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Selection of topical corticosteroids in children atopic dermatitis

Aurelia Stephanie*, Prima Sanjiwani Saraswati Sudarsa, Luh Mas Rusyati

ABSTRACT

Background: Atopic dermatitis (AD) is a chronic inflammatory skin disease that typically starts in childhood with classic symptoms of dry and itchy skin that occurs continuously and recurrences and even causes sleep disorders and skin that is susceptible to infection. AD sufferers often have atopic comorbidities such as asthma and allergic rhinitis in themselves and their families. The effects of this itching cycle result in growth disturbance and decreased quality of life for AD patients and their parents. Moderate and severe AD have an impact on parents, the stress in medication, and care, which takes up time and money. Atopic dermatitis is due to damage to the skin barrier, so the principle of management is to improve the skin barrier so that the inflammatory process can be avoided. The course of AD is chronic and relapsing; generally, patients come for treatment with an acute phase that sometimes requires topical corticosteroids. However, topical corticosteroids (TC) are used only to treat the acute phase for a short period. After the acute lesions have subsided, corticosteroids can be stopped immediately to prevent side effects and continue with daily skincare.

Conclusion: Topical corticosteroids are first-line therapy in the acute phase. The choice of TC is based on age, body location, dosage, and severity of AD. If the acute lesion has subsided, then corticosteroids can be stopped and substituted with other antipruritic therapy and moisturizer.

Keywords: atopic, dermatitis, corticosteroid, children
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Dermatology and Venereology Department, Faculty of Medicine, Universitas Udayana/ Sanglah General Hospital Denpasar, Bali, Indonesia

*Corresponding author:
Aurelia Stephanie;
Dermatology and Venereology Department, Faculty of Medicine, Universitas Udayana/ Sanglah General Hospital Denpasar, Bali, Indonesia;
draurel2015@gmail.com

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INTRODUCTION

Atopic dermatitis (AD) is a chronic inflammatory skin disease mainly started during childhood with typical symptoms of dry and itchy skin that occurs continuously and relapses and is accompanied by atopic comorbidities such as asthma and allergic rhinitis.[1,2] AD often starts in infancy, around 45% starts in the first six months of life, 60% in the first year of life, and 85% before five years of age. The prevalence of DA has tripled since 1960.[1] The increase in AD incidence is likely due to several factors such as urbanization, pollution, and the hygiene hypothesis.[2-4] The prevalence of AD in the United States, North and Western Europe, Africa, Japan, Australia, and other industrialized countries reaches 10 -20%.[1] In Indonesia, the prevalence of DA is around 10-20% of the population.[5] Whereas, based on patient visit data at the Dermatovenereology Department of the Children's Dermatology Division of the Sanglah General Hospital, Denpasar in the period February 2019 to February 2020 found 12 cases. Pathogenesis of DA is multifactorial; it includes intrinsic factors such as genetic, skin barrier damage, immunological responses, stress, and extrinsic factors such as irritants, allergens, food, microorganisms, and weather. The diagnosis of DA is made based on the history and clinical features that fit the diagnostic criteria. One of the diagnostic criteria that are often used is the Hanifin-Rajka criteria.[1] Atopic dermatitis results from damage to the skin barrier. Hence, the principle of management is to improve the skin barrier provide hydration to the skin so that pathogens and allergens do not readily enter it. Topical corticosteroids are used only to treat the acute phase for a short time to reduce inflammation.[4] This literature aimed to discuss atopic dermatitis in children, the selection of topical corticosteroids as therapy and its side effects in children.

ATOPIC DERMATITIS IN CHILDREN

AD is an itchy, chronic, and recurrent skin condition characterized by clinical symptoms of dry skin, inflammation, and lichenification.[6] AD can affect all ages, but most often, it affects children.[7,8] The age limit of children is from the womb up to 19 years according to WHO, and up to 18 years according to the Ministry of Health 2014.[9] The diagnosis of DA is based on Hanifin-Rajka criteria, namely there must be three major criteria and at least three minor

Table 1. Hanifin-Rajka criteria[1]

Major Criteria
Itchy
Redness of the face and/or extensors in infants and young children
Lichenification in the area of flexure in older children
The tendency to become chronic or recurrent dermatitis
Individual or family history of atopic disease: asthma, allergic rhinitis, atopic dermatitis
Minor criteria or other findings
Xerosis (dry skin)
Dennie-Morgan folds
Allergic shiners (darkening under the eyes)
Onset at an early age
Pale face
Pityriasis alba
Ichthyosis (especially palmar hyper linear or keratosis pilaris)
White dermographism
Non-specific dermatitis on the hands or feet
Dermatitis in the papilla mammae
Cheilitis
Recurrent conjunctivitis
Keratoconus
Anterior subcapsular cataract
Darkening periorbital
Itching when sweating
Intolerance of wool or fat solvents
Periofollicular accentuation
Hypersensitivity to food
Environmental or emotional factors influence the course of the disease Increased serum Immunoglobulin E
Positive immediate-type allergy skin test
Skin infections (especially by *S. aureus* and herpes simplex virus)

Table 2. Clinical manifestations of AD based on age[11]

Age	Skin manifestations
Infantile phase	Acute lesions: pruritic papules and vesicles with serous or crusting exudates Predilection: head, neck, limb extensors It starts with erythema on both cheeks and extends to the neck, forehead, and scalp
Children phase	Dry lesions, papules, and lichenification plaques predilection: wrist and foot, palm, antecubital and popliteal fossa Facial involvement is rare if present in the perioral and periorbital
Adolescent or adult phase	Symmetrical, dry lesions, papules and scaling plaque Lichenification and excoriation (often), crusting and exudate (rare) Predilection: dominant in the flexor, plus the forehead, neck and the area around the eyes In adults, predilection is less typical, localized dermatitis on the hands, areola or eyelids

Table 3. Fingertip unit (FTU) for children[14]

Body area	FTU dose according to age group			
	3-6 month	1-2 year-olds	3-5 year-olds	6-10 year-olds
Face and neck	1	1.5	1.5	2
Arms and hand	1	1.5	2	2.5
Leg and foot	1.5	2	3	4.5
Trunk	1	2	3	3.5
Back and bottom	1.5	3	3.5	5

criteria (Table 1).[1,2] Scoring for atopic dermatitis (SCORAD) index is most often used to describe the severity of AD in clinical practice. The severity of AD is divided into: mild (SCORAD <25), moderate (SCORAD 25-50), and severe (SCORAD> 50).[10,11] The development of AD consists of 3 stages, namely the infantile phase (2 months-2 years), children (2-10 years) and adolescents or adults (over ten years) (Table 2).[11]

THE PRINCIPLE OF AD TREATMENT IN CHILDREN

The principle of AD treatment is to improve skin barrier by increasing hydration, relieving acute inflammation with anti-inflammatory agents, one of which is topical corticosteroids, and identification and avoidance of triggering factors such as irritants, allergens, infectious agents, and emotions.[1-3]

TOPICAL CORTICOSTEROIDS FOR ATOPIC DERMATITIS IN CHILDREN

Apart from TC pharmacology, safety also depends on a variety of considerations, including appropriate diagnosis and parental behavior. TC must be used wisely and rationally as possible to prevent side effects and adverse drug effects. TC is not given if the diagnosis is not precise because it can obscure the diagnosis. Although the diagnosis is clear, choose the weakest potency TC that can be used to control the disease. Discontinuation of TC as early as possible and replace it with a moisturizer, topical calcineurin inhibitor, or antipruritic agent such as calamine.[12] The number of topical corticosteroids needed can be calculated using a fingertip unit (FTU). One FTU weighs 0.5 grams and can be used for two adult palms, or an average skin surface area of 312 cm^2.[13] TC dosages in children based on FTU can be seen in Table 3 and Table 4.

TC should be chosen, potentially the weakest but effective for skin lesion conditions, based on the patient's age, localization, and the severity of the lesion. Infants and children tend to have thin skin and have a higher surface area to skin ratio so that drug penetration is higher. Babies are also less able to metabolize potent glucocorticoids immediately. If the signs of acute inflammation have disappeared, the use of daily TC can be tapered with proactive therapy that is 1-2 times per week in areas that often recur to prevent a recurrence. Some recommendations for the management of AD in children based on severity can be seen in Table 5 and Table 6.[14,17] Topical corticosteroid recommendations in children according to the Food and Drug Administration (FDA) can be seen in Table 7.[18]

Table 4. The cumulative amount of TC per week or month applied to the entire body surface based on the age[16]

Age group	Application twice a day	Maintenance		
		1-2 times/ week	2-3 times/ week	1-2 times/ week
Three month - 2 year	28 - 47 g/week	10 g/month	15 g/ month	75 g/month
3 – 12 year	56 - 100 g/week	20 g/month	30 g/ month	150 g/month

TOPICAL CORTICOSTEROID SIDE EFFECT

Due to tend to have side effects, the corticosteroid is only used to control acute exacerbations of DA.[1,2,19] Corticosteroid side effects consist of local side effects including irritation, skin atrophy, acneiform reaction, changes in pigmentation, infection and systemic side effects include hypothalamus-pituitary-adrenal axis suppression, osteoporosis, glaucoma, cataract, and growth retardation.[20]

Table 5. Treatment of AD in children based on severity according to the National Institute of Allergy and Infectious Diseases[17]

	Daily skincare No symptom	Mild eczema Symptom: itchiness, erythema patch, wound	Severe eczema Symptom: the lesion did not respond to mild eczema therapy
Bath	Soak in a bath of lukewarm (not hot) water for 15 minutes. Cleanse with a non-drying, fragrance-free soap only when needed. Gently pat skin dry and apply moisturizer within 3 minutes after bathing.	Soak in a lukewarm bath once or twice per day for 15 minutes. Add ½ cup bleach to the bath every other day. Gently pat skin dry and apply topical medicine and moisturizer as below within 3 minutes after bathing.	Soak in a lukewarm bath once or twice per day for 15 minutes. Add ½ cup bleach to the bath every other day. Gently pat skin dry and apply topical medicine and moisturizer as below within 3 minutes after bathing.
Apply for medicine	None	To the face (and groin and underarms): apply hydrocortisone 2.5% ointment only to affected areas two times per day, for a maximum of 14 days, including immediately after baths. To the eyelids: apply Protopic 0.03% ointment to eyelids two times a day for up to 10 days for eyelid eczema. To the body: apply triamcinolone 0.1% ointment only to affected areas two times a day, for a maximum of 21 days, including immediately after baths.	To the face (and groin and underarms): apply desonide 0.05% ointment only to affected areas two times per day, for a maximum of 14 days, including immediately after baths. To the eyelids: apply Protopic 0.03% ointment to eyelids two times a day for up to 10 days for eyelid eczema. To the body: apply mometasone 0.1% ointment only to affected areas once a day, for a maximum of 10 days, including immediately after baths.
Moisturize	Apply moisturizer immediately after baths and at least two additional times a day	Apply moisturizer to all healed and unaffected areas of the body immediately after baths (do not apply over topical medicines), and at least two additional times a day. Apply cold compresses to affected areas at night as needed for nighttime itching.	Apply moisturizer to all healed and unaffected areas of the body immediately after baths (do not apply over topical medicines), and at least two additional times a day. Apply cold compresses to affected areas at night as needed for nighttime itching.
Antibiotic	Apply mupirocin to open areas of the skin twice a day, until healed, to prevent infection. Apply mupirocin inside each nostril twice a day for five days. Repeat monthly.	Apply mupirocin to open areas of the skin twice a day, until healed, to prevent infection. Apply mupirocin inside each nostril twice a day for five days. Repeat monthly.	Apply mupirocin to open areas of the skin twice a day, until healed, to prevent infection. Apply mupirocin inside each nostril twice a day for five days. Repeat monthly.
Next steps		When the skin is healed, follow the daily skin maintenance. If skin worsens or does not improve after several days, follow the severe eczema management.	When the skin starts to improve, follow the yellow duck routine for mild eczema flares.

Table 6. Treatment of AD in children by severity according to the American Academy of Dermatology 2014[14]

Mild eczema	Moderate to severe eczema
Basic management: 1. Skincare includes moisturizers and warm baths using a non-soap cleanser or mild soap. 2. Antiseptic: dilute bleach baths especially for patients with recurrent skin infections 3. Avoid common irritants, temperature extremes, and proven allergens.	
Acute treatment: Low potency TC (class VII) twice daily for up to 3 days beyond clearance	Acute treatment: Medium potency TC (class III-IV) such as triamcinolone 0.1%, mometasone furoate 0.1%, or fluticasone propionate 0.005% twice daily for up to 3 days after clearance. Consider possible secondary infections that may require oral antibiotics.
	For the relapsing course (frequent/ persistent flares despite treatment), give basic skincare and maintenance therapy. Maintenance therapy: Medium potency TC (class III-IV) such as triamcinolone 0.1%, mometasone furoate 0.1%, or fluticasone propionate 0.005% 1-2 times a week except for face and eyes areas and/or (depends on the patient and affected area). Low potency TC (class V-VII) such as betamethasone valerate 0.1%, desonide 0.05%, or hydrocortisone 2.5% 1-2 times a day includes face and eyes. **or** Topical calcineurin inhibitor (pimecrolimus or tacrolimus) 2 – 3 times a week

Table 7. Topical corticosteroid recommendations in children by FDA[18]

Topical corticosteroid	Age group
Clobetasol propionate 0.05% foam	Above 12 year age
Fluocinonide 0.1% cream	Above 12 year age
Fluocinolone acetonide 0.01% oil	Above two year age
Mometasone 0.1% cream/ointment	Above two year age
Fluticasone 0.05% cream/ ointment	Above one year age
Alclometasone 0.05% cream/ointment	Above one year age
Desonide 0.05% foam/gel	Above three month age
Hydrocortisone butyrate 0.1% cream	Above three month age

CONCLUSION

Atopic dermatitis (DA) is a chronic inflammatory skin condition that disrupts the quality of life of children and has an impact on parents, namely stress in medication that takes time and money. Therefore, AD in children requires a holistic treatment from the provision of therapy to the proper education of patients and their families. Various drugs can be used to treat AD in children; one of the first-line choices is topical corticosteroids. The choice of use of corticosteroid is based on age, body location, dosage, and severity of DA. If the acute lesion has subsided, then corticosteroids can be stopped and substituted with other antipruritic therapy such as calamine to avoid long-term corticosteroid side effects. Another therapy that must still be given is a moisturizer to hydrate the skin. The thing to remember and most important is to avoid triggering atopic dermatitis, to prevent exacerbations, shorten the course of the disease and improve the quality of life of children.

AUTHORS CONTRIBUTION

All authors were contributed to the reference search, manuscript preparation, and publication.

CONFLICT OF INTEREST

The authors stated no conflict of interest regarding publication.

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