease. The patient and his mother were further counselled about the use of intermittent wet-wrap therapy with options of immunomodulating therapies such as azathioprine or mycophenolate mofetil.

Discussion

Itch, the cardinal symptom of AD, is a very distressing problem associated with sleep disturbance and at times is out of proportion to the severity of the disease (8). Wet wrap has been advocated as an effective modality of treatment for the short-term relief of itch, and involves the use of an emollient under retention bandaging (1,2,4,9). However, the objective determination of its itch-relieving efficacy has been difficult and many issues associated with its use are yet to be defined. In our experience, many teenagers would refuse to use this tedious modality of

treatment when the initial enthusiasm fades. Specifically, the mere procedure of cutting and applying the Tubifast bandages to fit the various parts of the body can be tedious and discouraging. The ready-made Tubifast garments may bypass such inconvenience. These garments are easy-to-apply and the two-way stretch construction ensures freedom of movement and aid compliance. The fibre content is 86% viscose, 11% nylon and 3% elastane. It is recommended that the garments are sized according to dimensions as well as age. The parts of the garments include vests, tights, leggings and socks. The sizes are divided into 6–24 months, 2–5 years, 5–8 years, 8–11 years, and 11–14 years, respectively. Comfortable to wear under nightwear and ordinary clothes, they also help to promote fully active days and restful nights.

In this small case series, we demonstrated that short-term wet-wrap treatment with the Tubifast garment did impressively help reduce the severity scores and improve quality of life. More importantly, we used an objective non-intrusive tool to assess the nocturnal itch associated with AD and found that the average scratching activity was significantly reduced by 20–60% on the third day of wet wrap when compared with baseline. Case 6 illustrated a very difficult scenario in that the child suffered from intense itching despite treatment with combined systemic immunosuppressive therapy in addition to topical AD therapy. Scratching was reduced by more than 20% following the 3-day therapy.

We interviewed the patients and their parents at the end of the 5-day study period in order to assess possible factors and problems associated with the use of the wet-wrap procedure (Table 2). During the warm and humid summer months in Hong Kong, the majority of families would turn on the air-conditioning. Most previous studies did not consider air-conditioning as a contributive/confounding factor, which is specific for Hong Kong. It is not known whether climate and air-conditioning have any impacts on the choice of emollients and use of wet wrap. In contrast, coldness and shivering can be a deterring factor of its use during winter. Importantly, the procedure can be regarded as an opportunity for teaching and the re-education of patients about emollients and bathing techniques (10).

In our experience, many Chinese parents find it tedious to use Tubifast bandages because they have to cut two layers of bandage per body part (such as the four limbs, trunk, head, and neck). In addition, some parents dislike the 'mummy' appearance when the bandage becomes loose with repeated usage. The new garment is certainly appealing. However, there are a number of issues that are yet to be explored concerning its use. First, compliance concerning the longer-term use of this garment has not been explored. Bathing and wearing the garments may be considered tedious and not tolerated, especially in adolescents. The garment is a new and expensive item and at least four sets of

Table II. Comments and problems associated with the Tubifast garment.

Patient 1	The patient used aqueous cream as an emollient, liquid paraffin for bathing, and mometasone furoate 0.1% cream. The skin excoriations were exacerbated while she put on the tight wet garment on the first night and it took the patient nearly 1 hour to take a bath and put on the garment. The process became easier on subsequent nights.
Patient 2	As the patient did not like the texture of aqueous cream, emulsifying ointment or Vaseline, we prescribed Cetaphil® moisturizing cream (Galderma, France) for her to try. It took the patient and the mother 30 minutes to complete the bath and the wet-wrap procedure. The patient initially felt cold despite the double wet-wrap garments, pajama and blanket due to air-conditioning in the room. Consequently, the patient waited until the garment became drier before bed resting. When this happened, however, the garments became uncomfortably hot to wear.
Patient 3	The patient used aqueous cream as an emollient, emulsifying ointment for bathing, and mometasone furoate 0.1% cream mixed 1:10 with aqueous cream for the more extensive eczematous areas on the abdomen and thighs. The whole procedure took 30 minutes. There was some difficulty with the second dry garment when worn on top of the first wet garment. The patient put a pajama on top of the two garments and her room was air-conditioned.
Patient 4	As a bath was not available, the mother used Physiogel® cleanser (Stiefel, Germany) for the shower, mometasone furoate 0.1% cream mixed with Vaseline on skin lesions, and Vaseline on the rest of her body. On the first night, the patient felt uncomfortably cold with the wet garment despite putting on a pajama and two blankets. On subsequent nights, she did not wet the garment and wore it dry.
Patient 5	The mother used emulsifying ointment for the bath, mometasone furoate 0.1% cream for the eczematous lesions, and requested new emollients to try. We prescribed Cetaphil moisturizing cream.
Patient 6	The patient took a bath with emulsifying ointment and liquid paraffin before bedtime. It was difficult to put on the wet garment but application of additional emulsifying ointment helped. As it was winter time, the patient shivered in bed despite wearing a pajama. She applied more blankets which helped relieve the shivering. The patient experienced some pain and discomfort when the garment was being taken off the next morning.

garments have to be prescribed (two garments per use and two sets as spare). It is not known how durable the material is. Traditionally, Chinese parents are always concerned that 'wearing something wet to sleep' is associated with contracting 'flu'. The feasibility of using the garments during cold winter months when AD is potentially worse has to be investigated.

In conclusion, the Tubifast garments appear to be effective in the short-term improvement of AD severity and quality of life in children with AD. The evaporation of water from the skin surface results in vasoconstriction with relief of the pruritus (11). Wet-wrap therapy also helps to debride crusts from the skin surface, soften the skin which enhances the penetration of topical medication, and serves as a mechanical barrier against scratching (11). Clear instructions and individualized regimes are essential for good compliance. The efficacy of the longer-term use of the wet-wrap garment needs to be determined.

Acknowledgement

We thank Mölnlycke Health Care for freely supplying the Tubifast garments for this research.

Appendix

Treatment protocol

	Day				
	1	2	3	4	5
Assessment	SCORAD	–	–	–	SCORAD
	QoL	–	–	–	QoL
	DigiTrac	DigiTrac	–	DigiTrac	DigiTrac
Wet wrap	–	Yes	Yes	Yes	–

References

- Devillers AC, de Waard-van der Spek FB, Mulder PG, Oranje AP. Treatment of refractory atopic dermatitis using 'wet-wrap' dressings and diluted corticosteroids: Results of standardized treatment in both children and adults. *Dermatology*. 2002;204:50–5.
- Devillers AC, Oranje AP. Efficacy and safety of 'wet-wrap' dressings as an intervention treatment in children with severe and/or refractory atopic dermatitis: A critical review of the literature. *Br J Dermatol*. 2006;154: 579–85.
- Pei AY, Chan HH, Ho KM. The effectiveness of wet wrap dressings using 0.1% mometasone furoate and 0.005% fluticasone propionate ointments in the treatment of moderate to severe atopic dermatitis in children. *Pediatr Dermatol*. 2001;18:343–8.
- Schnopp C, Holtmann C, Stock S, Remling R, Folster-Holst R, Ring J, et al. Topical steroids under wet-wrap dressings in atopic dermatitis – a vehicle-controlled trial. *Dermatology*. 2002;204:56–9.
- Hon KL, Lam MC, Leung TF, Kam WY, Lee KC, Li MC, et al. Nocturnal wrist movements are correlated with objective clinical scores and plasma chemokine levels in children with atopic dermatitis. *Br J Dermatol*. 2006;154: 629–35.
- Chuh AA. Validation of a Cantonese version of the Children's Dermatology Life Quality Index. *Pediatr Dermatol*. 2003;20:479–81.
- Hon KL, Kam WY, Lam MC, Leung TF, Ng PC. CDLQI, SCORAD and NESS: Are they correlated? *Qual Life Res*. 2006;15:1551–8.
- Leung AK, Barber KA. Managing childhood atopic dermatitis. *Adv Ther*. 2003;20:129–37.
- Pei AYS, Chan HHL, Leung TF. Montelukast in the treatment of children with moderate-to-severe atopic dermatitis: A pilot study. *Pediatr Allergy Immunol*. 2001;12: 154–8.
- Hon KL, Leung TF, Wong Y, Li AM, Fok TF. A survey of bathing and showering practices in children with atopic eczema. *Clin Exp Dermatol*. 2005;30:351–4.
- Leung AK, Hon KL, Robson WL. Atopic dermatitis. *Adv Pediatr*. 2007;54:241–73.

Copyright of Journal of Dermatological Treatment is the property of Taylor & Francis Ltd and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.