

ORIGINAL ARTICLE

Instant barrier repair: a pilot study investigating occlusion with a new hydrogel patch for the treatment of atopic dermatitis

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Abstract

The ideal repair mechanism for overcoming barrier disruption in atopic dermatitis (AD) needs to completely eliminate microbe and allergen penetration as well as transepidermal water loss. We propose the hydrogel patch as an innovative approach to complete barrier repair. It is composed of an adhesive, thin, flexible, hydrogel layer on an impermeable urethane surface. We conducted a 6-week pilot study with 15 AD patients, who applied the hydrogel patch over one lesion for 6–8 h daily and triamcinolone (TAC) 0.1% cream twice daily to another lesion. Results after 2-week no treatment follow-up showed hydrogel patch had notable efficacy, and comparable to TAC 0.1% cream. Larger studies are needed to validate these results.

Key words: atopic dermatitis, eczema, barrier dysfunction, occlusion, hydrogel, stratum corneum

Introduction

Atopic dermatitis (AD) is characterized by defective skin barrier function (1) occurring when the stratum corneum (SC) is compromised by decreased SC lipids, mechanical trauma (i.e. scratching), and genetic defects in SC proteins, notably filaggrin. The disrupted barrier is hypothesized to allow increased microbe and allergen penetration and increased transepidermal water loss – leading to xerosis, hypersensitivity, pruritus, and inflammation (2).

The purpose of this pilot study was to evaluate the efficacy and safety of a hydrogel patch for AD treatment. The patch is composed of an adhesive, thin, flexible, hydrogel layer on an impermeable urethane surface. Unlike hydrocolloid dressings (e.g. Duoderm®, Convatec) with low water content, the hydrogel layer contains approximately 50% water. This patch alone may instantly “repair” and hydrate the dysfunctional AD skin barrier.

Patients and methods

Participants included 15 adults with AD. Disease severity was based on a modified Eczema Area and Severity Index (EASI) 12-point scale, which assessed erythema, induration, lichenification, pruritus, and excoriation. Two target lesions with an EASI score of ≥ 5 were identified. Exclusion criteria included topical use within 2 weeks and systemic treatment or phototherapy within 4 weeks prior to starting the study.

During the 6-week study, patients were examined and scored before treatment and at weeks 1, 2, and 4. Participants were instructed to apply the hydrogel patch over one lesion for 6–8 h daily and triamcinolone (TAC) 0.1% cream BID to the second lesion. After 4 weeks, treatment was discontinued and final evaluation was conducted after a 2-week observation period involving no active therapy.

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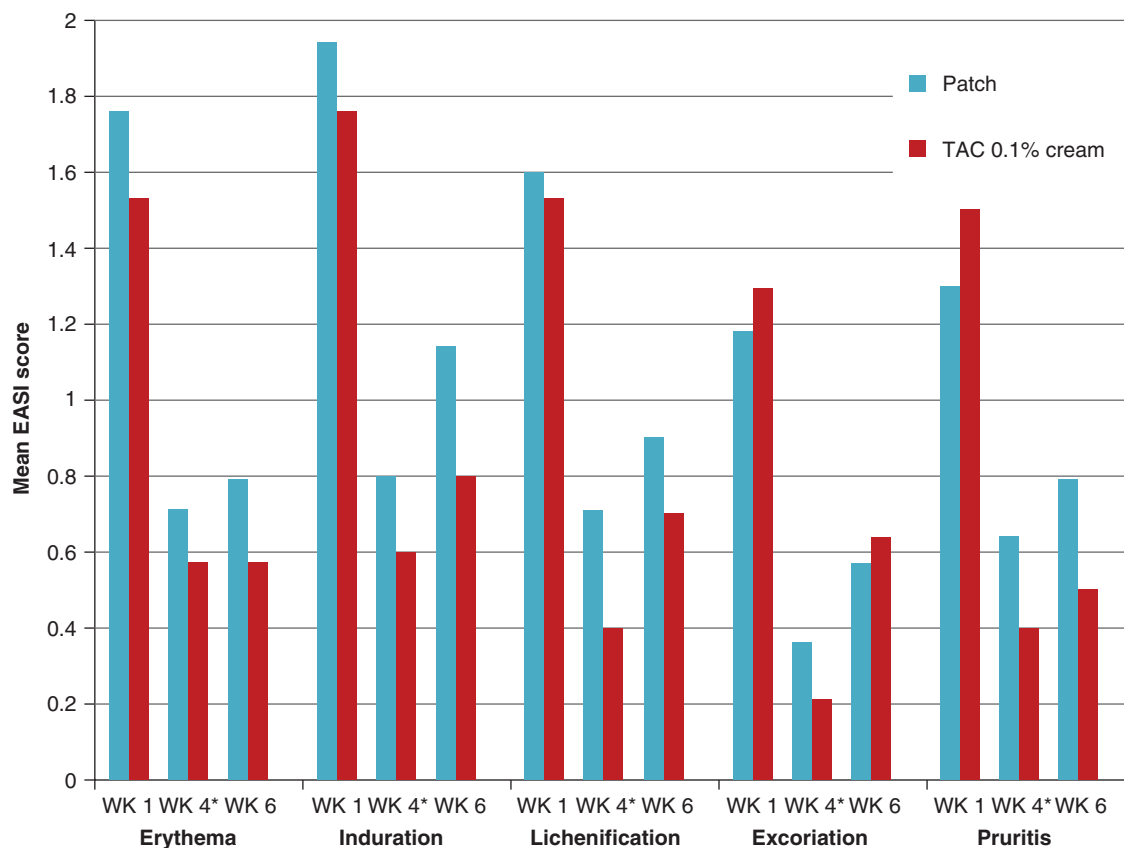


Figure 1. Mean EASI subscores at weeks 0, 4, and 6: hydrogel patch vs. TAC 0.1% cream. *Both patch and TAC groups had statistically significant improvement at week 4 with no statistically significant difference between the two groups.

Results

At week 4, erythema, induration, lichenification, excoriation, and total EASI scores significantly improved compared with baseline in both the patch group and the TAC group (see Figure 1). Pruritus improved in both groups but was only statistically significant in the TAC group ($p = 0.004$). At week 4, there was no significant difference in all subscores between the patch group and the TAC group (Figure 2). Improvement was maintained after discontinuing the treatment for 2 weeks. No adverse events occurred.

Discussion

This hydrogel study with active comparator (i.e. TAC cream) shows that instant correction of the dysfunctional skin barrier with hydrogel patch can improve signs and symptoms of AD comparable to TAC 0.1% cream. This result supports the abnormal skin barrier theory of AD and highlights its role in the pathogenesis of the disease.

Although occlusion can be achieved with other materials (e.g. Saran Wrap[®], SC Johnson), plastic wraps lack intrinsic adhesive properties, are difficult



Figure 2. Clinical photos: before and after treatment with hydrogel patch as monotherapy.

to apply, uncomfortable, unsightly and may even exacerbate AD. Plastic wraps are often secured with tape, which often causes skin irritation and mechanical trauma ("tape burn") when removed. In contrast, the hydrogel patch is self-adhesive, convenient, hypoallergenic, and elegant. If used with topical agents, the impermeable backing has been documented to enhance the efficacy of topical steroids, topical tacrolimus, and other topical agents (3).

Although our sample size was small and there was no placebo control arm, the therapeutic effect suggests that instant barrier repair with hydrogel patch with impermeable urethane top layer may benefit AD patients. Larger studies are needed to validate these results.

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Declaration of interest: Dr. Park, Dr. Bhutani, Dr. Lee, Dr. Heller, Ms. Kamangar, Dr. Busse, and Dr. Patel have no financial conflicts of interest to declare. Dr. Koo has been a clinical researcher, consultant, and speaker for Abbott, Allergan, Amgen, Astellas, Galderma, Genentech, JSJ, Photomedex, Roche, Warner-Chilcott, and Teikoku Pharmaceuticals, Inc.

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