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Patch Testing Pearls

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Abstract
Dermatitis is one of the most common illnesses encountered by healthcare providers and the causes are numerous. Contact dermatitis is the form of dermatitis resulting from contact with the environment, and it may be either irritant or allergic in nature. Patch testing has been the gold standard for diagnosis of allergic contact dermatitis since its formal description over 100 years ago by Jadassohn. While this diagnostic tool may seem simple to us today, there are numerous potential points for error that the practitioner must keep in mind. Patient selection, technique of patch test placement, allergen selection, patch test reading and interpretation, and patient management all must be considered. To simply apply a given set of test allergens indiscriminately and not be prepared to interpret the results accurately with patient education and management in mind would be a great failure. Conversely, with experience and the proper knowledge base some of the most complex dermatitis questions can be answered.

Keywords Contact dermatitis · Allergic contact dermatitis · Patch testing · International contact dermatitis research group reading criteria · Patch test relevance · Patch test pearls · Regional clues to patch testing · Patch test placement · Patch test reading

Introduction

Dermatitis is one of the most common illnesses affecting the US population. While the causes of dermatitis can be numerous, contact with the environment is the most frequent. The psychosocial and economic burden of contact dermatitis has been described extensively in the medical literature [1–5]. Accurate diagnosis is imperative, because of the significant potential to both negatively impact the quality of life and impose substantial costs to the healthcare system. The gold standard for diagnosis of allergic contact dermatitis (ACD) is patch testing.

History of Patch Testing

The technique of patch testing was first formally described by Jadassohn over 100 years ago. Sulzberger and Wise have been credited with introducing patch testing to the USA [6]. The patch test takes advantage of the fact that in sensitized individuals there are primed antigen-specific T lymphocytes circulating throughout the body which are able to produce a delayed-type hypersensitivity reaction when antigens are applied to normal skin in test doses.

Patient Selection

The term *eczema* is often used in a very nonspecific manner, with many clinicians using the terms *dermatitis* and eczema interchangeably. Still others reserve the use of the term "eczema" for only those patients with atopic dermatitis [7]. Further complicating matters is the fact that some divide eczema and dermatitis into endogenous and exogenous types. ACD is the prototypical example of exogenous dermatitis.

Perhaps a more functional approach is to use the working concept of *eczematous dermatitis* until a more specific diagnosis can be rendered. Here, we can consider acute, subacute, and chronic manifestations of eczematous eruptions such as erythema, edema, weeping, crusting, scaling, hyperkeratosis, and lichenification. It is here where we find the highest yield for patch testing. The European Society of Contact Dermatitis (ESCD) published recommendations for the best practice of patch testing in 2015 which recommended patch testing be considered in patients with the following [8]:

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1. Suspected contact dermatitis, acute or chronic, including dermatitis related to occupational exposures.
2. Other types of (chronic) dermatitis (eczema) not improving with treatment.
3. Skin and mucous membrane eruptions (including delayed-type drug eruptions) in which delayed-type hypersensitivity is suspected.

Chronic Eczematous Dermatitis

Patients with chronic eczematous dermatitis should be considered for patch testing to evaluate for possible underlying allergic contact dermatitis. The term chronic eczematous dermatitis is appropriate in cases that persist for more than 3 months or recur two or more times within a 12-month time frame. The best example of this is seen in patients with chronic hand eczema. Hand eczema (HE) is a diverse entity with a multitude of etiologies, severities, and morphologies. The morphology of HE may include a mix of erythema, edema, vesicles, papules, scaling, hyperkeratosis, and fissures. Patients often report itching, pain, or both. The prevalence of HE is estimated to be up to 10% of the general population [9, 10]. Occupational HE is the most common occupational disease [11] and is increased among occupations involving wet work or exposure to irritants and/or allergic substances such as hairdressers, cooks, healthcare workers, metal industry workers, and janitorial service workers [12]. While the true prevalence of ACD among patients with chronic HE is difficult to determine, a positive patch test to one or more allergens has been reported in 65% of these patients [13]. Certain allergens such as nickel and rubber additives are more frequently implicated in patients with ACD of the hands.

Regional Clues

There are well established regional clues to suggest allergic contact dermatitis [14–21]. The infraumbilical plaque of dermatitis seen in nickel allergy related to a patient's belt buckle is pathognomic for ACD. Eyelid dermatitis is another example of a well-defined patient subset. Here, the differential diagnosis can be broad and contributing factors to consider in addition to ACD include atopic dermatitis, seborrheic dermatitis, psoriasis, irritant contact dermatitis (ICD), rosacea/periocular dermatitis, and connective tissue disease. Patch testing often plays an integral part in the evaluation of patients with chronic eyelid dermatitis, and with certain allergens are more frequently implicated. Components of nail cosmetics, hair care products, facial moisturizers/cleansers, eye make-up, and jewelry are important to consider. Potential airborne contactants should also be considered. This is particularly important in the occupational setting. As previously noted above, patch testing should be considered in chronic HE. While there is a great deal of overlap in the morphology among the various causes of hand eczema there are some presentations which are more suggestive of ACD. Dermatitis affecting the dorsal hand and wrist is suggestive of an underlying ACD related to gloves. Edema and microvesicles affecting the finger tips has also been suggested as a clue to ACD.

Worsening of Previously Well-Controlled Disease

Another important indication for patch testing is worsening of previously well-controlled dermatitis. Topical medicaments are often required for management of chronic skin disease. Over time, the active or inactive ingredients in these products may act as sensitizers. One such example is seen in elderly patients with chronic stasis ulcers. Previous reports have shown that among the Medicare patient population the most common cause of ACD are topical medications applied to stasis ulcers [22, 23]. In 2012, the North American Contact Dermatitis Group (NACDG) published a retrospective analysis of positive patch test reactions in older individuals. This study showed that in addition to higher rates of sensitivity to the topical antibiotics neomycin and bacitracin there were also higher rates of sensitivity to preservatives commonly found in topical medications and personal care products (methyldibromoglutaronitrile, quaternium-15, formaldehyde, diazolidinyl urea, and imidazolidinyl urea) [24].

The concept of "atopic dermatitis" was popularized in 1933 by Wise and Sulzberger with the hope of avoiding confusion between allergic and non-allergic eczemas [25]. We know now that there is a complex relationship between atopic dermatitis and ACD. Patients with atopic dermatitis have an impaired epidermal barrier, and the mainstay of management is a barrage of topical treatments applied repeatedly over time. This creates a condition ripe for the development of ACD. A 2014 study in Denmark looked at 2221 patients (293 patients with atopic dermatitis and 1928 without) and noted that, while the overall frequency of positive patch test reactions was similar between the groups, a higher frequency of multiple positive patch test reactions was found in patients with severe atopic dermatitis [26]. The recent development of a pediatric contact dermatitis registry has highlighted the frequency of ACD in children with atopy. Interestingly, data from this registry has shown a different reaction profile in patients with atopic dermatitis than those without atopic dermatitis. Specifically, atopy was associated with an increased frequency of reported reactions to cocamidopropyl betaine, wool alcohol and lanolin, tixocortol pivalate, and parthenolide [27].

Patch Test Placement

Once it has been determined that a patient would benefit from undergoing patch testing, several factors must be considered.

One important consideration is scheduling. Will the testing be placed at the time of the initial encounter or scheduled for a later appointment date? This often depends on the setting. While it is common for patch test centers to perform a consultation visit and place the testing at the initial visit, it is relatively uncommon for clinicians in a general clinic setting to perform patch testing at the initial visit. Several factors impact the timing of patch test placement. If possible, it is advisable to avoid patch testing during acute or severe flares of dermatitis, which is largely why patch testing is not often performed during the initial visit in the general clinic setting. Performing patch testing during acute and/or severe dermatitis can result in false-positive reactions which have been termed "angry back" and "excited skin" reactions. The angry back reaction is a generalized, erythematous, dermatitic reaction on the back where patch testing materials were placed [28]. This background noise may be so severe that the test is uninterpretable. The excited skin reaction was described by Mitchell in 1975 and denotes the finding of multiple false positive patch test reactions [29, 30]. These positive test reactions are not reproducible on subsequent patch testing. In addition to testing during acute and/or severe episodes of dermatitis, patch test substances and location of allergen placement may contribute to the excited skin reaction. In 2002, Duarte and colleagues demonstrated that allergens which were cosensitizers or allergens tending to have cross-reactions induced false positive tests when applied close to each other [31]. This is part of the reasoning behind splitting up similar test substances between patch test panels on standard series rather than grouping like substances.

The day of patch test placement is considered day 0 of the patch testing process. Prior to patch test placement, it should be verified that all standardized allergens have been stored correctly. The majority of allergens should be stored at a temperature between 36 °F (2 °C) and 46 °F (8 °C) and protected from light. It has been recommended that potentially unstable allergens, such as isocyanates and acrylates, be stored in the freezer at − 0.4 °F (−18 °C) to slow degradation [8, 32]. These allergens will also typically require more frequent renewal. All allergens tested in an aqueous vehicle should be considered potentially volatile and should be prepared as close to the time of patch test placement as possible to prevent evaporation and changes in the tested concentration.

The history and examination should help guide which patch test materials are used. The T.R.U.E. TEST ® system is an FDA approved patch test product indicated for use as an aid in the diagnosis of allergic contact dermatitis in persons 6 years of age and older whose history suggests sensitivity to one or more of the 35 allergens and allergen mixes included on the T.R.U.E. TEST ® panels **(www.smartpractice.com)**. While this product offers significant advances in ease of use, its primary limitation is diagnostic sensitivity. Concerns of low diagnostic yield when testing with fewer patch test allergens has been investigated in detail with studies showing that only about 1/3 of the patients (or less) were fully evaluated by use of a limited patch test screening series [33–40]. For this reason, the majority of patch test experts rely on the off-label use of standardized allergens to perform expanded patch testing. Part of the challenge is that unsuspected allergens often turn out to be clinically relevant. Even experienced patch testers will only correctly predict positive reactions in common allergens, such as nickel, 50–80% of the time and < 10% of the time for less common allergens [41, 42]. A variety of systems are available for application and occlusion of standardized allergens beyond the T.R.U.E. TEST ® panels **(www.smartpractice.com, www.chemotechnique.se/)**. The term *patch test unit* has been used to describe a system of chambers mounted on an adhesive tape which is then utilized to ensure that the test chemicals remain in direct contact with the skin during testing. The chambers are typically supplied in strips of 5 or 10 and consist of small aluminum disks (Finn chambers) or square plastic chambers mounted on non-occlusive hypoallergenic (Scanpor) tape.

Determining which allergens should be tested can be complex at times. A few general rules can be helpful. First, most patients benefit from testing to a 'baseline series or standard series' such as the NACDG Standard Series, European Baseline Series, or the American Contact Dermatitis Society (ACDS) Core Allergen Series. These series have been compiled based on years of testing large numbers of patients, and their use helps to optimize the yield of patch testing with the fewest false-negative and false-positive results possible for a given allergen. An allergen is usually included in a baseline series when routine patch testing of patients with suspected contact dermatitis results in a positive test result of at least 0.5–1.0% of the time and when this allergen is particularly common and/or clinically highly relevant [8, 43, 44]. These baseline series are also dynamic and subject to continual evaluation and occasional modification. One such example is the removal of gold as a standard test allergen from the NACDG Standard Series. While testing to gold has shown a high rate of positive reactions (8.7%) [45], concerns about the potential for robust persistent patch test reactions and questions over relevance have led to its removal for the NACDG Standard Series [46]. However, it is still an important allergen to consider in the proper clinical context. Gold has been reported as the most common allergen to induce eyelid ACD and is therefore typically included for testing when evaluating eyelid dermatitis [47]. It is also an important allergen to consider in patients with gold dental restorations. Finally, when discussing allergen choice, it is important to mention that unknown substances should never be tested. Chemicals from home or work may be extremely toxic. Testing without a detailed review of the manufacturer's list of ingredients and safety data sheets may result in cutaneous and rarely systemic injury.

By convention, allergen placement is typically on the upper back. The back typically offers an adequate surface area for patch test application. The outer surface of the upper arms and thighs may be used if the upper back is not suitable for patch testing or if expanded room is needed. Prior to testing, it is important to advise patients to avoid sun exposure, including tanning bed use for at least 2 weeks. Ideally patients will also be off all systemic corticosteroids and have stopped application of topical corticosteroids and topical immunomodulators to the test site for at least 2 weeks. Patch testing in patients who are on systemic corticosteroids or who are applying topical corticosteroids or immunomodulators to the back may result in false-negative results. However, from a practical standpoint, there will be times in which patients cannot be fully off these treatments and remain clear enough for patch testing. It has been reported that systemic steroids in doses of 20 mg daily or less probably do not inhibit a "significant" patch test [47, 48]. While the application of topical corticosteroids has been shown to have a suppressive effect on both the intensity and the size of patch test reactions [49], one study noted that the application of intermediate strength corticosteroids (triamcinolone ointment 0.1%) three times a day for a week prior to patch testing did not have a significant effect [50]. In situations where corticosteroid treatment is unavoidable, the lowest level of corticosteroid exposure is preferable and the results should be interpreted cautiously keeping in mind the potential for false negative results.

Patch Test Reading

Standardized allergens should always be removed at day 2 which correlates with an occlusion time of 48 h. Often a preliminary read is taken at the 48-h visit with notations being made if there were any technical difficulties with the testing such as test sites with poor adherence. The preliminary or first patch test read should be taken at least 15 min after the removal of allergens to allow for pressure effects to resolve. There is also often dermatographic erythema present at the time of allergen removal which can interfere with reading. It is important to remember that any readings taken at 48 h should be considered preliminary only and that a final read is required as will be discussed below.

Final reading times may vary to some extent with day 3 (72 h), day 4 (96 h), and day 7 (168 h) being the most common reading times utilized. A reading at 72 h or 96 h is considered obligatory [8]. A delayed reading between day 7–10 is optional but felt to be important for detecting reactivity of certain allergens with a propensity for delayed reactivity such as corticosteroids, antibiotics, and some metals. It has been reported that if a delayed reading is not taken in these allergens 7–30% of positive reactions will be missed [51–54].

The International Contact Dermatitis Research Group (ICDRG) (Fig. 1) has established patch test reading criteria based on morphology (Table 1) which has been adopted by the NACDG and others. Conceptually, this system places reactions in one of three categories: [1] irritant reactions [2] questionable reactions, and [3] clear positive reactions. There are different morphologies which suggest irritant reactions. Pustular, purpuric, glazed, or "scorched" epidermal changes are the most commonly encountered irritant morphologies. Pustular reactions are commonly seen in nickel, cobalt, and chromium, and caution should be exercised to not overinterpret these reactions. Purpuric reactions are also more common with metals. Cobalt in particular is noted for inducing a poral purpuric reaction. It is helpful to keep in mind those allergens which have a higher intrinsic irritancy, such as cocamidopropyl betaine, benzoyl peroxide, phenyl mercuric acetate, propylene glycol, benzalkonium chloride, octyl gallate, and 1,3-diphenyl guanidine [55]. It is not uncommon to see a scorched or glazed epidermal change with these allergens. A unique and notable irritant morphology is what has been termed the edge effect. This morphology is notable because, while it is most often the result of friction and corresponds to an irritant reaction, it may suggest a true positive reaction in the case of corticosteroids [56]. It has been postulated that the higher concentration in the center of the allergen tray may be adequate to suppress a positive immune response while the lower concentration of active corticosteroid at the periphery is sufficient to induce an allergic reaction but insufficient to suppress the immune response. Clear positive reactions are further graded based on the strength of reaction into + which consists of erythema with induration and possibly some papules, ++ which consists of erythema, induration with papules and possibly some vesicles, and +++ which consists of erythema, induration with coalescing vesicles and possibly bullae.

Patch Test Interpretation

Perhaps the most challenging component of the patch testing process is the interpretation of the test results. A positive patch test result is merely a sign of contact allergy which simply means that sensitization to the tested substance has occurred at some point. A positive test does not equal the diagnosis of ACD. The results must be interpreted to determine if the patient's current clinical signs and symptoms may be the result of exposure to this substance. To assign the diagnosis of ACD, the physician should look for the presence of dermatitis which is understandable and explainable with regard to the exposure and type of allergen. The involved anatomical site and clinical course should also be in keeping with the expected exposure. This is the process of assigning relevance to positive patch test reactions [57]. Table 2 [58] shows the different categories of

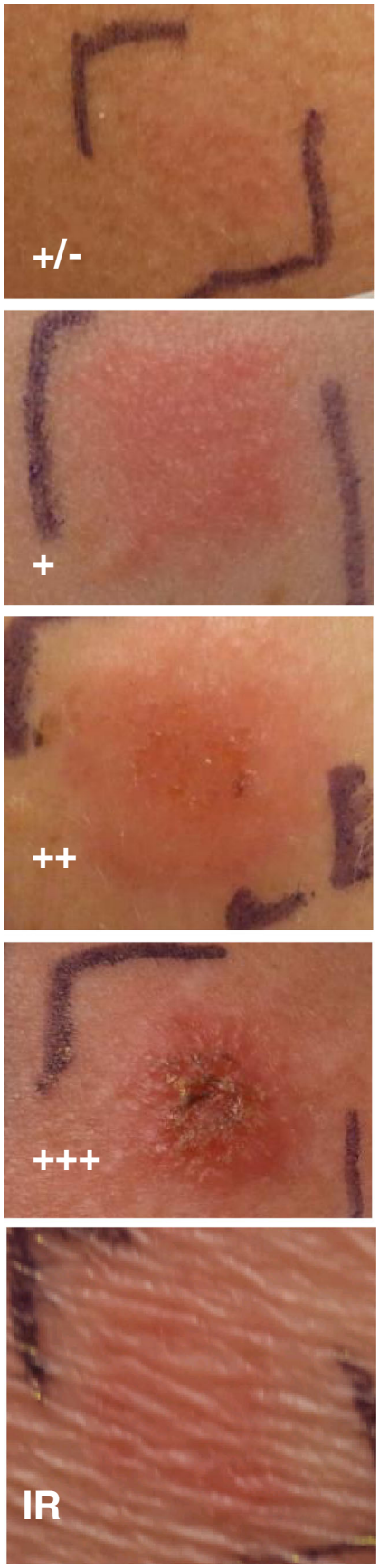

Fig. 1 ICDRG Reading Criteria

relevance which are typically used. The ability to assign definite relevance requires testing to an actual product or item containing the allergen. If the allergen is identified as an ingredient or component of a contactant used by the patient, then *probable relevance* can be assigned. *Possible relevance* is used when the patient is exposed to circumstances in which skin contact with the type of materials known to contain the allergen occur. It is important to note that the physician's assessment of relevance at the time of the final reading should be considered a preliminary assessment [59]. Only after some months of adherence to an adequate allergen avoidance regimen can true relevance be determined based on clinical outcomes. It is also important to realize that patch test grading based on morphology and relevance are separate and do not always correlate in a linear manner. For example, a patient with infraumbilical dermatitis may have a doubtful ± reaction to nickel and a clear positive ++ reaction to thimerosal. The nickel released from a belt buckle would be the likely causative allergen giving a *probable relevance* assessment to nickel. Positive reactions to thimerosal are often not relevant even though they may be clearly positive. Even doubtful reactions should be evaluated for relevance [60].

Patient Management

The singular most important component of treating ACD is allergen avoidance, and patient education is paramount to adequate avoidance. While some causative allergens are commonly known to the general population, many are not. In patch test positive patients, adequate time should be allotted during the post patch test appointment for allergen education and discussion of a tailored management plan. There are numerous tools available to both the practitioner and the patient to assist with this process. An excellent place to start is the Contact Allergen Management Program (CAMP) supported by the ACDS **(http://www.acdscamp.org/HomePage)**. One component of CAMP is a collection of allergen-specific educational handouts which can be printed in both English and Spanish. A second component of CAMP is the ability to generate a list of products which should be free of a particular group of allergens and cross-reacting substances. After entering the specific allergens which should be avoided, a product list can be generated and utilized by the patient to assist in allergen avoidance. This allows patients to search for products which could be used rather than relying solely on reading labels and trying to avoid specific allergens. While patients should be educated on reading ingredient labels, relying exclusively on reading labels to avoid allergens is laden with potential error. Ingredient lists on labels are often incomplete or absent. Another significant challenge is the use of chemical synonyms. For example, the common sunscreen ingredient oxybenzone may be listed as benzophenone-3, 2-hydroxy-4-

Table 1 ICDRG Reading Criteria

Symbol	Morphology	Assessment
–	No reaction	Negative
±	Faint erythema only	Doubtful
+	Erythema, infiltration, and possible papules	Weak positive
++	Erythema, infiltration, papules, and possible vesicles	Strong positive
+++	Intense erythema, infiltration and coalescing vesicles or bullae	Extreme positive
IR	Various irritant morphologies	Irritant

methoxy-benzone, or 2-benzoyl-5-methoxyphenol. When reading labels, patients should also be educated on potentially relevant cross-reacting substances. The prototypical example is the formaldehyde releasing preservatives. Formaldehyde is released by quaternium-15, DMD hydantoin, diazolidinyl urea, imidazolidinyl urea, 2-bromo-2-nitropropane-1,3-diol, and tris nitromethane. As you can see, the seemingly simple task of reading ingredient labels can quickly become daunting.

Adjuvant medical management is often required at the time of initiating an avoidance program and may be needed chronically in the case of multifactorial dermatitis or in cases where complete allergen avoidance is not possible. Options for adjuvant medical management are diverse and similar to those employed in the management of patch test negative dermatitis. In the case of patch test negative dermatitis, the working nomenclature of "undifferentiated eczematized dermatosis" should be considered if an underlying etiology is not evident. Stopping the itch scratch cycle is often discussed within the context of atopic dermatitis, but this concept is equally important in all pruritic dermatoses. Scratching not only induces epidermal trauma with subsequent release of inflammatory cytokines but it also creates a portal for the entry of pathogenic microbes. It is important to review gentle skin care measures with all patients who have pruritus. In the case of ACD, this regimen should consist of gentle skin care products devoid of the patient's known allergens. Liberal application of an appropriate moisturizer should be encouraged and bathing habits discussed. In patients with a component of xerosis, such as is often the case in the elderly population, daily bathing may worsen their skin disease. Patients with pruritus often prefer to take showers with an excessively hot water temperature to alleviate their itching. It is important to educate patients on the potential adverse effects of overly hot bathing water on their dermatitis and to encourage tepid bath or shower temperatures. Periodic dilute bleach baths may also be helpful in patients with chronic dermatitis. While antihistamines have not traditionally been utilized in the treatment of ACD there are several points which support their use. First and most importantly, the more soporific H1 antagonists such as diphenhydramine and doxepin can be important tools in preventing nocturnal pruritus. Secondly, while antihistamines do not affect the ability to elicit a positive patch test, they may help dampen down the epidermal inflammatory milieu and accelerate epidermal barrier repair [61, 62]. An action plan should be outlined for management of acute flares of itching and dermatitis. Measures for symptomatic control such as cool compresses, soothing soaks, and topical emollients with anti-itch agents such as pramoxine can be considered. Topical corticosteroids and wet wraps are also useful during acute flares as rescue therapy. In rescue therapy, higher potency topical corticosteroids are often used with increased frequency for a limited duration. Some have advocated for the use of suppressive therapy in patients with frequent acute flares using an intermittent scheduled application of low potency topical corticosteroids or topical calcineurin inhibitors (TCIs) [63, 64]. TCIs inhibit T cell and dendritic cell activation, and both tacrolimus ointment and pimecrolimus cream have limited data suggesting a degree of ability to suppress both allergic and irritant contact dermatitis [65, 66]. In select cases of severe dermatitis, systemic corticosteroids may be necessary. This is typically in cases of

Table 2 Clinical relevance

Unknown	No evidence of current or past exposure
Past relevance	Allergen found in past environment and patient had reaction to allergen in the past
Possible relevance	Patient was likely exposed to allergen in products/environment
Probable relevance	Allergen was present in products/environment and clinical presentation consistent with allergy
Definite relevance	Allergen found in patient's products/environment, dermatitis corresponds to point of contact with allergen, use test is positive or patch test positive to product, dermatitis improved with removal of the allergen or recurred with rechallenge (provocative use test)

acute dermatitis affecting > 20% body surface area or severe dermatitis affecting the face, eyelids, hands, or genital skin. It is important to exercise caution in patients at risk for infection or who have congestive heart failure, diabetes, hypertension, and/or osteoporosis. Methotrexate is an antimetabolite cytotoxic agent derived from folic acid. It limits lymphocyte proliferation creating an immunosuppressive and anti-inflammatory state and may be considered in severe refractory dermatitis as a steroid sparing agent. There is extensive literature available on the off-label use of methotrexate in the management of various types of dermatitis [67–69]. Hepatotoxicity is the principal concern in long-term methotrexate use. Other potential adverse effects include gastrointestinal upset, myelosuppression, pulmonary toxicity, carcinogenicity, and teratogenicity. Cyclosporine is a systemic calcineurin inhibitor with a significant benefit of having a relatively rapid onset of action. Like methotrexate, there is extensive literature available to support the off-label use of cyclosporine in select cases of severe refractory dermatitis [70–75]. The potential for nephrotoxicity, hypertension, hyperkalemia, and malignancy should be kept in mind when using cyclosporine. Treatment is typically limited to intermittent short courses to minimize the potential for renal toxicity [76]. Azathioprine is a synthetic purine analogue which may be considered as a second line systemic option in some cases of severe dermatitis [69, 77]. However, there is a significant potential for myelosuppression, hepatotoxicity, gastrointestinal disturbances, infections, and neoplasia including non-melanoma skin cancer and lymphoma. Mycophenolate mofetil (MMF) inhibits de novo purine synthesis. It selectively and non-competitively inhibits inosine monophosphate dehydrogenase in the de novo purine synthesis pathway. MMF has been shown to be beneficial in many inflammatory skin diseases including various types of dermatitis [69, 78]. MMF should not be used in pregnancy, and the potential for gastrointestinal side-effects, myelosuppression, infection, and carcinogenicity should be kept in mind. Apremilast is an oral phosphodiesterase-4 (PDE-4) inhibitor indicated for moderate to severe psoriasis and psoriatic arthritis which has garnered some interest in the off-label use for pruritic dermatoses such as atopic dermatitis [79, 80]. The extent to which this medication will be helpful in management of patients with various types of pruritic dermatoses requires further investigation. A topical PDE-4 inhibitor (crisaborole 2% ointment) has received FDA approval for treatment of mild-to-moderate atopic dermatitis in adults and children 2 years of age and older. Dupilumab is a fully human monoclonal antibody that targets the interleukin (IL)-4 receptor alpha and inhibits signaling of the Th2 cytokines IL-4 and IL-13 [81]. Dupilumab was approved in March 2017 for treatment of adults with moderate-to-severe atopic dermatitis and may prove useful as an adjuvant therapy in atopic patients with concomitant contact dermatitis.

Compliance with Ethical Standards

Disclosure The authors have no relevant disclosures.

Human and Animal Rights No research involving human participants and/or animals was used.

Informed Consent No identifying patient information was used requiring informed consent.

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