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Review Article

Hand Eczema: Diagnostic approach and management

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Abstract

Hand eczema (HE) is a chronic inflammatory disorder of the hand with a prevalence of 14.5% worldwide. The incidence of HE has increased considerably during Coronavirus-19 (COVID-19) pandemic due to increased hand hygiene practice. Despite not affecting the mortality rate, HE can decrease the patient's quality of life significantly and increase morbidity. In general, HE can be classified based on its onset, etiology, precipitating factors, and clinical morphology. The diagnosis of HE is established through history taking and physical examination, however, several diagnostic tests should be performed to identify the etiology and exclude the differential diagnosis, including dermoscopic examination, histopathological examination, patch test, and prick test. In addition to diagnostic tests, the severity of HE should also be established to determine the appropriate therapy and monitor the therapeutic responses. After HE is identified, comprehensive management should be provided immediately so that HE will not progress into a chronic disorder which will further decrease the patient's quality of life.

Key words
Hand eczema, diagnosis, treatment, severity.

Introduction

Hand eczema (HE) is a term used for all skin-related inflammatory disorders of the hand.[1] The prevalence of HE is 14.5% worldwide with incidence of 7.3 cases per 1000 people-years. Female is reported to experience HE at younger age than male. In general, the duration of HE is approximately 11-16 years with onset at second decade of life.[2] Despite not increasing mortality rate, HE imposes significant impact on the patient's quality of life (QoL) and increases morbidity.[3]

The Coronavirus-19 (COVID-19) pandemic, occurring since the end of 2019 till now, prompt the increase of hand hygiene practices, in the forms of hand washing, use of alcohol-based disinfectants, as well as use of disposable gloves. These customs can trigger or precipitate HE, regardless its etiology.[4] A study in Munich, Germany reported the HE incidence of 11.2% in 512 patients at a university hospital in 2020 with the main risk factors comprising younger age, history of atopic dermatitis (AD), and increasing frequency of hand disinfection.[5] Another study from Thailand in 2020 reported that healthcare workers (HCWs) had higher HE prevalence than general population (36.5% vs. 19.7%) with associated risk factors consisting of increasing frequency of hand washing, history of AD, female gender, and use of gloves.[6] A study from Indonesia in 2020 reported HE incidence of 53% in 200 HCWs working at three hospitals in Banten.[7]

HE is classified based on its etiology and clinical morphology. In addition, it has various differential diagnoses which sometimes cannot be differentiated by simply clinical examination. In addition to diagnostic approach,

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comprehensive management for HE is also important because it depends on the etiology and precipitating factors. Prevention should also be implemented to prevent recurrence and continue to decrease the patient QoL.[8] Since the etiologies and clinical manifestations of HE may vary and need a thorough examination, this review aims to explore the diagnostic approach and management of HE.

Ethiopathogenesis

Etiology of HE is multifactorial, which can be classified into exogenous and endogenous factors. Exogenous factors include irritant contact (detergent, rubber, soap, chromium, nickel, vegetables, etc.), trauma, friction, drugs (neomycin, hydroxyquinolone, etc.), fungal infection, and smoking.[1,9] The most reported endogenous factor is atopy; however, stress, hormones, and xerosis have also been reported. The etiology cannot be identified in several cases, which are subsequently classified into idiopathic HE.[9]

In HE due to irritant contact dermatitis (ICD), the irritants damage the cell directly without prior sensitization. Keratin will be denatured followed by loss of lipid and epidermal barrier, leading to disruption of water retention ability of the skin. The irritant's type, vehicle, and individual susceptibility influence HE severity. Very moist, maceration, or thin skin is easier to undergo irritation compared to normal, dry, or thick skin. Hence, ICD is often identified on dorsal of the hand and between fingers. In ICD, inflammation occurs, which is subsequently followed by disruption of barrier function and increase of epidermal proliferation. The proinflammatory mediators acting in acute ICD consist of tumor necrosis factor-α (TNF-α), interleukin (IL)-1, IL-2, IL-6, IL-8, interferon-γ (IFN-γ), and granulocyte monocyte-colony stimulatory factor (GM-CSF).[9]

Genetic factors and barrier function also play a role in the development of HE, especially atopic HE. In AD patients, T-helper (Th)2 dan Th22 cells expression increases significantly, leading to disruption of epidermal lipid and protein composition, antimicrobial peptides, as well as keratinocytes junction. These events contribute to disruption of barrier function. In addition, Th2 will induce IL-4 dan IFN-γ production, which along with aquaporin-3 increase can activate keratinocyte proliferation and epidermal hyperplasia, leading to hyperkeratotic HE.[10] HE risks increase in individual with deficiency of filaggrin, ceramide, desmoglein, claudin, and epidermal structural protein, e.g., involucrin, envoplakin, and periplakin, as well as increased protease activity.[9]

Classification

HE classification is crucial for physician in order to provide optimal management. HE can be classified based on its onset, precipitating factors, etiology, and clinical morphology **(Table 1)**.[11,12]

Table 1 Classification of hand eczema (HE).[11,12]

Onset	*Precipitating factors*	*Etiology*	*Clinical morphology*
Acute Chronic	Exogenous factors ICD ACD Protein contact dermatitis Endogenous factors Atopic HE Hyperkeratotic HE Acute vesicular recurrent HE	ICD ACD Atopic HE Hybrid HE (combination of ICD, ACD, and atopic HE) Protein contact dermatitis Unclassified	Recurrent vesicular or dyshidrotic and pompholyx HE Hyperkeratotic HE Chronic pulpitis Nummular HE Xerotic HE with fissures Interdigital HE

ACD, allergic contact dermatitis; HE, hand eczema; ICD, irritant contact dermatitis.

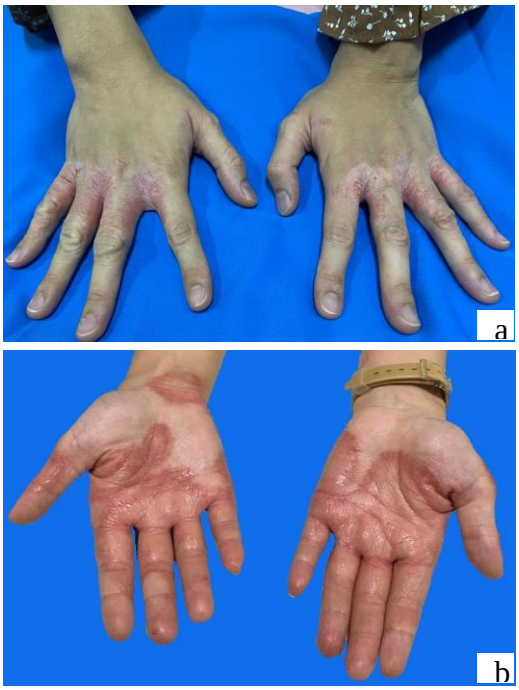

Figure 1 Etiological classification of hand eczema (HE): a). Irritant contact dermatitis (ICD) due to use of hand sanitizer*;* b). Atopic H

Based on its onset, HE is classified into acute and chronic HE. Acute HE has onset less than 3 months and only occurs once a year. Chronic HE has onset more than 3 months or recur twice or more in a year.[11] Classification of HE based on its precipitating factors and etiology is relatively similar but the etiology classification is used more frequently. HE due to ICD occurs if there is repeated irritant exposure at a certain period and it is associated with wet works, oil, food, and mechanic works **(Figure 1a)**. HE due to allergic contact dermatitis (ACD) occurs if there is allergen contact and it is often associated with works, such as contact with nickel, rubber, epoxy, and biocides. Atopic HE occurs in patients with history of AD or other atopy stigmata (asthma and hay fever) **(Figure 1b)**. Protein contact dermatitis often occurs in patients who works with food, manifested as urticaria which subsequently progress into an eczema.[11,12]

If the cause of HE can be identified, the classification is referred to etiology classification. Morphological classification is usually used if the etiology cannot be identified. Recurrent vesicular or dyshidrotic and pompholyx HE is characterized by vesicular eruption and multiple bullae on the palm and lateral side of the fingers **(Figure 2a)**. Hyperkeratotic HE is characterized by circumscribed hyperkeratosis on the palm along with painful fissures **(Figure 2b)**. This subtype is often identified in middle-aged and elderly male. Chronic pulpitis is characterized by xerosis, fissures, and scales at the tip of first to third fingers of dominant hand as well as vesicles in some cases. Nummular HE is characterized by multiple, round, coin-sized erythematous lesions on the dorsum of the hand **(Figure 2c)**. Xerotic HE with fissures is a manifestation of chronic HE without vesicles **(Figure 2d)**.[12] Interdigital HE is characterized by erythema and scales in between fingers which can be found with vesicles **(Figure 2e)**.[13] Combination of two subtypes can occur concurrently and change as the disease progresses.[11]

Diagnostic approach and differential diagnoses

Diagnosis of HE is usually established based on history taking and physical examination. However, sometimes additional diagnostic tests should be performed to exclude the differential diagnoses and to identify the etiology which will imply to the therapeutic choice and prevention measures.[14] The diagnostic algorithm for HE is shown in **Figure 3**.

History taking and physical examination

History taking is the most important step to diagnose HE. The trigger and precipitating factors should be identified during history taking. The questions should include history of skin diseases and allergies of the patient or patient's family, employment history, disease

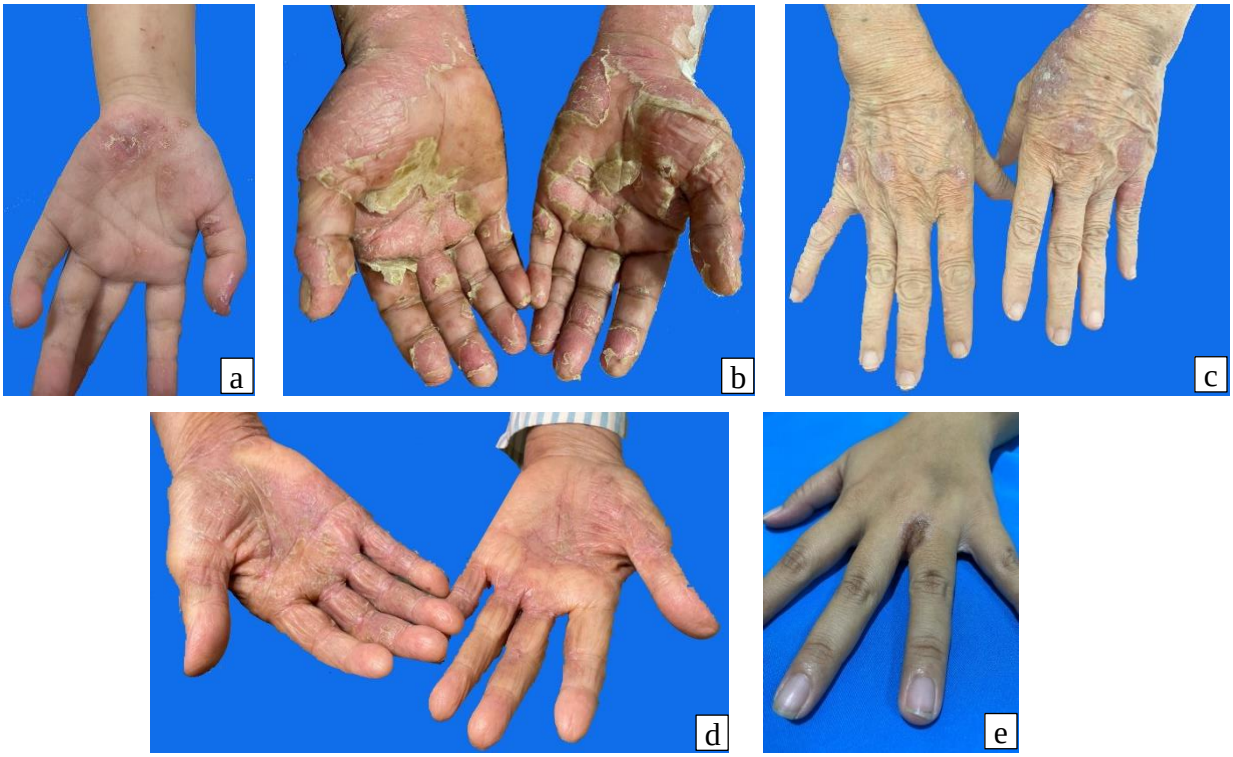

Figure 2 Morphological classification of hand eczema (HE): a). Recurrent vesicular HE; b). Hyperkeratotic HE; c). Nummular HE; d). Xerotic HE with fissures; e). Interdigital HE.

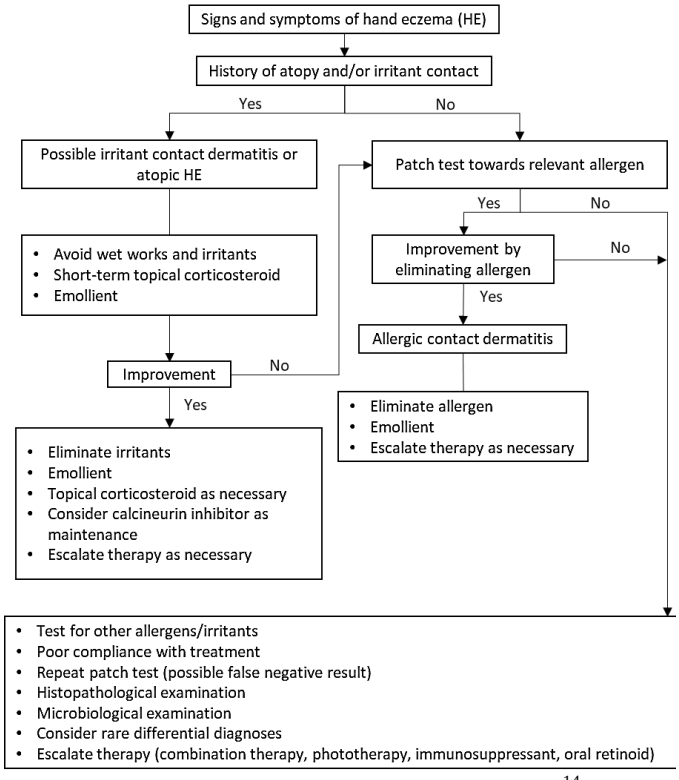

Figure 3 Diagnostic algorithm for hand eczema[14]
Modified from algorithm by Salvador *et al.*[14]

onset, relapse and remission related to work. In addition, weather, lifestyle, irritant or allergen exposure (type, frequency, duration), hand washing habit, use of skin care products, use of gloves, and the impact of HE on quality of life should be addressed.[14]

Nordic Occupational Skin Questionnaire (NOSQ-2002) was developed for occupational-related skin disease. This questionnaire has two versions, namely short version and long version. The short version can be used for screening and monitoring while the long version is usually used for researches. The long version consists of 58 questions and the short version consists of 14 questions, including sociodemographic characteristics, employment history, history of atopy, HE symptoms, exacerbating factors, impact on quality of life, urticaria contact on hand and forearm, skin symptoms, skin tests, exposure, as well as general health of the patient and patient's family.[15] This questionnaire has

sensitivity of 96.5% and specificity of 75.2% on diagnosing HE and forearm eczema.[16]

During physical examination, all skin surfaces should be inspected, not only the hands. The differential diagnoses of HE comprise psoriasis, tinea manus, scabies, mycosis fungoides (MF), porphyria cutanea tarda, hand-foot-and-mouth disease (HFMD), lichen planus, granuloma annulare, herpes simplex, erythema multiforme, pityriasis rubra pilaris, and dermatomyositis.[11,14]

Laboratory examination

Laboratory examination is performed to identify the etiology of HE. Leukocyte count, serum immunoglobulin E (IgE) level, and radioallergosorbent test (RAST) can be performed when there is a suspicion of type I hypersensitivity reaction or atopy diathesis. In addition, increased serum IL-4 level can be found in allergic reaction.[9,13,17]

Microbiological examination

Microbiological examination is necessary if there is a secondary infection which can precipitate HE symptoms. Culture and Gram examination can be performed to determine the cause of infection, which is subsequently followed by antibiotic resistance test to decide the appropriate therapy. Microscopic examination with potassium hydroxide is performed to exclude scabies and dermatophytosis.[18]

Dermoscopic examination

Dermoscopic examination is usually performed to exclude the differential diagnoses, such as palmoplantar psoriasis, albeit thick palmar skin can might make the interpretation challenging. The most common findings of HE are pink or dull red background color, brown-orange-yellow dots, patchy yellow scales, yellow crusts, atypical blood vessels, and irregular arrangement of blood vessels (patchy distribution). Brown-orange-yellow dots are correlated to spongiotic vesicle which has high resistance towards rupture. Yellow scales are correlated to irregular hyperplasia of spinous layer, spongiotic edema, and serous exudate. Yellow crusts are correlated to dried serous exudate. Atypical blood vessels and irregular arrangement of blood vessels usually occurs due to scratch. [19-21]

Histopathological examination

Histopathological examination is performed if there are any differential diagnoses which cannot be excluded by other examinations. The result might be difficult to interpret since HE has similar findings to palmar psoriasis.[14] In addition, the result of histopathological examination cannot differentiate the etiology of HE, whether it is allergen or irritant.[18] The histopathological findings in HE are confluent parakeratosis, tortuous vessels at papillary dermis, infiltrates of plasma cells and polymorphonuclear leukocytes at parakeratosis focus, as well as irregular epidermal hyperplasia.[22] The differential diagnoses of HE based on histopathological findings consist of psoriasis, lichen planus, fungal infections, keratoderma palmoplantar, palmar pustulosis, and scabies.[17]

Other diagnostic tests

a. Patch test

Patch test should be performed in patients with chronic HE. The results are interpreted in consideration of patient's history.[14] This test identifies type IV hypersensitivity reaction in ACD. The tested substance should be standardized and can be varied according to

geographical area. European Society of Contact Dermatitis (ESCD) and European and Environmental Contact Dermatitis Research Group (EECDRG) has recommended standard substances, comprising 30 allergens which are usually identified as the cause of ACD. Relevant substances should be added according to the history taking, such as gloves, cosmetics, or topical medications. When an unstandardized substance is used, the concentration and vehicle should be considered carefully. After the patch test is performed, the reading is performed on day 2 and 3. Also, it is recommended to repeat the reading at day 5 to day 7. The scoring used is based on International Contact Dermatitis Research Group (ICDRG).[18]

b. Prick test

Prick test is performed by using the specific allergen in the patient's house and workplace, or food in the case of protein contact dermatitis.[14] Prick test identifies type I hypersensitivity reaction in the case of contact urticaria, allergic conjunctivitis, asthma, AD, anaphylaxis, as well as food or drug allergy.[23] Evaluation of the test's results should be perform carefully due to the risk of non-specific positive reaction.[18]

Determining HE severity

HE severity is important to be determined both in daily clinical practice and clinical trials. In addition to determine the severity, these assessments can monitor the therapeutic outcome. Several instruments which are often used to determine HE severity are:[24]

a. *Hand eczema severity index (HECSI)*

HECSI was developed by Held *et al*.[25] in 2004 to assess HE severity objectively and accurately. HECSI assess the extend and intensity of HE. Each hand is divided into five areas, namely, fingertips, fingers (without the fingertip), dorsum of the hand, palm, and wrist. Each area is assessed for the severity of erythema, induration/papules, vesicles, fissures, scales, and edema. The scores are 0= without lesion; 1= mild; 2= moderate; and 3= severe. The extend of the lesion are 0= 0%, 1= 1-25%; 2= 26-50%; 3= 51-75%; and 4= 76-100%. Total score is the sum of intensity score times extension score. The score ranges from 0 to 360.[25] Score 1-16 is considered mild; 17-37 is considered moderate; 38-116 is considered severe; and ≥117 is considered very severe.[26]

b. *Osnabrück hand eczema severity index (OHSI)*

OHSI was developed by Dulon *et al*.[27] in 2008 to determine HE severity objectively and assess the therapeutic responses. OHSI assesses the clinical findings, including erythema, scales, papules, vesicles, infiltration, and fissures. Each finding is scored 0-3 based on its extension, except for fissure which is scored 0-3 based on its severity. Total score is the sum of area score and severity score, ranging from 0 to 18. Severe HE is diagnosed when the total score is more than 7. OHSI has sensitivity of 73% and specificity of 78% on diagnosing HE.[27]

c. *Physical global assessment (PGA)*

PGA is based on the symptom's intensity, which is scored 1= almost none, 2= mild, 3= moderate, dan 4= severe.[24,28]

d. *Clinical photo guide (CPG)*

CPG was developed by Coenraads *et al*.[29] in 2004 to increase the diagnostic sensitivity of verbal instrument. The photograph is taken from palm and dorsum of both hands. The patient's photo is compared to the reference photograph to be later scored 1-4 based on the conformity of

patient's clinical symptoms to reference photograph.[24,29]

e. *Dermatology life quality index (DLQI)*

DLQI was developed by Finlay *et al*.[30] in 1993 to assess the quality of life of patients with various skin disorders. There are 10 questions to determine the impact of skin disorders on functional, physical, and social aspects in the past one week before the assessment. The score is 0= not at all, 1= a little, 2= a lot, and 3= very much. The total score ranges from 0 (the best) to 30 (the worst).[24,30] DLQI has been translated to Indonesian with good validity and reliability for skin disorders (acne vulgaris, psoriasis, AD, leprosy, and vitiligo).[31]

Management

Nonpharmacological management

The management of HE needs good collaboration of a multidisciplinary team which combine the clinical and workplace aspects in order to provide optimal therapy. There should be good communication between physician and patient and the physician should involve the patient actively in order to improve the compliance towards therapy.[3] In addition to the management, preventive measures should be implemented to avoid recurrence or a new HE event.[14]

a. Primary prevention

Primary prevention is focused on susceptible population, such as patients with history of AD and patients with risk at work. Risk assessment at workplace and risk classification is important prior to implementation of preventive measures. The preventive measures include technical regulation through workplace regulation, personal protection (use of gloves, hand hygiene practice, and moisturizer), education, and access to specialistic care.[14]

b. Secondary prevention

Secondary prevention aims to prevent the progression of HE into a chronic condition through early detection, diagnosis, and management approach. This is done by routine examination at workplace to identify and manage HE, use of moisturizer and other topical medications for prevention, as well as education at workplace.[14]

c. Tertiary prevention

Tertiary prevention is implemented in patients with chronic HE to alleviate the severity, increase quality of life, reduce corticosteroid use, and facilitate the patient back to workplace. It includes consideration for sick leave to prevent sensitization while waiting for the skin barrier function normalizes as well as implementation of multidisciplinary approach (dermatologist, occupational specialist, and other HCWs).[14]

Pharmacological management

Pharmacological management for HE includes topical, systemic, and phototherapy. The recommendation for HE pharmacological management is shown in **Table 2**.

Topical therapy

Moisturizer is a must for HE patients to alleviate the inflammation and pruritus, induce epidermal barrier improvement, and act as corticosteroid-sparring effect. The recommended moisturizer is oil-based emollient for hyperkeratotic or xerotic HE or water-based emollient for exudative HE. For acute and macerated HE, the recommended therapy is antibacterial and astringent topical

Table 2 Recommendation of therapy for hand eczema

Drug	*Dosage*	*Level of evidence (LOE)**
Topical therapy		
Topical corticosteroid [47]		1a
0.05% clobetasol propionate foam	twice daily	
0.1% mometasone furoate cream	once daily	
Calcineurin inhibitor [47]	twice daily	1a
Calcipotriol [34]	twice daily	1b
Delgocitinib [35]	twice daily	1a
Systemic therapy		
Corticosteroid [18]	0,5-1 mg/kg/day	-
Cyclosporine [47]	3 mg/kg/day	1a
Azathioprine [47]	50 mg/day	1a
Acitretin [48]	20-30 mg/day	2b
Alitretinoin [41,47]	10-40 mg/day	1a
Methotrexate [43]	0,1 mg/kg/week	1b
Dupilumab [44,45]	Loading dose 600 mg subcutaneously followed by 300 mg every 2 weeks	2c
Phototherapy		
PUVA [47]	twice a week	1a
308 nm excimer [49]	twice a week	1b

*Level of evidence is based on Oxford Centre for Evidence-Based Medicine: Levels of Evidence.

agent, moist wound dressing, as well as hydrophilic gel or cream. For subacute HE, the topical therapy should have anti-inflammatory, moisturizing, and antipruritic properties. On the other hand, chronic and hyperkeratotic HE should be treated with keratolytic agent (salicylic acid with concentration up to 20% and urea 10-20%) and ointment with high-lipid content.[3]

Topical corticosteroid is the first-line therapy for HE and recommended to be used in short term (<6 weeks). The recommended agent is corticosteroids with high potency, namely clobetasol propionate foam or 0.1% mometasone furoate cream. Before prescribing corticosteroid, the possibility of secondary infection should be excluded.[14] The application of once daily 0.1% mometasone furoate cream was reported to be effective and safe for chronic HE. Seventy seven percent of patients improved significantly and 4% of patients were cured in 8 days.[32] Use of ultrapotent corticosteroid in long term is not advised because it can induce skin atrophy and prevents the stratum corneum restoration.[3,14]

Calcineurin inhibitor binds the FK-binding protein which will inhibit the calcineurin phosphatase, leading to inhibition of proinflammatory cytokines release by mast cells and T-cells.[3] 0.1% tacrolimus ointment is recommended for patients aged ≥16 years old while 0.03% tacrolimus ointment is recommended for patients aged <16 years old. Another choice is 0.1% pimecrolimus cream. The indications for calcineurin inhibitor administration are patients who do not response or have history of allergy towards topical corticosteroid. However, there was a report that combination of calcineurin inhibitor and topical corticosteroid can become a choice for long-term use.[14] Kazmi *et al*.[33] reported that administration of twice daily 0.1% tacrolimus ointment could reduce PGA score significantly in 6 weeks in patients with mild-moderate chronic HE.

Tar has been used since a long time ago for recalcitrant HE. However, its use was discontinued due to carcinogenesis potency. The latest study reported the effectiveness of sulfonated shale oil on mild-moderate AD,

therefore it might be use for HE.[3]

Calcipotriol is a vitamin D3 derivate which has corticosteroid-sparring effects. Combination of calcipotriol and topical corticosteroid can reduce HE severity significantly in 8 weeks.[3] Juntongjin *et al*.[34] reported that the administration of calcipotriol ointment reduced HECSI 75% in 8 weeks with minimal side effects, i.e. mild scales and xerotic skin.

Delgocitinib is a Janus kinase (JAK) inhibitor, specifically JAK1, JAK2, JAK3, and TYK2 kinase which inhibits the release of proinflammatory cytokines. Administration of topical delgocitinib twice daily for 8 weeks has been proven effective on reducing HECSI scores significantly compared to placebo in chronic HE cases without serious side effects (60.1% vs. 36.3%).[35]

Systemic therapy

Systemic corticosteroid is indicated for severe acute or chronic HE, to be administered for 3 weeks. Longer duration is not advised due to harmful adverse effects, e.g., osteonecrosis, glaucoma, osteoporosis, hyperglycemia, immunosuppression, hypertension, and cataract. The recommended dose is 0.5-1 mg/kg/day equivalent to prednisone's dose. To date, there has been no randomized clinical trial to prove the effectiveness of systemic corticosteroid on HE.[3,14]

Cyclosporine is a lipophilic cyclic polypeptide which inhibit the transcription of IL-2 and other cytokines, subsequently inhibiting the activation of T-cells.[3] Cyclosporine is administered for patients with chronic HE unresponsive to other therapies. Good response is shown by recurrent vesicular HE. Duration of treatment is 6 months with minimum effective dose, followed by tapering off within 3 months. Monitoring of renal function, blood pressure, infection, and cancer screening should be performed during the administration of cyclosporine.[3,14] A study by Grandlund *et al*.[36] reported that administration of cyclosporine 3 kg/mg/day for 6 weeks could improve the quality of life of HE patients (31.5%). Another study by Kim *et al*.[37] reported that administration of cyclosporine with initial dose of 200 mg/day and maintenance dose of 25-100 mg/day reduced HECSI 53.9% after 4 weeks of therapy.

Azathioprine is an immunosuppressant which is a result from metabolism of 6-mercaptopurine into 6-thioguanine nucleotides. Azathioprine can be a therapy of choice if other therapies fail. Liver function should be performed during the administration of azathioprine.[3,14] Agarwal *et al*.[38] reported that combination of azathioprine 50 mg/day and 0.05^ clobetasol propionate cream was more effective in reducing HECSI score compared to clobetasol propionate cream only in 24 weeks (95.55% vs. 74.15%).

Acitretin is a retinoic acid derivate which is recommended for patients with chronic HE and hyperkeratotic HE.[14] Acitretin inhibits the activation of Th1 and Th17 cells as well as reduces the production of cytokines and vascular-endothelial growth factor (VEGF). In the case of hyperkeratotic HE, acitretin normalize the keratinization process. The effectiveness of acitretin was reported to range between 51-57.9% without serious side effects.[39,40] Acitretin should not be used in pregnancy or women planning pregnancy.[14]

Alitretinoin is a retinoid acid derivate which is used for chronic HE unresponsive to topical corticosteroid. Alitretinoin has anti-inflammatory and immunomodulator properties. Duration of treatment is 24 weeks.[14] Alitretinoin was reported to be effectively reduce PGA of 40-69% in various clinical trials.[41] Luchsinger *et*

al.[42] also reported the effectivity of alitretinoin in pediatric patients with chronic HE, which was reduction of PGA ≥1 point in 78% of patients. The reported side effects were headache, dyslipidemia mucocutaneous reaction, and thyroid function disorders. Use in pregnancy and women in their productive age is also not recommended because alitretinoin is teratogenic.[14]

Other choices are methotrexate and mycophenolate mofetil but they are off-label.[14] Ghosh *et al*.[43] reported reduction of HECSI score 75.5% in patients with chronic HE who received low-dose methotrexate for 3 months (0.1 mg/kg/week). Methotrexate is often administered if the first-line and second-line therapy cannot be given or is not effective.[3]

Dupilumab is a monoclonal antibody which inhibits IL-4 and IL-13 signaling pathway.[3] Oosterhaven *et al*.[44] reported that 96% of patients with HE and AD experienced improvement of HECSI with average reduction of 74.6% after administration of dupilumab with loading dose of 600 mg subcutaneously, followed by 300 mg every 2 weeks. Lee *et al*.[45] also reported that 96% of HE patients experienced improvement of pruritus with average reduction of Investigators' Global Assessment (IGA) score of 47.2%.

Phototherapy

Phototherapy is indicated for chronic HE unresponsive to corticosteroid therapy. The recommended phototherapy was psoralen and ultraviolet A (PUVA) as well as 308 nm excimer laser. Although PUVA is quite effective, the systemic side effects of psoralen as well as intricate protection protocol make PUVA start to be left. Use of PUVA cream or PUVA bath is more preferrable.[3,14] A study which compared narrow band ultraviolet B (NB-UVB) to PUVA reported that PUVA was more superior in reducing severity of chronic HE.[46]

Prognosis

HE tends to be chronic if the patient does not receive the proper management. A study by Petersen *et al*.[50] in 2014 reported that HE patients improved in 7 years after being treated by dermatologists. However, there were still a lot of patients who did not experience significant improvement. Poor prognosis was associated with no improvement of symptoms since being diagnosed, lesions on other body parts, history of AD, allergic sensitization, and smoking.[11,50] Occupational HE is associated with poor quality of life because the patient often has to change job. The quality of life of working women is reported to be more influenced compared to men. In addition, patients living in urban area have poorer prognosis compared to patients living in rural area.[11]

Conclusion

Deep understanding on the diagnostic approach and management of HE is crucial in the midst of increasing cases of HE. With proper management and preventive measures, it is expected that HE will not progress into a chronic condition and the patient's quality of life can improve.

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