

# A study analysing the effect of wet wraps in patients of atopic dermatitis

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## Abstract

**Objective** We sought to evaluate the efficacy of wet wrap therapy treatment in patients with Atopic dermatitis.

**Methods** Total 30 patients, (25 males and 5 females) were enrolled in this study with severe dermatitis [SCORAD] score  $\geq 50$ ) were enrolled in this study. For disease severity SCORAD was used, for quality of life dermatology life quality index (DLQI) scores, visual analog scale (VAS) for pruritus and investigator's global assessment (IGA) was used. For evaluation of water content in the corneum, the capacitance was measured by Corneometer (Courage and Khazaka, Cologne, Germany), and TEWL was measured by Tewameter TM210 (Courage and Khazaka). The lipid amount of skin surface was assessed by Sebumeter (Courage and Khazaka). The patients underwent WWT (daily dose: 15 g Mometasone furoate cream+100g Vaseline ointment) twice daily for 2 h/session for 7 days.

**Results** There was significant improvement in lesions, quality of life and itching. SCORAD was clearly decreased, epidermal water content was increased, and transepidermal water loss was decreased after wet-wrap dressing.

**Conclusion** Wet wrap therapy (WWT) can relieve pruritus, reduce skin lesions, and improve quality of life.

## Key words

Dermatitis, wet wrap dressing, quality of life.

## Introduction

Atopic dermatitis (AD), or atopic eczema, is a common chronic, recurrent, itchy inflammatory skin condition.<sup>1</sup> The pathogenesis of AD involves both epidermal barrier dysfunction and immunologic dysregulation. The stratum corneum (SC) is located in the outermost part of the epidermis and plays an important role in

preventing water loss and external exposure intrusion to maintain the structural integrity of the skin barrier.<sup>2</sup> Atopic dermatitis was diagnosed by Hanifin and Rajka in 1980<sup>3</sup> diagnostic criteria, consisting of four major criteria and 23 minor. Skin barrier abnormalities appear to be associated with mutations within or impaired expression of the filaggrin gene, which encodes a structural protein essential for skin barrier formation.<sup>4</sup> These skin barrier abnormalities lead to transepidermal water loss (passage of water from inside the body through the epidermal layer of the skin to the surrounding atmosphere) and increased penetration of allergens and microbes into the

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skin. TEWL is increased despite normal or low epidermal water content.<sup>5</sup> Filaggrin plays a very important role in the pathogenesis of atopic dermatitis and allergic disease. The levels of filaggrin and involucrin are reduced in skin of atopic dermatitis patient.<sup>6</sup> WWT is a widely used adjunct in the treatment of moderate to severe AD. The process involves covering with two layers of bandages, the inner one being the moist while as the outer is dry.<sup>7</sup> It works in a few ways. Firstly, WWT hastens restoration of the skin barrier by trapping moisture within stratum corneum and decreasing transepidermal water loss. Hydrating effect increases lamellar body secretion and enhances recovery of the intercellular lipid lamellar structure.<sup>8</sup> Secondly, the cooling effect from gradient moisture evaporation causes vasoconstriction, reducing pruritus.<sup>9</sup> It also has an anti-inflammatory effect by reducing inflammatory mediators such as serum chemokines and E-selectin.<sup>10</sup> Thirdly, the moist skin enhances uptake of topical medications such as steroids and emollients, also, the wrap creates a mechanical barrier to inhibit scratching and reduce further damage to the skin.<sup>11</sup>

## **Materials and Method**

Patients with atopic dermatitis, diagnosed by Hanifin and Rajka diagnostic features were enrolled in the study. Total of 30 patients (25 males, 5 females), the age of the patients was from 21 years to 28 years, with average age being 24 years. Patients were classified according to the classification based on the severity of atopic dermatitis designed by Rajka and Langeland,<sup>3</sup> before the start of treatment, the entire study was completely explained to the patients and then and the signed consent were taken from the patients. SCORAD was used to evaluate clinical symptoms before and after wet-wrap dressing. For evaluation of water content in the corneum, the capacitance was measured

by Corneometer (Courage and Khazaka, Cologne, Germany), TEWL was measured by Tewameter TM210 (Courage and Khazaka). The lipid amount of skin surface was assessed by Sebumeter (Courage and Khazaka). All the patients and a one attendee was fully explained and trained about the procedure.

## ***Wet WRAP Therapy***

Patients were first asked to take a bath using gentle body wash. Mometasone cream (Daily dose: 15g) was then applied on the lesions on the trunk and limbs and the treatment areas were massaged for 5 minutes until the Mometasone cream was absorbed completely. Subsequently, the whole-body surface was covered with the Vaseline ointment at a daily dose of 100g. The patient then put on a wet tight cotton trouser which was soaked in warm water before wearing, and a dry cotton trouser or tubular bandage on top of the wet layer. Each WWT lasted two hours, after every WWT skin repair body lotion was applied on the whole-body surface. At night, after the whole-body surface was covered with Vaseline ointment, patients went to bed wearing a dry tight trouser. Patients were treated with the WWT twice daily for 7 days. Effectiveness and safety were assessed on day 8. Patients were instructed not to use any self-medications as to avoid interference in the assessment of effectiveness and safety of the WWT. SCORAD score was calculated using the equation:  $A/5+7B/2+C$ . 'A' represents lesion area. A total adult surface area was composed by head and neck (9%), upper limbs (9% for each), torso (27%), and lower limbs (22.5% for each). One percent of the total area is scored as one. 'B' represents lesion severity based on the estimation of the six characteristics: erythema, papules (or) edema, exudation (or) scab, epidermal exfoliation, lichenification, and skin dryness. The severity score ranges from 0 for no lesion, to 3 for the most severe lesion. 'C'

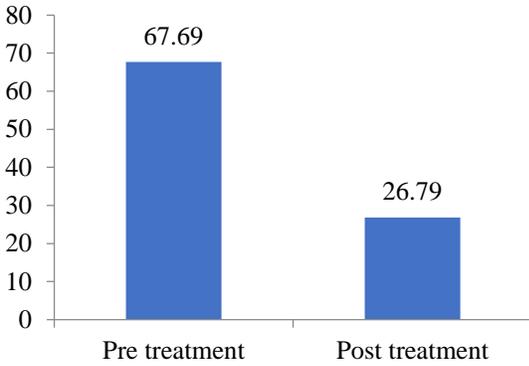


Figure 1 SCORAD.

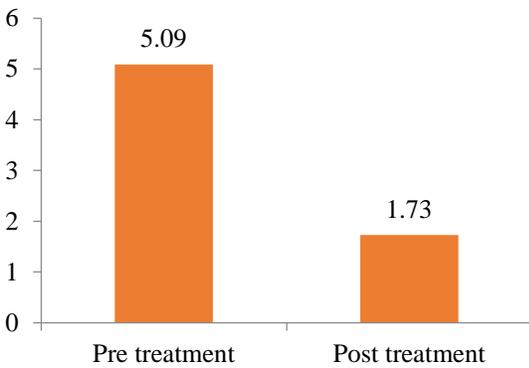


Figure 2 VAS Score.

represents the severity of pruritus and the effects of pruritus on sleep. The average score of the recent 3 days was used. SCORAD score ranges from 0 to 103. AD severity was defined as mild, moderate, and severe when the SCORAD score was 0–24 (mild), 25–50 (moderate), and 51–103 (severe), respectively. The lesions before and after WWT were evaluated. VAS was used for evaluation of itch. The front side of the VAS illustrates 10 color shades changing from the lightest to the darkest shade representing no itch to the most severe itch. The back side of the VAS shows score 0–10 representing each color shade. 0 stands for no itch and 10 for the most severe itch. Patients determined pruritus severity by themselves, and the score was recorded, finally assessed by IGA score of systematic and head/neck inflammation according to a 0–5 scale.

**Inclusion criteria** 1) Diagnosed with AD by Hannifin criteria, a scoring Atopic Dermatitis (SCORAD) score  $\geq 50$ , 2) Patients having assistance /help at home, 3) 21 to 28 years, 4) except oral antihistamine, patients did not receive any other systematic treatments for AD 1 month before the enrolment, 5) signed the informed consent form.

**Exclusion criteria** 1) were allergic to mometasone cream or Vaseline ointment; 2) secondary viral, bacterial, and/ or fungal infections in the skin lesions; 3) depression/ mental disease.

## Results

There was significant improvement noticed in the patients, the average SCORAD score came down from  $67.69 \pm 9.51$  (before WWT) to  $26.79 \pm 5.15$  (after WWT), ( $P < 0.001$ ) (Figure 1). The percentage reduction in the SCORAD score after the WWT ranged from 39.7% to 67.75%. There was improvement in pruritus as per VAS scoring ( $8.5 \pm 1.26$  vs.  $2.75 \pm 0.62$ ), ( $P < 0.001$ ) (Figure 2). The DLQI score, Figure 3, ( $14.93 \pm 2.75$  vs.  $7.23 \pm 1.83$ ) and IGA score, Figure 4, ( $5.09 \pm 0.51$  vs.  $1.73 \pm 0.37$ ) showed significant improvement. After treatment, water content in the corneum of lesional atopic skin was increased significantly ( $P < 0.01$ ). The increase of the water content in the corneum of lesional atopic skin after the treatment indicates either the increase of natural moisturizing factors or the recovery of the damaged intercellular lipid. TEWL was significantly decreased after treatment, in comparison with TEWL before the treatment ( $P < 0.01$ ). The reduction of TEWL in the corneum implies the recovery of the damaged epidermal barrier. One week after the treatment, TEWL was significantly lower than that measured before the treatment. No statistically significant difference was detected before and after the treatment in

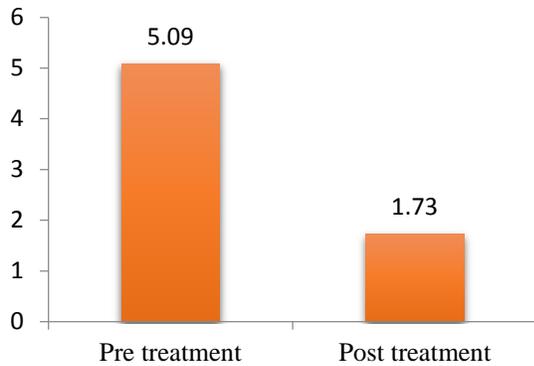


Figure 3 DLQI Score.

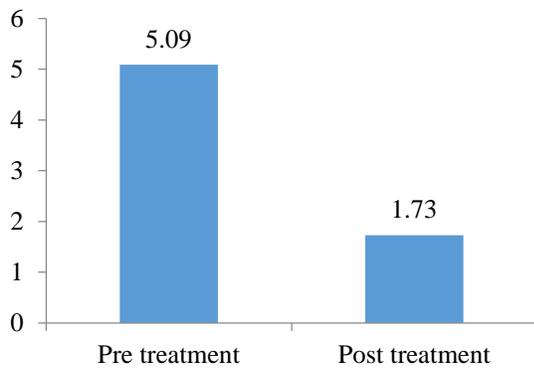


Figure 4 IGA Score.

case of lipid amount of skin surface.

**Statistical analyses** The statistical analysis was performed by IBM SPSS Statistics version 25.0 (IBM Corporation, Armonk, NY). Paired t-test was used to compare scores of SCORAD, IGA, DLQI, and VAS before versus after the WWT. The statistically significant level was defined as  $P \leq 0.05$ .

## Discussion

Our study showed that WWT twice daily for 1 week effectively alleviated the skin lesions of adult patients with severe AD. Sherief *et al.* revealed in its study that WWT with diluted corticosteroid acted very efficaciously and at a faster rate. There was significant improvement in both SCORAD and quality of life of index.<sup>12</sup>

A randomized split body control study carried by Simi D, *et al.* revealed that there was significant difference in IgA scores upon conclusion of wet wrap therapy, though no significant difference was found difference between efficacy ratings of cream and ointment, also, except stinging, no other side effect was reported observed.<sup>13</sup> The safety of wet-wrap therapy has been reviewed in the literature, and it has been determined to be a safe intervention when used for a short period of time.<sup>14</sup> Previous studies have also shown that WWT is effective and safe for adult AD. Bingham and colleagues investigated the effectiveness of 1-day WWT on 331 patients aged 15–95 years with various types of dermatitis, such as AD, eczema, and neurodermatitis, and they found that pruritus was attenuated in 98.2% of the patients.<sup>15</sup> Studies have shown WWT could be used to effectively relieve common symptoms of skin diseases, such as pruritus and skin inflammation. In a recent study, Albarrán and colleagues found that WWT was effective and safe on 5 patients who had severe AD and showed resistance to systematic glucocorticoids and immunosuppressant and 2 patients with nodular prurigo.<sup>16</sup> According to the current European Task Force Atopic dermatitis/ European Academy of Dermatology and Venereology guidelines for AD, WWT is recommended for paediatric and adult moderate-severe AD and acute exudative eczema.<sup>17</sup> The TCS used in WWT, the types of dressing, and frequency and duration of WWT vary widely.<sup>18</sup> Janmohamed<sup>19</sup> and colleagues investigated the effectiveness of 0.1% mometasone furoate cream used in WWT on 39 children with AD aged 6 months to 10 years.<sup>19</sup> They found that compared with the control group (without TCS and only used 20% cetomacrogol), the TCS group showed significant improvements in the skin condition. Gauze and tight pajama are commonly used as wet dressing in WWT. Since 2004, elastic tubular cotton bandage, which can retain

moisture very well, has a good elasticity, and is comfortable to wear, has been used widely in WWT.<sup>20</sup> The treatment duration of WWT ranges from 2 to 14 days; the most common duration is 3–24 h daily for 7 days; the wet dressing is re-moisturized every two hours.<sup>21</sup> In our study, the difference between the epidermal barrier function of non-lesional and lesional atopic skin was examined. It has been reported that the water content in the corneum is decreased and TEWL is increased in both lesional and non-lesional atopic skins.<sup>22</sup> Similarly, water content in the corneum of lesional atopic skin before the treatment was significantly lower than non-lesional atopic skin, and TEWL in lesional atopic skin was significantly higher than in non-lesional atopic skin in our study. Because the water content in the corneum is mostly contributed by natural moisturizing factors and intercellular lipid, the reduction of water content suggests either decreased natural moisturizing factors or the abnormality of intercellular lipid. But with regard to the lipid amount of skin surface in the corneum assessed before the treatment, a significant difference between lesional and nonlesional atopic skin was not detected. Additionally TEWL was increased in lesional atopic skin, suggesting abnormal epidermal barrier functions. After the treatment, the water content in the corneum of lesional atopic skin was significantly increased compared with that before the treatment. This finding suggests either increase of natural moisturizing factors or recovery of damaged intercellular lipid. Additionally TEWL was decreased after the treatment, which was also contributed by the recovery of damaged epithelial barrier function, particularly intercellular lipid.<sup>23</sup> But regarding the lipid amount of skin surface, a significant difference was not detected between before and after the treatment. The increased water content in the corneum and the reduced TEWL were maintained even 1 week after the termination of the treatment, which suggests that the treatment

effect of wet-wrap dressing is the recovery of the damaged epidermal barrier rather than the temporary effect due to hydration. In summary, it may be speculated that the hydration by wet-wrap dressing affects the secretion of lamellar body, and due to the increased secretion of lamellar body, abnormal epidermal barrier was recovered, and consequently, the clinical improvement of atopic dermatitis was achieved. Recently, for the treatment of patients with exacerbated, severe, and refractory atopic dermatitis, wet-wrap dressing with a topical corticosteroid was superior treatment option in patients to wet-wrap dressing alone.<sup>24</sup> However, also the difference of epidermal barrier between lesions treated with a topical corticosteroid in addition to wet-wrap dressing and wet-wrap dressing alone has not been examined, and further investigations should be followed. Study by He, Huiling showed that WWT brought significant improvement in disease severity and QoL from baseline ( $P < .001$ ), and such improvement was similar with both materials (viscose and nanopolyester).<sup>25</sup>

### **Limitations**

There are some limitations in the current study. This was a non-randomized design with no control group study and only included 30 patients. Nevertheless, the effectiveness and safety profile were quite consistent in the 30 patients.

### **Conclusion**

Wet wrap therapy has shown a significant improvement in SCORAD, VAS, and DLQI. WWT relieved pruritus, reduced skin lesions, and improved quality of life in adult patients with severe AD. There was significant improvement seen in TEWS and water content in the corneum, although no significant improvement was noticed in lipid amount of

skin surface.

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