An Overview on Dermatitis Diagnosis and Management Approach in Primary Health Care Center

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ABSTRACT

Background: Dermatitis is a major cause of reduced quality of life and burden on the medical system and individuals. Eczematous dermatoses are common, affecting up to 30% of the population across various countries and ethnicities. They have a varied presentation from acute to chronic. Usually acute eczematous dermatoses are red, inflamed, vesicular lesion that present with pain, itching, or burning. Chronic conditions present with scaly, dry skin with fissuring and thickening. Proper diagnosis is essential in order to provide the best treatment. Some may only require avoiding the causative factor, while other may require medical therapy. **Objectives :** We aimed to review the literature investigating pathophysiology of common dermatitis conditions, risk factors, clinical features, evaluation, diagnosis, and management of these conditions. **Methodology:** PubMed database was used for articles selection, from where papers were obtained and reviewed. **Conclusion:** Physicians must have a solid background clinically with appropriate knowledge of different dermatoses in order to diagnose patients properly and accurately. Improper diagnosis will only lead to improper management and increased burden on patient and healthcare system. A lot of these conditions share similarities between them, but with proper approach and careful history and physical examination, reaching the diagnosis can be possible. There are emergent therapies to treat these conditions in hopes to reduce rates of relapse and to help patients restore their quality of life.

Key Words: *Dernatitis, Atopic deramatitis, Contact dermatitis, Allergic contact dermatitis, Irritant contact dermatitis*

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INTRODUCTION

Skin diseases are one of the notorious leading contributors of disease burden and medical expenses worldwide [1]. In the US, it is estimated that cutaneous diseases are responsible for about $75 billion of healthcare costs annually [2]. There are different types of dermatitis. However, because of the similarities between the types, it proves to be quite the challenge for physicians to diagnose and provide proper management [3]. Atopic dermatitis affects around 20% of children worldwide [4, 5]. Since dermatitis is a common condition, contributing to around 30% of all cutaneous conditions across different populations and ethnicities, accurate diagnosis will lead to proper management and reduce the healthcare expenses that are used when the diagnosis is not accurate [6]. In this review, we will go through different types of dermatitis

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covering the pathophysiology, clinical features, diagnosis, and management for each.

METHODOLOGY

PubMed database was used for articles selection, and the following keys used in the mesh ("Dermatitis"[Mesh]) AND ("Diagnosis"[Mesh] OR "Management"[Mesh])). In regards to the inclusion criteria, the articles were selected based on inclusion of one of the following topics; Dermatitis evaluation, diagnosis, and management. Exclusion criteria were all other articles which did not have one of these topics as their primary endpoint.

DISCUSSION:

Generally many types of dermatitis have been widely studied and identified in the population. Moreover, even though they may share a lot of clinical features, they have different causes and management. (Table 1) The primary health care physician shall be able to identify these types in order to properly diagnose, treat, and if needed refer to higher center. Thus, we will discuss each type separately and review the main clinical aspects in them from family physician perspective.

Atopic Dermatitis (AD)

Atopic dermatitis is a chronic, pruritic, inflammatory skin condition that affects both children and adults, although it is more common in children. It is commonly referred to as "eczema" [7]. It commonly affects the cheeks, neck, arms, and legs. However, in some cases it may spread into the groin and axilla. As stated earlier, atopic dermatitis affects approximately 20% of children worldwide. The rate of AD appears to be increasing over the years [4].

- **Pathophysiology:**

The pathogenesis of AD involves multiple factors that are immunological responses. There are two theories to explain AD, the inside-out hypothesis and the outside-in hypothesis, whether the inflammation is caused by immunological dysregulation or via a break in the skin barrier integrity, respectively [8].

The epidermis, the external layer of the skin, is the first line of defense between the body and the environment. This barrier keeps all irritants, microbes, and allergen from entering the body. The permeability of this layer is determined by complex interactions between the terminal differentiated keratinocytes on the surface of the skin and regulatory enzymes, lipids, and groups of structural proteins, such as filaggrin [8]. Filaggrin deficiency is one of the major determinants of defective barrier function. Another factor that can result in the breaking of this function is the imbalance between proteases in the epidermis and antiproteases, such as LEKTI. In patients suffering from AD, the epidermis function is impaired with increased water loss transepidermally [9].

Filaggrin, a protein that is produced by the terminal differentiated keratinocytes is essential to maintain skin hydration and aids in water retention. Following the synthesis, it undergoes phosphorylation reactions to be stored within granules in keratinocytes to be subsequently dephosphorylated again, forming filaggrin monomers. This breakdown of filaggrin results in the production of hygroscopic free amino acids that are major components of the natural moisturizer factor (NMF). These include pyrrolidone carboxylic acid and trans-urocanic acid [8]. Another important factor is the tight junction-related proteins. In patients with AD, it has been demonstrated that nonlesional skin was deficient in these proteins. They provide further support to the epidermis function of water retention and as a barrier to the environment [9].

Genetics has been proposed after a study found concordance rates of 80% between monozygotic twins compared with 20% for dizygotic ones [10]. Multiple genes have been reported, such as: FLG mutations, which are loss of function mutations affecting the production and function of filaggrin protein; and SPINK5 gene, which encodes the production of LEKTI leading to an imbalance between proteases and antiproteases function, ultimately leading to increased cleavage of intracellular attachments and reduced corneocyte cohesion [8, 11].

Immune dysregulation occurs on two levels, innate and adaptive immune system [12]. The innate immune system is the first-line rapid response mechanism to prevent microbial invasion. It consists of four components: the epidermis, the antimicrobial peptides (AMPs), cytokines, chemokines, antigen-presenting cells, and skin normal flora. If microbes were able to go through the dermis, the antigen-presenting cell can detect them via the toll-like receptors (TLRs), which are pattern recognition receptors. Activation of these receptors will lead to the release of cytokines and chemokines. In patients with AD, it has been found that they are deficient in TLR2 and TLR9, which means that their innate immune system is impaired, leading to alteration in skin flora and more severe inflammations [8]. As for the adaptive immunity, AD patients were found to have increased release of Th2 and Th22 cytokines. Those cytokines modulate the response to external microbes and irritants by suppressing the expression of keratinocytes genes, FLG for instance, and inhibiting the production of other AMPs [8].

- **Clinical Features:**

In AD, dry skin and severe pruritus are the cardinal, must be present symptoms. However, the presentation varies greatly depending on the age and disease activity. Acute attacks are characterized by intense pruritic erythematous vesicles and papules with exudation and crusting. On the

other hand, chronic AD presents as dry, scaly, or thickened papules. In subacute AD, it presents with scaling and/or crusting in addition to erythema [2]. Most patients will have cutaneous hyperreactivity to various stimuli. These include, but not limited to, food, inhalant allergen, a change in the environment, infections, and stress.

AD occurs in the first year of life in about 60% of patients. This percentage increases to 85% by the age of five. In infants and young children, it typically presents with pruritic, red, scaly, and crusted lesions on the extensor surfaces and face, with sparing of the diaper area usually. In older children, the disease typically presents with leathery, scaly plaques on the flexor surface, especially on the antecubital fossae, volar aspect of the wrists, ankles, and neck. In adults, the disease presents similarly to older children with reduced frequency of affecting the face, neck, and hands [9].

There are other features that are considered within the minor criteria. They do not always present, but sometimes they will be the only presentation for patients. These signs are called atopic stigmata. It includes centrofacial pallor, keratosis pilaris, palmar hyperlinearity, pityriasis alba, periorbital darkening, Hertoghe's sign (thinning or absence of the lateral portion of the eyebrows), and nipple eczema [7, 13].

- **Complications:**

Atopic Dermatitis (AD) follows a chronic relapsing course over years. Most patients with mild disease will experience intermittent flares with spontaneous remission, while patients with a more severe disease will rarely remit without medical therapy [7]. The majority of patients are clear of the disease by late childhood. However, it may persist into adulthood in some cases. The risk factors for persistence are disease severity, duration, and female gender. Moreover, the most determinant for persistence is the age of onset, especially if it was between 6 and 11 years of age [14]. Furthermore, the rates of infections are also increased because of the change of the flora. Almost most of the patients have *Staphylococcus aureus* colonizing the epidermis. Viral infections are also increased due to impaired defenses. In addition, patients suffering from AD have increased rates of allergic rhinitis, asthma, and food allergy when compared with the public [8, 14].

- **Diagnosis:**

The diagnosis of AD is clinical. It is based on the history of the disease, morphology and distribution of the lesions, and clinical signs. The diagnosis, according to the United Kingdom working group on atopic dermatitis criteria, needs one mandatory criterion and three from five major criteria. The mandatory criterion is an evidence of pruritic skin, which can be reported by the patient or family members who notice scratching and itching. The five other major criteria are involvement of skin creases that include antecubital fossae, popliteal fossae, neck, areas around eyes, fronts of ankles, history of asthma or hay fever, generally dry skin within the past year, visible dermatitis involving flexural surfaces in older children, and extensor surfaces in children under the age of four, and symptoms beginning in a child before the age of two. This criterion cannot be used if the patient is younger than four years of age [7, 14]. Other investigations are not recommended that include skin biopsy and laboratory studies. However, in selecting patients, histologic examination of the lesions and lab studies can be useful to exclude other conditions [7, 9, 14].

- **Management:**

Before treatment of AD, one must always assess the severity of the condition. A useful and practical guide to assess the severity has been provided by the UK NICE. It divides the disease activity into mild, moderate, or severe. In mild disease, there are areas of dry skin, infrequent itching, and little impact on everyday activities. In moderate disease, there are areas of dry skin, frequent itching, redness, moderate impact on everyday activities and psychosocial well-being, and frequently disturbed sleep. In severe disease, there are widespread areas of dry skin, incessant itching, redness, severe limitation of everyday activities and psychosocial functioning, and nightly loss of sleep [7].

The most important part of the management is the non-medical therapy. Patient's education is the most crucial of them. Patients must be educated to avoid irritants, such as house dust mite, mold, pollens, and nickel, as much as possible. They must also maintain proper skin hydration by using moisturizers and bathing with warm water and soap free cleaners [14].

The choice of the drug and its amount depends on the severity of the disease and age of the patient. In patients with mild disease, the disease can be controlled with non-medical therapy alone. If, however, there is a need for medical therapy, the first line choice is low potency (group 5 or 6) topical steroids, such as desonide 0.5%, applied one or two times a day for two to four weeks. Emollients should be used on conjunction with topical steroids. For patients with moderate disease, a medium to high potency (group 3 or 4) topical steroids, such as fluocinolone 0.025%, applied in a fashion similar to mild disease. For the treatment of acute exacerbations, it can be terminated by the administration of systemic glucocorticoids, for instance, prednisone 40-60 mg daily for three days and the 20-30 mg daily for another three days. This method is not advised for infants and young children [14].

Adverse events include skin thinning, telangiectasias, and contact dermatitis. For this reason, if the disease involves the skin fold or the face, it is strongly recommended to start

therapy with low potency topical steroid. Long term use of topical steroids, especially high potency drugs or large affected surface area, may lead to adrenal suppression in a minority of cases [7].

Calcineurin inhibitors, i.e. alternative to steroids, are NSAIDs agents that do not have the steroids adverse effects. They can be used instead of topical steroids in areas like the neck, skin folds, face, and eyelids. Tacrolimus is an example of such agents. Although they are effective in mild disease, there are concerns over their long-term usage. Animal studies have shown increased risk of lymphomas and skin cancer with concurrent long-term usage of calcineurin inhibitors. However, further research is needed [9].

In patients with severe disease or persistent disease, despite best medical therapy, phototherapy or systemic immunosuppressants can be used. These strategies should not be used in young children unless the disease proves to be quite a burden on the quality of life. Narrowband ultraviolet B (NBUVB) phototherapy is the most effective and recommended for use in severe disease. It has the major disadvantages of high cost and increased risk of melanoma and other skin cancers. Thus, it should be avoided in younger children [14].

Immunosuppression therapy can be used to control the disease long term. Dupilumab being the safest, relatively have better efficacy than other agents do. It is a human monoclonal antibody that binds to interleukin-4, thus inhibiting the signal to Th2 that have a role in the pathophysiology of AD. It is administered as subcutaneous injections two weeks apart between doses. While it is the safest and effective drug, its cost may prove to be a challenge to handle by patients. Other agents to be used are methotrexate for long-term and cyclosporin for short- term control [7].

Contact Dermatitis (CD)

This condition refers to any dermatitis resulting from direct skin contact or exposure to a certain material. It has two types, allergic and irritant, with the latter being more common (up to 80% of CD cases).

- **Allergic Contact Dermatitis (ADC):**

It occurs when an agent elicits a delayed hypersensitivity reaction. Common substances that cause this condition are poison ivy, metal such as nickel, preservatives such as formaldehyde, perfumes, cosmetics, topical antibiotics, and hair dyes [15].

Acute lesions consist of erythematous, indurated scaly, itchy plaques, with vesiculation in severe cases. Edema is more prominent in areas of thin skin. While the disease primarily presents as an acute reaction, repeated exposure may result in chronic disease. The skin becomes dry, scaly, and thick with fissures developing later on. This is due to repeated edema and damage resulting in hyperkeratosis and cellular infiltration [15]. The primary lesion is typically limited to the area of skin contact with the allergen. However, in some cases there may be diffuse distribution. The hands, face, and eyelids are the most common sites involved in ACD since they are the most commonly areas that come into contact with the environment. Patients may present with dermatitis of the scalp in cases of allergy to cleaning products, pendant like legion in metal ACD, involvement of the chest with the axilla as a sign of allergy to cloth dyes, and involvement of the dorsum of the foot as a sign of allergy to shoe chemicals or rubber [16].

The diagnosis of ACD depends upon a combination of five components; clinical features, history, patch testing, lab tests, and lack or recurrence after empirical treatment. If the lesion is well demarcated, pruritic, and localized to the area of skin that came into contact with the substance, then it is most likely ACD since this is the typical presentation. Lesion may not be limited to a single area, for instance shampoo products may present with scalp dermatitis and other lesions on the back, face, and even legs. A history of repeated, long term exposure to a substance does not rule out ACD since repeated exposure is needed to develop the reaction. A history of improvement on the weekends and worsening during the week days is associated with occupation dermatitis [17]. Patch testing is essential for the diagnosis as well as determining the allergen responsible for the condition. Laboratory tests are not always needed for the diagnosis, but they are useful to rule out other differential diagnoses. If the patient responds to medical therapy and the condition does not relapse after avoiding the allergen, then there is no need for patch testing as it proves the diagnosis of ACD [15].

Proper patient education is essential in the management of ACD. Avoiding the triggering materials is the most important step in management. Some patients may be able to determine the allergen they were exposed to, while others may not. For those who are unclear about the allergen, patch testing can be useful in determining the material they will develop a reaction to. The use of emollient and barrier creams can reduce the frequency and may even prevent occupational ACD. For rapid control of symptoms, topical steroids or calcineurin inhibitors can be used to achieve remission swiftly. For face, eyelids, or flexural areas ACD, the use of low potency topical steroids is recommended. For hands, feet, and nonflexural areas ACD, the use of high potency topical steroids is recommended. If more that 20% of the body is involved, the use of systemic glucocorticoids is advised. In rare cases, immunosuppressive therapy, methotrexate for example, can be used in those where the allergen is airborne or photodermatitis [16, 17].

- **Irritant Contact Dermatitis (ICD):**

This condition develops when the material that the skin was exposed to can inflict physical, chemical, or mechanical damage and irritation. It is the commonest cause of contact dermatitis, responsible for 80% of cases of CD. The commonest irritants include water, soaps, cleaners, bleach, solvent, acids, alkalis, dust, and soil. Irritant Contact Dermatitis (ICD) of the hand is common in health care workers, food handlers, and housekeepers [16].

The development of ICD is influenced by both patient and environment factors. As for patient factors, the skin is at highest reactivity in infancy and decreases with age. Most studies show that females are affected more by ICD than males. However, this can be explained by the fact that females are exposed to detergents and wet work more than males rather than a genuine gender difference. Additionally, body site is important in determining the susceptibility to ICD. Areas of thin skin are more likely to develop this condition when compared with those of thick skin. As for the environment, both high and low temperatures and humid and dry air can increase the susceptibility of ICD either by disrupting the epidermal layer integrity or by increasing the transepidermal water loss [15].

The clinical presentation of ICD ranges from mild dryness and erythema to acute eczematous dermatitis and even skin necrosis in cases of chemical burns. While presentation varies, the mostly encountered forms are acute and chronic ICD. Acute ICD results from a single exposure to an irritant, usually chemical. It presents with erythema, edema, bullae formation, and oozing. The reaction is limited to the site of exposure similar in fashion to ACD. The patient may report a sensation of burning, stinging, or pain. Chronic ICD, also called wear and tear dermatitis, results from repeated exposure to mild irritant or small concentrations of strong irritants. It is characterized by erythema, scaling, thickening, and fissuring. The most common sites include the dorsum of the hand, fingertips, and finger webs. The face is rarely involved in cases where the irritant is volatile [16, 17].

The diagnosis of ICD depends on the history of the condition and physical examination. Careful history taking is essential to determine the irritant, duration and period of exposure. Important points in history are daily activities, workplace behavior and environment, use or protective gear, hand washing habit, use of cleaners, and previous episodes. A complete skin examination must be done in all cases of ICD to evaluate the extent of involvement and other skin conditions. Lesions are almost always very typical of ICD and thus the diagnosis can be clear from the start. There are clinical criteria that favor a diagnosis of ICD. These include the onset of symptoms minutes to hours after exposure, sensation of pain, burning, or stinging, glazed or scalded appearance of skin, and predominance of scaling, thickening, and fissuring over vesicular changes. Patch testing is often needed to exclude ACD. Histologic examination is not necessary unless to exclude other conditions such as psoriasis [17].

The treatment of ICD is similar to ACD. Patient education is crucial and is the most important step. Identification and avoiding irritants will prevent relapses. For occupation associated ICD, patients must take protective measures before handling the irritant materials such as gloves, masks, and minimizing exposure. If wet work cannot be avoided, using plastic gloves with cotton lining is helpful. Hand washing is also of paramount importance provided that the patient must dry his hands after every wash. The use of moisturizers can help reduce the frequency and severity of the condition in addition to improving skin integrity. To reduce the signs and symptoms of the condition, the empirical use of topical steroid and emollients is advised. Calcineurin inhibitors are not used in the treatment of ICD [15, 16].

Table 1. Differentiating between Common Types of Dermatitis

	Endogenous	Exogenous	
	AD	ACD	ICD
Features	Erythematous, Edematous Rash. Follows an Age-dependent Distribution Chronically Relapsing Course Positive Family History	Well-demarcated Erythematous Rash with Vesiculation Systemic Exposure May Produce a Diffuse Rash	Well-demarcated Erythematous, Edematous Rash Improves with Rest and Worsens with Repeated Irritant Exposure
Distribution	Infants: Facial and Extensor Involvement Children: Flexural Surfaces Adult: Flexural Surfaces, Neck, Face, Anterior Chest	Hands and Feet Eyelids and Face Scalp	
Diagnosis	Clinical	Clinical Patch Testing Is Needed	Clinical
Symptoms	Severe pruritis	Pruritis	Burning, Stinging
Onset	Appears Anytime in Life	One to Three Days Post Exposure	Minutes to Hours Post Exposure

		Needs Sensitizing	Does not Need Sensitizing
Treatment	Emollients Topical Corticosteroids Topical Calcineurin Inhibitors	Allergen Avoidance Emollients Topical Corticosteroids Topical Calcineurin Inhibitors	Irritant Avoidance Emollients Topical Corticosteroids
Systemic Therapy	Systemic Corticosteroids NBUVB Dupilumab	Systemic Corticosteroids Phototherapy	Not Typically Used

- **Stasis Dermatitis:**

Statis dermatitis is a common inflammatory condition that affects the lower extremities of individuals with chronic venous insufficiency. Typically, it presents with erythematous, scaly, eczematous patches on a chronically swollen leg. It can present acutely with an inflamed, weeping plaques, vesiculation, and often bacterial superinfection. Chronically, it develops lipodermatosclerosis. Due to the chronic inflammation, fat degradation, and fibrosis, constriction around the ankles develops which give the leg the appearance of an inverted champagne bottle. It is treated by treating the venous insufficiency [6].

- **Asteatotic Eczema**

It is an eczematous condition of the lower limbs that typically occurs in older individuals. Its incidence peaks around the winter. It is believed this condition is due to the increased water loss transepidermally. It typically presents with dry, scaly, and fissured skin giving it the appearance of a dried river bed. The diagnosis is clinical and responds well to topical steroids. Emollients and skin care must be optimized to minimize relapse [6].

CONCLUSION

Given the importance and prevalence of dermatitis within the modern context, establishing an accurate diagnosis is critical in guiding management. Managing these conditions involves education, avoidance of the provoking agent, and treatment of flares using topical agents. However, the efficacy of newly developed immunologic therapies is still under study. Future research investigating the potential use of these treatments could provide new avenues for managing dermatitis.

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