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Selected Dermatologic Emergencies: Recognition, Differential Diagnosis, and Initial Therapeutic Considerations for the Emergency Physician.

Part I: Immunologic and Toxin-Mediated Syndromes

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The emergency physician is often faced with acute presentations of dermatological disorders. In this regard, the chief complaint of "rash" is encountered in approximately 5% of emergency department (ED) visits nationwide; in addition, cutaneous findings help the physician make the correct diagnosis and determine appropriate management in another 5% of ED cases. Overall, one in 10 ED visits will require expertise in dermatologic disorders.[1]

The emergency physician is frequently the first, and only, clinician who examines a patient with a "rash." Accordingly, he or she must make the diagnosis, stabilize the patient, select proper therapy, and arrange for a timely disposition with appropriate consultation. The physician's ability to identify the dermatologic disorder not only determines the treatment pathway, but may also influence patient outcomes. Although most patients with dermatological diseases can be adequately managed on an outpatient basis with appropriate follow-up, some conditions are potentially life-threatening and require immediate diagnosis, intensive management, and in-hospital disposition.

The pitfalls of managing dermatological syndromes are well-known. Two studies addressing the management of patients with dermatological disorders are revealing. The first, a study of academic internists, demonstrated that 40% of dermatologic cases were misdiagnosed and appropriate referral was not made.[1] Among 40% who were misdiagnosed, 64% were treated inappropriately. The precise clinical significance of inappropriate treatment was not addressed; however, one case of impetigo was treated with topical steroids, and antifungal agents were prescribed for a case of psoriasis. In this same study, 33% of dermatology referrals were deemed unnecessary.[1] Although there are no data on the appropriateness of diagnosis and treatment of dermatological disorders by emergency physicians, these specialists may have similar diagnostic and disposition difficulties. The second study stresses the importance of visual diagnosis and pattern recognition in evaluating patients with dermatologic complaints. Several groups of physicians at different levels of training were given 100 color slides of various skin lesions; the accuracy of diagnosis, as well as the time to diagnosis were noted. Second-year medical students made the correct diagnosis in only 21% of cases, while their fourth-year colleagues scored slightly higher—a 31% accuracy rate. Second-year family medicine residents were correct 55% of the time, while primary care physicians made the correct diagnosis in 66% of cases. In contrast, dermatologists were correct in approximately 90% of cases. Interestingly, an accurate diagnosis was inversely associated with response time.[2]

With these issues in mind, the purpose of this two-part arti-

cle is to present a step-by-step approach to the recognition and treatment of common and challenging dermatological conditions encountered in the ED. Because visual identification is essential for making the diagnosis, a photographic legend is provided as a clinical support tool.

—The Editor

Urticaria and Angioedema

Urticaria, also referred to as hives or wheals, is a common and distinctive skin reaction that is encountered at least once in up to 20% of the general population; atopic individuals experience urticarial reactions even more frequently. Urticarial reactions result from vasodilation and transudation of fluid into the superficial skin layers (the epidermis); angioedema, which is produced by a similar process, occurs in deeper skin structures. Urticaria and, to a lesser extent, angioedema are classified as either acute or chronic: A chronic episode is arbitrarily defined as hives persisting for six weeks or longer. Although men and women are affected equally by acute urticaria, women in the fourth decade or older are more likely to experience the chronic form. The emergency physician should be aware that such dermatologic findings may be the initial or an early event that may culminate as a potentially life-threatening, multisystem allergic reaction (i.e., anaphylaxis).

A broad range of etiologies *(See Tables 1 and 2)* may be responsible for producing such reactions, including various foods and food additives, medications, infectious agents, inhalants, rheumatologic disease states, physical stimuli, hormones, and genetic predispositions. In any particular case, the precise trigger is not always identified despite extensive investigation and subspecialty consultation; overall, patients with acute urticarial events will have a triggering agent identified in only 50-60% of cases, whereas in chronic cases the precipitating factor is confirmed in only 5-20% of cases.[3,4]

Clinical Pathophysiology. The pathogenesis of urticaria and angioedema is complex and involves a number of triggering events and associated cellular reactions. Once exposed to a triggering mechanism, a cascade of cellular events is set in motion. All such triggers—regardless of the ultimate cellular response—result in the release of histamine and other mediators of allergic phenomena, which produce the clinical manifestations of urticaria and angioedema. Precipitant stimulate production of cyclic-GMP from GTP, which generates activating enzymes. These enzymes cause degranulation of intracellular histamine storage depots and other preformed mediators of allergic reaction. Released from mast cells, eosinophils, and basophils via this process, histamine is the primary mediator of any allergic reaction. A number of stimulatory events can lead to histamine release, including 1) cross linking of cellular antibodies via antigens (i.e., food, medications, inhalants); 2) cholinergic stimulation (i.e., acetylcholine); 3) physical stimuli, including temperature extremes, vibration, pressure, etc.; 4) nonimmunologic stimuli such as morphine, lobster, strawberries, etc.; and 5) anaphylatoxins, including complement fragments C3a and C5a. Upon its release, histamine produces an increase in vascular permeability and leakage of plasma fluids into the tissues.

The location of the reaction within the skin will determine characteristics of dermatologic manifestations. Urticaria results from capillary vasodilation and increased permeability in the epidermis; similar events in the dermis and subcutaneous tissues manifest as angioedema. Other related pathogenic actions include alterations in the arrachidonic acid pathways, complement-mediated responses, IgE-dependent hypersensitivity reaction, the actions of various chemotactic factors, and leukocyte infiltration.

Clinical presentation and diagnosis. The presentation of urticaria and angioedema usually are straightforward, and the diagnosis generally does not present difficulty. Patients with urticaria complain of pruritus, which can range range from mild and irritating to severe and disabling; they may also note burning or stinging sensations or superficial pain. The cutaneous reaction of urticaria consists of localized, well-circumscribed, raised, erythematous papules and plaques; the individual lesions vary in size from small, measuring 1-2 mm in diameter, to very large, with involvement of an entire body area. Individual lesions may coalesce, forming one large, confluent plaque that can cover the entire trunk. The skin is said to resemble an "orange peel." The lesions may be surrounded by either an erythematous ring or a zone of pallor; alternatively, normal skin may directly abut the lesion. Excoriations and other local skin

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Table 1. Etiologic Classifications of Urticaria (Acute and Chronic Forms)

FOOD AND FOOD ADDITIVES
- Shellfish, eggs, nuts, strawberries, wheat, yeast, various dyes and preservatives

MEDICATIONS
- Penicillins, NSAIDs, sulfa drugs, morphine, dextran, quinine, ACE inhibitors

INFECTIOUS AGENTS
- Bacteria (URI, UTI, dental, chest), fungus (particularly candidiasis), virus (hepatitis B, mononucleosis), protozoa (giardia, malaria), helminths

HORMONAL
- Pregnancy, premenstrual

INHALANTS
- Pollens, spores, mites, dust, aerosols, and volatile chemical agents

PHYSICAL STIMULI
- Pressure, exertional, solar, extremes of temperature, vibratory

MALIGNANCY
- Lymphomas, various carcinomas

RHEUMATOLOGIC DISEASE
- Serum sickness, rheumatic fever, SLE, rheumatoid arthritis, leukocytoclastic vasculitis

GENETIC

Table 2. Causes of Urticaria and Angioedema

MEDICATIONS
Aspirin, other salicylates, and NSAIDs
Codeine and other narcotic agents
Antibiotics—penicillins and sulfa drugs
ACE inhibitors

INGESTANTS/CONTRACTANTS
Food—shellfish, nuts, and strawberries
Inhalants—pollen, spores, and mites
Volatile chemicals and aerosols
Cosmetics
Animal and plant materials

PHYSICAL STIMULI
Extremes of temperature
Exercise
Pressure
Vibration

INFECTIONS (ACUTE, SUBACUTE, AND CHRONIC)
Viral
Bacterial
Parasitic

trauma may be seen in the patient with the intensely pruritic rash. True urticaria frequently appears abruptly and resolves quickly with appropriate therapy. Individual lesions are transient in nature, usually resolving within 1-3 hours, while new lesions may appear in other body areas. Single lesions rarely persist beyond a 24 hours.[3,4] *(See Figure 1 for an example of simultaneous urticaria and angioedema.)*

Angioedema is a more pronounced form of urticaria. It may involve any area of the body (skin or mucous membrane), especially the face, oral cavity, genitalia, hands, and feet. *(See Figure 2 for an example of angioedema involving the lips and face.)* Some patients may note only mild pruritus or related skin discomfort, whereas others may not complain of any skin irritation but identify only an unusual appearance or bodily dysfunction (i.e., inability to speak with lingual edema, airway compromise with laryngeal or lingual edema, or abdominal pain and emesis with gastrointestinal edema). The edema is usually nonpitting and asymmetric in distribution, and may be accompanied by scattered urticarial lesions. Angioedema usually is characterized by a slow progression to full development yet usually resolves within 24 hours. *(See Table 3 for a list of cutaneous lesions encountered in the patients with urticaria and angioedema.)*

The persistence of individual urticarial or angioedematous lesions beyond 24 hours should prompt consideration of alternative diagnoses, including urticarial vasculitis, Kawasaki syndrome, and erythema multiforme (EM). Allergic-mediated urticaria and angioedema tend to be relatively transient in nature with marked pruritus (urticaria only). Lesions resulting from a vasculitic process, Kawasaki disease, or EM will manifest little to no pruritus and will remain fixed in place for several days to weeks; in addition, other lesion morphologies may also be encountered. Patients with non-allergic hives may also note the presence of fever, malaise, myalgias, arthralgias, and abdominal pain. *(See Table 4 for the differential diagnosis of urticaria.)*

Management. Mild cases of acute urticaria can be treated with oral antihistamines (H_1 antagonists), including diphenhydramine (adult: 25-50 mg q6h; children: 4-6 mg/kg/24 hr given q6-8h not to exceed 200 mg in 24 hours) or hydroxyzine (adult: 25-100 mg q8h; children: 2-4 mg/kg/24 hr q8-12h not to exceed 200 mg in 24 hours). Additional medication-related therapy is probably not indicated in mild cases. In the moderate to severe case of urticaria, without respiratory or cardiovascular compromise, widespread body surface involvement and/or marked pruritus may be disabling due to pronounced pruritus. In these cases, parenteral therapy may be required to achieve a more rapid response to treatment. However, the oral route is recommended in all but extreme cases. H_1-antagonists may be used as noted above via the intramuscular or intravenous routes. Oral or parenteral H_2-antagonists (e.g., ranitidine or famotidine) have also demonstrated some benefit in urticaria, particularly in idiopathic and chronic forms of the disorder. Subcutaneous epinephrine in a 1:1000 concentration may be used in severe cases of pruritus at a dose of 0.3 mL for adults and 0.01 mL/kg for children not to exceed 0.3 mL; the beneficial effects of epinephrine will appear within several moments of administration and last for up to one

Table 3. Lesions of Uticaria and Angioedema

URTICARIA
Erythematous/white nonpitting papules/plaques
Peripheral erythematous ring or a zone of pallor
Localized/well-circumscribed
Coalescent lesions resembling an "orange peel"
Excoriations and other local skin trauma
ANGIOEDEMA
Nonpitting and asymmetric edema
Involving the oral cavity, genitalia, hands, and feet
Scattered urticarial lesions

Table 4. Differential Diagnosis of Urticaria and Angioedema

Erythema multiforme
Urticarial vasculitis
Kawasaki disease

Table 5. Antihistamines Useful in the Management of Urticaria/Angioedema

Medication	Adult Dose	Pediatric Dose
Diphenhydramine (Benadryl)	25-50 mg po/IV q6h	4-6 mg/kg/24h po/IV q6-8h (max 200 mg/24h)
Hydroxyzine (multiple names)	25-100 mg po/IV q8h	2-4 mg/kg/24h po/IV q8-12h (max 200 mg/24h)
Astemizole* (Hismanal)	10 mg po q24h	10 mg po q24h**
Cetirizine (Zyrtec)	5-10 mg po q24h	5-10 mg po q24h**
Fexofenadine (Allegra)	60 mg po q12h	not recommended***
Loratadine	10 mg po q24h	10 mg po q24h**

* Indication limited to chronic idiopathic urticaria (see package insert for details).

** Pediatric use is only recommended in children 6 years or older (see package insert for details).

*** Pediatric use is not recommended in package insert.

year. Susphrine, a "sustained effect" version of epinephrine, may be administered subcutaneously at one-half the epinephrine dose; the therapeutic effects of Susphrine are prolonged and may last for 4-6 hours. Systemic steroids—prednisone by mouth or methylprednisolone IV—are used in patients with symptomatically disabling reaction.[5] Both urticarial and angioedematous reactions not accompanied by airway involvement or hemodynamic compromise may be managed on an outpatient basis.

Additional medication options are available for the management of pruritus associated with chronic urticaria. These agents, termed the second-generation antihistamines, include astemizole, cetirizine, fexofenadine, loratadine, and terfenadine; terfenadine has been recently withdrawn from the market due to the risk of potentially fatal medication reactions. In general, these newer antihistamines offer the advantages of reduced dosing frequency and less sedative effect; these agents, however, are more costly than the traditional antihistamines. In general, comparisons of these new medications to hydroxyzine are favorable; comparisons among these second-generation agents do not demonstrate significant differences.[6,7] (*See Table 5 for a list of the various antihistamine medications used in the management of urticaria.)*

Angioedema cases associated with potential airway compromise represent medical emergencies. Intravenous antihistamines (H_1- and H_2-antagonists) and steroids, as well as subcutaneous epinephrine (or IV), may be required. Securing the airway via fiberoptic-guided endotracheal intubation or cricothyroidotomy may also be necessary. Admission to permit additional airway observation and/or management is required in patients with oropharyngeal angioedema.

The use of topical antihistamine preparations is discouraged because these topical antihistamine agents are readily absorbed and dosing is difficult to predict. Accidental overdosage may occur in patients who aggressively apply the preparations. Topical steroids have no proven clinical benefit and, therefore, are not recommended. Of course, attention toward identification and elimination of the trigger is warranted in all forms of urticaria and angioedema. Most cases of urticaria and angioedema will resolve in 1-3 days without sequelae. A minority of patients will require additional diagnostic evaluation aimed at trigger identification.

Erythema Multiforme

Erythema multiforme (EM) represents an acute inflammatory skin disease with a broad clinical spectrum that ranges from a localized papular eruption of the skin (EM minor) to a severe, multisystem illness (EM major) with widespread vesiculobullous lesions and erosions of the mucous membranes (Stevens Johnson Syndrome [SJS]). Lyell disease (toxic epidermal necrolysis [TEN]) is also considered a form of EM major in certain classification schemes,[8] though such controversy will not effect management and disposition decisions for the emergency physician. The disorder strikes all age groups, with the highest incidence in young adults (20-40 years of age). It affects males twice as often as females and occurs commonly in the spring and fall. Many factors have been implicated in the etiology of EM, including infection, drugs, and malignancies.[9] Drug reactions (particularly antibiotics and anticonvulsants) and malignancies are important causes of EM in older patients, whereas mycoplasma and herpetic infections are the most common precipitants in children. Approximately 50% of all cases lack an identifiable etiology.

The pathogenesis of EM remains largely unknown. Most likely, it is the result of a hypersensitivity reaction. Immunoglobulin and complement components can be demonstrated in the cutaneous microvasculature via immunofluorescence studies of skin biopsy specimens; in addition, there are circulating immune complexes in the serum, and a mononuclear cell infiltrate on histologic examination.[8]

Table 6. Lesions of EM
Erythematous papule/macule
Maculopapule
Iris (or target) lesion
Uritcarial lesion
Vesiculobullous
Mucous membrane involvement

Table 7. Differential Diagnosis of EM
Herpetic infection
Vasculitis
Toxic epidermal necrolysis
Primary blistering disorders
Pemphigus and pemphigoid
Toxic-infectious erythemas

Clinical presentation and diagnosis. Patients with EM frequently report malaise, fever, myalgias, arthralgias, diffuse pruritus, and/or a generalized burning sensation before the development of skin lesions. The morphological configuration of the lesions is quite variable. *(See Table 6.)*

Maculopapular and target (iris) lesions are the most characteristic. Erythematous papules appear symmetrically on the dorsum of the hands and feet, as well as the extensor surfaces of the extremities. The maculopapule evolves into the classic target lesion over the next 24-48 hours. As the maculopapule enlarges, the central area becomes cyanotic, and occasionally is accompanied by central purpura and/or a vesicle. *(See Figure 3.)* Urticarial plaques may also occur with or without the iris lesion in a similar distribution. In contrast to true urticaria, EM lesions are approximately the same size (1-2 cm), nonpruritic, and persist for 1-2 weeks. *(See Figure 4.)* Partially formed target lesions may resemble urticaria. Vesiculobullous lesions, which may be pruritic and painful, develop within pre-existing maculopapules or plaques, usually on the extensor surface of the arms and legs and less frequently involving the trunk. Vesiculobullous lesions are most often found on mucosal surfaces, including the mouth, eyes, vagina, urethra, and anus.

Lesions develop in successive crops during a 2-4 week period and heal over a course of 5-7 days. Scarring is rarely a problem except in cases of secondary infection or in heavily pigmented patients in whom hypopigmentation or hyperpigmentation may occur. Recurrence may be noted on repeat exposure to the etiological agent, which is a special concern in cases associated with herpes simplex infection or medication use.[10]

Complications of EM include fluid and electrolyte deficiencies, secondary infection, sepsis, ophthalmological sequelae, and multiorgan failure syndrome. In particular, the ophthalmological sequelae may be severe and disabling in that permanent visual impairment may occur. Ocular involvement occurs in approximately 10% of patients with EM minor while the SJS variant experiences ophthalmological lesions in almost three-quarter of cases.[11] The differential diagnosis of EM includes herpetic infection, vasculitis, toxic epidermal necrolysis, various primary blistering disorders (pemphigus and pemphigoid), urticaria, Kawasaki disease, and the toxic-infectious erythemas. *(See Table 7.)*

Management. Outpatient treatment of EM minor with topical corticosteroids is sometimes possible. However, steroids should not be applied to eroded areas of the skin. Dermatological consultation and close follow-up are strongly encouraged. Those patients with extensive disease, systemic toxicity, and/or mucous membrane involvement require hospitalization, optimally in the intensive care or burn unit setting in which secondary infections, fluid deficits, electrolyte disorders, and nutritional demands are best managed.

Systemic steroids are commonly used to provide symptomatic relief, but are of unproven benefit as far as duration and outcome of EM.[12-14] Some studies suggest an increased incidence of infection with systemic steroid therapy.[13] Many authorities recommend a short, intensive steroid course, particularly in drug-related cases, with abrupt cessation in 3-5 days if no favorable response is noted. This rapid intensive steroid therapy is felt to offer the patient the possible benefits steroids, while avoiding the complications of corticosteroid use.

Systemic analgesics and antihistamines will provide symptomatic relief. Stomatitis is treated with diphenhydramine and viscous lidocaine mouth rinses. Blisters are treated with cool, wet Burow's solution (aluminum sulfate/calcium acetate in aqueous solution) compresses. Ocular involvement should be monitored by an ophthalmologist; unfortunately, burst steroid therapy does not appear to reduce either the chance of development or significant existing ocular lesions.[11] EM, particularly SJS, has significant morbidity and a mortality rate of approximately 10%, despite aggressive therapy. The most common causes of death are sepsis and fluid-electrolyte deficits.

Toxic Epidermal Necrolysis

Toxic epidermal necrolysis (TEN) is an explosive dermatosis characterized by tender erythema, bullae formation, and subsequent exfoliation with associated systemic toxicity. As previously stated, TEN may present as a severe form of EM major.[8] TEN is found in all age groups and shows no predilection to gender. The syndrome has multiple etiologies, with medications most commonly implicated.[8,9,15-18] The most frequently encountered medications include antibiotics, anticonvulsants, and nonsteroidal anti-inflammatory drugs (NSAIDs). In one large series, a drug was identified as the causative agent in 77% of cases, with the following medications implicated: sulfonamide antibiotics (30 cases); NSAID, especially phenylbutazone and oxicam derivatives (29 cases); anticonvulsants (7 cases); allopurinol (3 cases); chlormezanone (3 cases); and miscellaneous medications (7 cases), including aspirin, antipyretics, and non-sulfa antibiotics.[19] Malignancy, however, is another causative factor in TEN.[20,21c] In many cases, an etiology is not found. Patients with HIV are particularly prone to TEN for unknown reasons.[22]

The pathogenesis of TEN is poorly understood, but it is felt to be partly immunological.[23] Human lymphocyte antigen (HLA) typing has suggested a possible genetic predisposition (increased incidence of HLA-B_{12} in many patients).[24]

Clinical presentation and diagnosis. Patients with TEN often present with a prodrome suggestive of a viral illness, including malaise, anorexia, arthralgias, fever, and upper respiratory infection symptoms. The prodromal symptoms, if present, occur 1-2 weeks prior to the development of dermatological findings. Skin tenderness, pruritus, tingling, or burning may

Table 8. Lesions of TEN
Warm, tender erythroderma
Vesicle
Bulla
Vesiculobulla
Exfoliation
Muccous membrane involvement

Table 9. Differential Diagnosis of TEN
Erythema multiforme
Toxic shock syndrome (staph and strep)
Staphylococcal scalded skin syndrome
Exfoliative drug reactions
Primary blistering disorders
Pemphigus and pemphigoid
Kawasaki syndrome

be reported during this period.[20,21]

The onset of objective skin findings is characterized by warm erythema, which initially involves only the face (in areas around the eyes, nose, and mouth) and genitalia, but later becomes generalized. (*See Table 8.)* The erythematous areas become tender and confluent within hours of onset. *(See Figures 5a and 5b.)* Tender erythema is especially characteristic of early TEN. Flaccid, ill-defined bullae appear within the areas of erythema. Lateral pressure with a finger on normal skin adjacent to bullous lesion dislodges the epidermis, producing denuded dermis and demonstrating Nikolski's sign. *(See Figure 6.)* The bullae form along the cleavage plane between the epidermis and the dermis. The epidermis is then shed in large sheets, leaving raw, denuded areas of exposed dermis. *(See Figure 7.)*

Stomatitis and conjunctivitis may precede the erythematous rash by 24-48 hours. Mucous membrane involvement is an early, characteristic finding of TEN. Oral lesions, which typically are blistering and are characterized by subsequent erosions, are found in the vast majority of patients. Orolabial lesions are disfiguring and often impair adequate oral intake, which may contribute to the significant fluid deficits present in most cases. The eyes are also commonly affected (approximately 75% of patients),[11,20,21] producing purulent conjunctivitis, painful erosions, and potential blindness. Anogenital lesions are found in about one-half of all TEN patients. In 60-65% of cases, there are simultaneous oral, ocular, and anogenital lesions. Additional mucous membrane involvement may be seen in the respiratory, gastrointestinal, and genitourinary tracts.[25]

The average time of onset of symptoms after exposure to the inciting agent is about two weeks. Cutaneous extension follows an unpredictable time course, ranging from 24 hours to 15 days, with a minority of severe cases demonstrating rapid, extensive involvement within 24 hours. The extent of skin involvement is variable, with an average of approximately 40% of body surface area. Sequelae include cutaneous and mucosal scarring, hypopigmentation/hyperpigmentation, and blindness. The differential diagnosis of TEN includes staphylococcal scalded skin syndrome (SSSS), EM, toxic shock syndrome (staphylococcal and streptococcal), exfoliative drug reactions, primary blistering disorders (pemphigus and pemphigoid), and Kawasaki disease. *(See Table 9.)*

The two major complications and leading causes of death in TEN are infection (pneumonia[25] and sepsis) and hypovolemia accompanied by electrolyte disorders. A broad range of pathogens are usually found, with staphylococcal and pseudomonal species predominating. The mortality rate has been reported to be 25-30%.[19,22] The following clinical variables are associated with poor prognosis: advanced age, extensive disease, idiopathic nature, multiple medication use, azotemia, hyperglycemia, leukopenia, and thrombocytopenia.

Management. Management of TEN requires hospitalization, optimally in a critical care setting or burn unit. In most cases, therapy is similar to the approach for the burn patient. Immediate concerns center on protecting and monitoring an adequate airway, as well as restoration and maintenance of circulatory volume. Correction of significant electrolyte disorders should also be addressed. Prompt, aggressive antibiotic administration is necessary in suspected or documented infection; initial prophylactic antibiotics are not recommended by most authorities.[22] Petrolatum gauze dressings applied to denuded areas provide a partial barrier against fluid and electrolyte losses. Elimination and/or treatment of any inciting factor is required. As with EM major, any ocular complaints or findings should be explored early by an ophthalmologist; the response to aggressive steroid therapy does not appear to alter the progression of ocular manifestations of TEN.[11]

Exfoliative Dermatitis

Exfoliative dermatitis, a cutaneous reaction produced in response to a drug or a chemical agent or to an underlying systemic disease, refers to a condition in which most or all of the skin surface is affected by a scaly erythematous dermatitis. Men are afflicted twice as often as women; at least 75% of patients are older than 40 years.[26-28] The mechanisms responsible for exfoliative dermatitis are not known.

Exfoliative dermatitis can have an abrupt onset, especially when it is associated with a drug, contact allergen, or malignancy. In contrast, exacerbations related to an underlying cutaneous disorder usually evolve more slowly. One study demonstrated that exfoliative dermatitis tends to be a chronic condition with a mean duration of five years when related to a chronic illness;[26] a shorter course often follows suppression of the underlying dermatosis, discontinuation of causative drugs, or avoidance of allergen. Both idiopathic and chronic disease-related exfoliative dermatitis can continue for 20 or more years; death is rare solely due to exfoliative dermatitis.

Clinical presentation and diagnosis. Generalized erythema and warmth is noted and is similar to that seen in patients with TEN; the erythema is accompanied by scaling or flaking and patients often complain of pruritus with tightness of the skin. In contrast to the patient with TEN, tenderness of the involved skin is usually not present, in contrast to the TEN patient. The patient usually presents with a low-grade fever. Active erythroderma is complicated by excessive heat loss that may manifest as hypothermia. The widespread and marked cutaneous vasodilation may result in high-output congestive heart failure in patients with little cardiovascular physiologic reserve. Disruption of the epidermis results in increased transepidermal water loss, and

Table 10. TSS Case Definition

MAJOR CRITERIA

- Fever—Temperature > 102°F
- Rash—Erythroderma (localized or diffuse) followed by peripheral desquamation in 5-14 days.
- Mucous membrane—Hyperemia of oral and vaginal mucosa and of conjunctiva
- Hypotension—History of dizziness, orthostatic changes, or hypotension

MULTISYSTEM MANIFESTATIONS

- CNS—Altered mentation without focal neurological signs
- Cardiovascular—Evidence of distributive shock (loss of peripheral vascular resistance, hyperdynamic cardiac state, and increased vascular permeability); heart failure with or without pulmonary congestion; and supraventricular or ventricular dyshrythmias, nonspecific T-wave/ST-segment changes, and atrioventricular blocks
- Pulmonary—Adult respiratory distress syndrome
- Gastrointestinal—Vomiting and diarrhea
- Hepatic—Elevations (at least twice normal) in bilirubin, alkaline phosphatase, and the transaminases
- Renal—Blood urea nitrogen and/or creatinine at least twice normal; abnormal urinary sediment without urinary tract infection oliguria
- Hematological—Thrombocytopenia or thrombocytosis; anemia; leukopenia or leucytosis
- Musculoskeletal—Myalgias; arthralgias, rhabdomyolysis
- Metabolic—Hypocalcemia; hypophosphatemia
- Absence of other etiological agent—Cultures of all body fluids negative (may be positive for *S. aureus*); no serological evidence of leptospirosis, rickettsial disease, or rubeola; no clinical evidence of Kawasaki syndrome

Note: The diagnosis of TSS requires the presence of all four major criteria and three or more indications of multisystem involvement.

continued exfoliation can produce significant protein loss and negative nitrogen balance. Chronic inflammatory exfoliation produces many changes, such as dystrophic nails, thinning scalp and body hair, and patchy or diffuse pigmentation changes.

Various erythrodermas may mimic exfoliative dermatitis; however, the presence of ichthyosis in other family members, the lifelong presence of disease, and the morphologic detail in scale and anatomic distribution make differentiation easy.

Management. Considerable effort must be made to identifiy the underlying etiology. This requires taking a careful history to document previous cutaneous disease and recent drug use, as well as laboratory tests, to establish whether there is a possible association with malignancy. Biopsy of involved skin and lymphadenopathy are indicated. Some patients respond to application of topical corticosteroids and oral antihistamines for their pruritus and low-grade pain. A significant percentage of patients require systemic corticosteroids. When systemic steroids are used, the patient can apply bland lotions or creams rather than topical corticosteroid preparations. Tepid colloidal baths, such as cornstarch or oatmeal powder suspension, are of some benefit as well. A patient with a newly diagnosed case of exfoliative dermatitis or one who is experiencing an acute exacerbation should be hospitalized for aggressive skin care, supportive therapy, and continued evaluation. Caution must be exercised in these patients. Those with widespread erythroderma require conservative management with an inpatient disposition and early dermatologic consultation.

Toxic Shock Syndrome

In 1978, Todd et al described a multisystem illness presenting with fever, shock, and erythroderma followed by desquamation; the authors noted an association between the illness and infection with toxigenic *Staphylococcus aureus*—the syndrome was named toxic shock syndrome (TSS).[29] Initially, the vast majority of cases involved menstruating women using extra-absorbent tampons.[30] With removal of these tampons from the market and increased physician awareness of the illness, a 30-50% increase in nonmenstrual cases has been reported.[31,32] Nonmenstrual cases of TSS involve either colonization with or infection by a *S. aureus* species capable of toxin production; this syndrome has been reported in association with acute infection and the presence of indwelling foreign bodies.

Women experience 85-90% of all cases of TSS.[33,34] The preponderance of cases in women is largely the result of the continued prevalence in menstrual cases. TSS has been reported in all age groups from neonatal to geriatric, but is most commonly encountered in patients 15-34 years of age, with one-third of cases occurring in the 15-19 age group and two-thirds in patients younger than 25 years of age. Patients with a nonmenstrual source of TSS are often older (27 years of age) than those with a menstrual etiology (22 years of age).[35]

Infection with, or colonization by, toxin-producing strains of *S. aureus* is required for the development of TSS. *S. aureus* can be isolated from specific soft tissue sites in the majority of cases, although blood cultures are often sterile. The numerous manifestations of illness are felt to originate from both the actions of a specific staphylococcal toxin and from myriad humoral mediators of acute injury.

Protean clinical manifestations of TSS range from a mild, trivial disease, often misdiagnosed as a viral syndrome, to a rapidly progressive, potentially fatal, multisystem illness. Criteria for the diagnosis of TSS are defined in the case definition. *(See Table 10.)* In this regard, the typical patient with TSS will present with erythroderma, fever, hypotension, and other evidence of organ involvement. A prodrome of fever, chills, arthralgias, myalgias, nausea, vomiting, and diarrhea may precede the more dramatic manifestations of the syndrome by 2-4 days. The majority of patients are hospitalized after 1-2 days of active illness. In addition to the characteristics listed in the case definition, TSS also is identified by its sudden onset and rapid progression to multisystem dysfunction.[35]

The dermatological hallmark of TSS is a nonpruritic, blanching macular erythroderma, which is a characteristic feature and an important criterion for the diagnosis. *(See Figure 8.)* As a result, the erythroderma is diffuse, although it may be confined to the extremities or trunk and frequently resembles a typical sunburn. The rash, however, may be subtle and is often missed altogether in heavily pigmented patients or in patients examined in a poorly illuminated room. By definition, the rash is noted at presentation and may resolve in 3-5 days. If the patient survives, a fine desquamation of the hands and feet follows in 5-14 days.

Table 11. Differential Diagnosis of Toxic-Infectious Erythemas

Scarlet fever
Rocky Mountain spotted fever
Leptospirosis
Rubeola
Meningococcemia
Streptococcal TSS
Staph scalded skin syndrome
Kawasaki disease
Toxic epidermal necrolysis
Stevens-Johnson syndrome
Gram-negative sepsis
Exfoliative drug eruptions
Localized bullous lesion

(See Figure 9.) Other dermatological manifestations include conjunctival and mucosal hyperemia, petechiae, alopecia, and fingernail loss.

The differential diagnosis *(see Table 11)* is broad, and includes scarlet fever, Rocky Mountain spotted fever, leptospirosis, rubeola, meningococcemia, streptococcal TSS, SSSS, Kawasaki disease, toxic epidermal necrolysis, SJS, gram-negative sepsis, and exfoliative drug eruptions.

Management of patients with TSS is dictated by the severity of their illness. As in any patient presenting in extremis, the emergency physician must perform a rapid, thorough assessment of the ABCs, insure a stable airway and ventilatory status, and support hemodynamic status. After stabilizing the patient, subsequent management objectives include identification and removal of any potential source of *S. aureus* and associated toxin (e.g., foreign bodies such as nasal packing or vaginal tampon, infected wound, and abscess). Finally, the patient must be monitored closely for evidence of organ system dysfunction. The vast majority of patients with TSS will require hospital admission and the patient who is critically ill is best managed in the intensive care unit. Vigorous fluid resuscitation, use of vasopressors and inotropic agents, and endotracheal intubation with mechanical ventilation are potential management options.

Antibiotic therapy with an appropriate antistaphylococcal agent is recommended. The use of antibiotics will not alter the course of the disease, but it has been shown to reduce the rate of recurrence, which is more common in menstrual cases. The use of corticosteroids is controversial and, currently, cannot be recommended.[2,10]

Toxic Streptococcal Syndrome

A syndrome similar to TSS, caused by *Streptococcus* organisms, has been described.[36,37] Streptococcal TSS (STSS) is a clinical syndrome involving multiple organ systems and is characterized by fever, hypotension, and skin findings. A retrospective review of hospital records from 1985 to 1990 identified 128 patients, aged 6 months to 96 years, with invasive group A streptococcal infection.[38] The causative agent of this clinical disorder is *Streptococcus pyogenes* (group A *Streptococcus*), a *Streptococcal* species that produces extracellular proteins called streptococcal pyrogenic exotoxins (SPEs). The presence of invasive streptococcal infection seems to be a common etiologic factor in STSS. One review noted that 75% of cases of STSS were associated with soft-tissue infections, among them cellulitis, myositis, and fasciitis.[39]

The clinical presentation of STSS is similar to that of staphylococcal TSS. Virtually all patients present with fever and hypotension. Skin findings, including swelling, erythema, or bullae, are found in up to 80% of patients. Subsequent desquamation is less common than in staphylococcal TSS.[40] From a clinical perspective, the clinician should consider STSS as a diagnostic possibility in any patient with fever, skin findings, and hypotension associated with a soft-tissue infection. The same major and minor criteria used to confirm the diagnosis of staphylococcal TSS are helpful for identifying patients with STSS. *(See Table 10.)* According to a consensus document, clinical features must include isolation of group A streptococci (*S. pyogenes*), hypoperfusion of target organs, and evidence of multisystem dysfunction.

Because as many as 75% of cases of STSS have an associated soft-tissue infection, exhaustive search for a site of infection is warranted. In this regard, a thorough skin examination is essential; the emergency physician should look for erythema, bullae, skin discoloration, and cellulitis. Palpation of muscle groups may demonstrate tenderness, indicating possible myositis or fasciitis. In extremity infections (myositis, fasciitis), elevated intracompartmental pressures may produce a compartment syndrome. Muscle compartment pressure monitoring may aid in making the diagnosis. The differential diagnosis of STSS is similar to that for staphylococcal TSS.

Management. Successful management of STSS requires early recognition and aggressive supportive care. As with TSS, prompt attention to ABCs and rapid correction of any derangements in these functions must be performed. The most important aspect of early management is aggressive fluid resuscitation. The clinical examination, chest radiograph, and arterial blood gas analysis should be monitored closely for impending respiratory failure. Because soft-tissue infection plays a large role in STSS, aggressive management of these infections is essential. Whether external or internal, the site of infection should be identified, and, if appropriate, quickly incised, and drained; debridement of nonviable tissue is essential. In severe myositis or fasciitis, limb amputation may be necessary to prevent fatal sepsis.[41] Because STSS is often associated with a focus of infection and bacteremia, parenteral anti-streptococcal antibiotics are required. Initially, this requires a combination of antibiotics to provide broad coverage until the pathogen is identified. Additional coverage is based on final culture and sensitivity results. Because of multisystem involvement and the propensity toward renal failure and ARDS, intensive care unit admission with invasive hemodynamic monitoring is usually necessary. Milder cases with appropriate monitoring may be managed outside of the intensive care unit.

Staphylococcal Scalded Skin Syndrome

Staphylococcal scalded skin syndrome (SSSS), also known as Ritter's disease, staphylococcal epidermal necrolysis, or staphylococcal epidermolytic syndrome, develops in patients with a clinically inapparent staph infection caused by a toxigenic organism. SSSS is one of several staphylococcal epidermolytic toxin syndromes, including bullous impetigo and scarlatiniform (staphylococcal scarlet fever) eruption. SSSS occurs in sporadic cases, as well as in outbreaks in nurseries and similar groupings

of infants and toddlers aged 6 months to 6 years.[42] A large case series of SSSS showed that 62% of patients were younger than 2 years of age, with 98% of patients younger than age 6.[43] Children who are afflicted with SSSS usually are healthy and otherwise normal, in contrast to adults who develop this disorder. The rare adult case occurs in individuals with chronic immunosuppression (e.g., steroid therapy) or moderate-to-severe renal insufficiency. The exotoxins involved, collectively known as exfoliatin, are elaborated by the bacteria, released into the circulation, and are responsible for such clinical manifestations as erythroderma followed by desquamation. The patient's immune response to antigenic toxin produces fever and irritability.

The exotoxin produces an antibody-mediated immune response directed against the toxin. Antitoxin antibodies are found in more than 75% of the population older than 10 years of age.[44] This finding explains the rarity of the syndrome in older children and adults. Additionally, the rare adult case results from inadequate renal clearance of the toxin in patients with chronic renal disease and suppressed immunity. Infants and children have creatinine clearances approaching 50% of adult values. In the adult with chronic renal disease or the pediatric patient with normal renal function, this relatively low creatinine clearance theoretically allows accumulation of the toxin with subsequent clinical disease.[45,46]

SSSS frequently begins as a clinically inapparent staphylococcal infection of the conjunctiva, nasopharynx, or umbilicus. The disease course can be divided into three phases: 1) initial/erythroderma; 2) exfoliative; and 3) desquamation and recovery. Initially, the patient (or parent) notes the sudden appearance of a tender diffuse erythroderma; localized disease also has been described. The involved skin may have a sandpaper texture similar to the rash of scarlet fever (which presents with a nontender rash). The tender erythema of SSSS is prominent in the perioral, periorbital, and groin regions, as well as in the skin creases of the neck, axilla, popliteal, and antecubital areas. *(See Figure 10.)* The mucous membranes are spared.

The exfoliative stage begins on the second day of the illness. Erythematous skin wrinkles and peels off at sites of minor trauma or with minimal lateral pressure with the examiner's fingertip, illustrating the positive Nikolski's sign (also found in TEN). Large, flaccid, fluid-filled bullae and vesicles appear next. These lesions rupture easily and are shed in large sheets; the underlying tissue resembles scalded skin and rapidly desiccates. During the exfoliative phase, the patient is often febrile and irritable. After 3-5 days of illness, the involved skin desquamates, with recovery of normal skin within 7-10 days. The vast majority of patients survive with supportive care. Additionally, cultures of the blood, nasopharynx, conjunctiva, and any obviously infected site are recommended, although the clinical utility is of these cultures is questionable since they are usually sterile due to toxigenic nature of the syndrome. The differential diagnosis of SSSS includes toxic epidermal necrolysis, TSS, exfoliative drug eruptions, staphylococcal scarlet fever, and localized bullous impetigo. *(See Table 11.)*

Management of the patient with SSSS includes fluid resuscitation and correction of electrolyte abnormalities, as well as identification and treatment of the source of the toxigenic *Staphylococcus*. Appropriate anti-staphylococcal antibiotics, preferably a penicillinase-resistant penicillin, is recommended. Fluid deficits and associated electrolyte deficiencies can be clinically significant because of loss of the skin as a protective barrier, reduced oral intake, and associated fever. Corticosteroids are contraindicated because of the interference with proper immune system functions. Most patients, with the exception of neonates, do not require topical therapies. The newborn may be treated with topical sulfadiazine or its equivalent. Wet dressings are not recommended. The majority of cases require antibiotics and careful monitoring.

Cutaneous Vasculitis

Vasculitis refers to a series of diseases caused by blood vessel inflammation. These conditions are characterized by perivascular inflammatory cell infiltration, vessel necrosis, and leukocytoclasis. Vasculitis may be a primary disease process or develop secondarily to other systemic abnormalities. The effects of vasculitis may be confined to the skin or may involve multiple organ systems. The pathogenesis of vasculitis is not well understood. This section will deal with cutaneous vasculitis as both a primary skin disorder and as well as a reflection of underlying systemic disease.

In cases in which an etiology for cutaneous vasculitis is identified, the most common causative syndrome was rheumatoid arthritis (13%). Other precipitants include food reactions, medications (penicillin, cephalosporins, cyproheptadine, procainamide, thiazide, aspirin), infections (group A streptococcal upper respiratory tract infections, bacterial otitis media, and viral hepatitis), collagen vascular diseases, and regional enteritis. In one large series, no such agent or syndrome was found in the majority of cases (54%).[33]

Clinical presentation and diagnosis. A detailed history is mandatory in patients with cutaneous vasculitis. Drug use (over-the-counter, illegal, and prescription) and infectious exposures should be documented. The history and review of systems may show evidence of systemic involvement. Clinical findings may include arthralgias, myalgias, arthritis, myositis, and renal involvement with hematuria and proteinuria; gastrointestinal involvement may be characterized by abdominal pain, nausea, bloody stools, hematemesis, and pancreatitis. Pulmonary, cardiac, ocular, and neurological symptomatology are less common.

Physical examination will demonstrate the vasculitic skin lesions. Other findings will depend on the presence of associated systemic illness. The most common skin manifestation of vasculitis is palpable purpura.[47,48] Other associated lesions include urticaria, ulcerative lesions, erythematous papules and nodules, vesiculobullous lesions, and livedo reticularis. *(See Figures 11a and 11b.)*[47-49] Lesions associated with cutaneous vasculitis commonly are located symmetrically on the lower extremities, usually on the feet and ankles.[47-49] The majority of patients will have a limited disease course without significant discomfort; the lesions, however, with their alarming and disfiguring appearance, usually prompt the ED visit. The disease usually lasts several weeks to months; the rare patient may have a chronic or relapsing course over a several year period.

Laboratory values are nonspecific in the evaluation of cutaneous vasculitis. Most patients will have an elevated erythrocyte sedimentation rate or C-reactive protein, especially if there is an associated connective tissue disease. Patients may have an abnormal complete blood cell count with anemia, leukopenia, or leukocytosis; thrombocytosis may be seen due to the "acute-

phase-reactant" nature of the platelet; eosinophilia may be present. Urinalysis and renal function tests may show azotemia, hematuria, pyuria, and proteinuria; the urinalysis is an excellent screening tool for systemic vasculitis. The stool may be positive for gross or occult blood. Definitive confirmation of the diagnosis is made with a skin biopsy.

Management. Antihistamines may be prescribed for symptomatic relief and they may prevent development of new skin lesion. Steroids may be used for severe disease. Prednisone 60 mg/d, in divided doses, usually will control cutaneous manifestations. Because the disease course is usually limited to several weeks, steroids should be tapered after the cutaneous symptoms have been controlled. Painful arthralgias and myalgias can be treated with NSAIDs. If cutaneous involvement is secondary to exogenous agents (drugs, food, or infection), they should be identified and removed. Vasculitis associated with systemic illness should resolve with treatment of the underlying disorder.[47-49] Although most patients will respond to conventional treatment, some will develop recurrent skin disease during steroid taper, which may be refactory to further therapy. Numerous therapeutic approaches have been suggested, with variable success in patients with recalcitrant disease, including chronic corticosteroid use, colchicine, and dapsone.

Patients with isolated cutaneous vasculitis or mild systemic symptomatology can be treated symptomatically and discharged home. Although identification of the etiological factor is recommended, the majority of the cases are idiopathic and identification may not be possible. Early dermatological follow-up is essential. Outpatients with cutaneous vasculitis should be watched closely for development of systemic disease.

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Physician CME Questions

97. After viewing 100 color slides of various skin lesions, second-year medical residents made a correct diagnosis of dermatologic complaints in what percentage of cases?
    A. 50%
    B. 72%
    C. 21%
    D. 11%
    E. 58%

98. A chronic episode of uticaria and andiodema is arbitrarily defined as a case of hives persisting for how long?
    A. Six weeks or longer
    B. One month or longer
    C. Three weeks
    D. Two weeks
    E. 12 days

99. Patients with uticaria can complain of:
    A. burning sensations.
    B. pruritus.
    C. stinging sensations.
    D. superficial pain
    E. all of the above.

100. Angiodema may involve any area of the body, especially:
    A. the face.
    B. the hands and feet.
    C. the oral cavity.
    D. the genitalia.
    E. all of the above.

101. In many cases of toxic epidermal necrolysis (TEN), a drug was identified as the causative agent. Which medication was implicated most often in the study by Porteous and Berger?
    A. Anticonvulsants
    B. Chlormezanone
    C. Allopurinol
    D. Sulfonamide antibiotics
    E. Anti-pyretics

102. Of all toxic shock syndrome (TSS) cases, women account for what percent?
    A. 50%
    B. 70-75%
    C. 85-90%
    D. 95%
    E. 60-65%

103. A review of streptococcal TSS cases reported that 75% of all cases were associated with:
    A. cellulitis.
    B. myositis.

C. fasciitis.
D. all of the above.

104. In cases of cutaneous vasculitis in which etiology could be identified, the most common cause was:
A. rheumatoid arthritis.
B. upper respiratory tract infection.
C. bacterial otitis media.
D. regional enteritis.
E. food reactions.

Corrections

In the May 25, 1998 issue of *Emergency Medicine Reports* in the article "Acute Bacterial and Viral Meningitis in Adults: Time-Sensitive Strategies for Optimizing Patient Outcomes," Table 1 should have contained this attribution: Adapted from: Maxson S, Jacobs RF. Viral meningitis. *Postgrad Med* 1993;93:153-166; Nelsen S, Sealy DP, Schneider EF. The aseptic meningitis syndrome. *Am Fam Phys* 1993;48:809-815.

Table 2 should have contained this attribution: Adapted from: Segreti J, Harris A. Acute bacterial meningitis. *Inf Dis Clin North Am* 1996;10:797-809.

Table 6 should have contained this attribution: Adapted from: Segreti J, Harris A. Acute bacterial meningitis. *Inf Dis Clin North Am* 1996;10:797-809; Martin JB, Tyler KL, Scheld WM. Bacterial meningitis. In: Tyler KL. Martin JB, eds. *Infectious Diseases of the Central Nervous System (Contemporary Neurology Series).* Philadelphia: FA Davis, 1993:176-178; Ashwal S. Neurologic evaluation of the patient with acute bacterial meningitis. *Neurol Crit Care* 1995;13:549-577.

On page 97 under the section "Interpretation of Lumbar Puncture," Item No. 4 should have read "Total CSF leukocyte count > 2 x 10^6 /L; Item No. 5 should have read "Total CSF neutrophil count > 1180 x 10^6 /L.

On page 98, the last sentence of the fourth paragraph from the end of the section "Intepretation of Lumbar Puncture" should have read: "Outpatient LP is *not* appropriate for patients who have already received antibiotics within the week prior to presentation or in children younger than 1 year of age."

The pages of the May 25, 1998 issue should have been 108-119.

The June 8, 1998 issue should have included the following peer reviewer: Robin Hemphill, MD, Research Director, Wilford Hall Medical Center, Department of Emergency Medicine, San Antonio Uniformed Services Health Education Consortium, San Antonio, TX.

In the June 8 issue, the physician CME questions should have been numbered 89-96.

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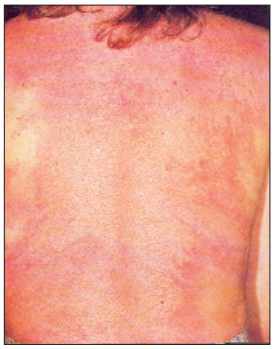

Figure 1. Mixed urticaria and angioedema on the back.

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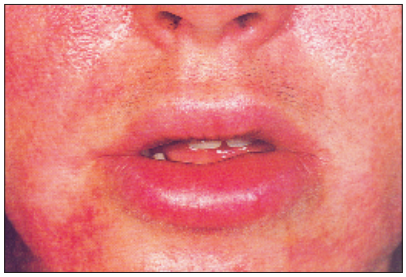

Figure 2. Angiodema of the face and lips

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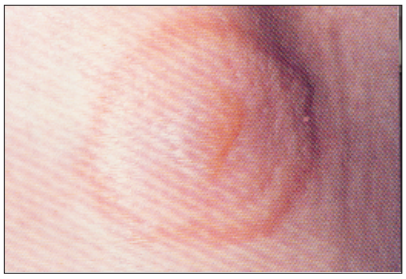

Figure 3. Iris or target lesion, a finding strongly suggestive of EM. This iris lesion is composed of a central bullous lesion with dusky, edematous center and erythematous halo.

Used with permission: Brady WJ, et al. *Am J Emerg Med* 1994;12:217-237.

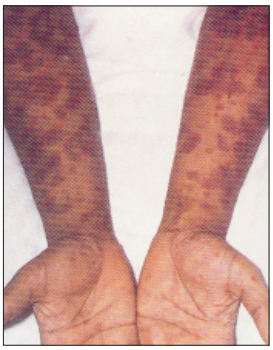

Figure 4. Erythema multiforme: Symmetrical, plaque-like lesions involving the flexor surface of the upper extremities—lesions that may be misdiagnosed as the IgG-mediated urticarial allergic reaction. Also note the erythematous macules on the palms.

Used with permission: Brady WJ, et al. *Am J Emerg Med* 1994; 12:217-237.

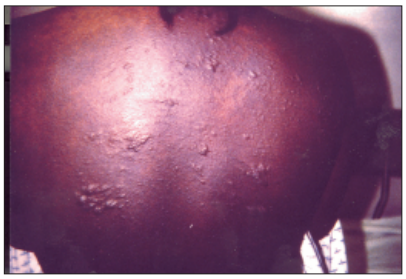

Figure 5a. Diffuse, tender, warm erythroderma with scattered bullous lesions in a patient with sulfa-related episode of toxic epidermal necrolysis.

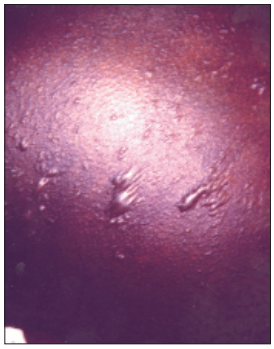

Figure 5b. Bullous lesions of TEN.

Figure 6. Nikolski's sign in a patient with TEN.

Figure 7. Raw, denuded tissue after skin loss in TEN.

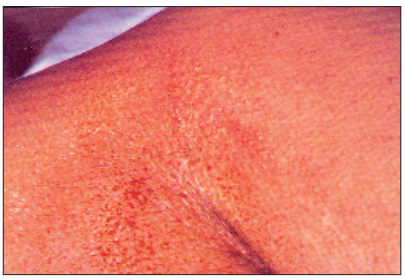

Figure 8. Blanching, nonpruritic erythroderma with scattered bullous lesions with a "rough" texture in a patient with TSS.

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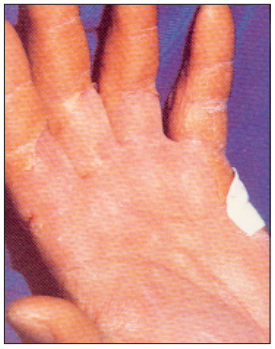

Figure 9. Superficial desquamation of the palms in a TSS patient 10 days after onset of illness.

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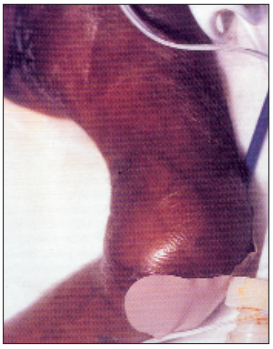

Figure 10. SSSS with "sandpaper" ertyhema and superficial desquamation in a child with septic arthritis involving *Staphylococcus aureus*.

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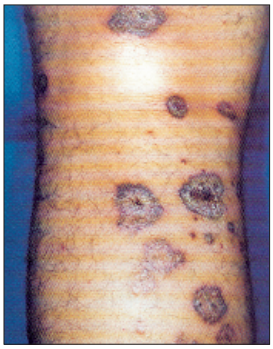

Figure 11a. Vasculitis: Palpable purpura with central necrosis.

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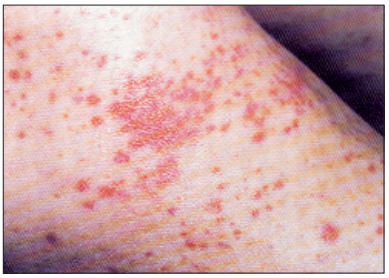

Figure 11b. Vasculitis: Palpable purpura.

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