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Pediatric Scabies

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*Scabies is an intensely pruritic dermatosis that is caused by a mite, *Sarcoptes scabiei* var *hominis*. Scabies is highly contagious and may have the pathognomonic sign of burrows in addition to erythematous papules. These lesions are often excoriated. In addition to classic scabies, special forms with distinctive clinical features exist. A variety of topical medications are available to treat the infestation.*

Human scabies is an intensely pruritic skin eruption secondary to infestation with the scabies mite *Sarcoptes scabiei* var *hominis*.^{1,2} Scabies occupies a unique place in history in that it was one of the first disorders of man in which the direct cause was isolated. It has been recognized as a disease for more than 2500 years, but it was not until 1687 that the causative mite was identified by Bonomo using light microscopy.^{1,2}

Life Cycle and Epidemiology

The scabies mite, *S scabiei*, has 4 pairs of legs and is classified as an arachnid of the genus *Acarus*. Armed with jaws and the cutting claws of its forelegs, the gravid female mite burrows into the stratum corneum of the epidermis within 20 minutes.¹ She has a lifespan of approximately 30 days and lays 2 to 3 eggs per day. The eggs hatch after 3 to 4 days, yielding larvae that migrate to the skin surface and mature into adults after 14 to 17 days. These adult mites then repeat the cycle. This feature differentiates the human-specific mite from other species, which are unable to complete their life cycle on the human host. The adult female mite, with a length of 0.4 mm, is barely visible to the human eye; the male is

smaller.³ The average mite population per patient with classic scabies is 20.⁴

Transmission of the mites occurs via skin-to-skin contact and often happens after sexual contact. Infestation through nonsexual contact among family members is common. Fomite transmission is possible due to the several-day viability of the mites.⁵ There are approximately 300 million cases of scabies a year, with pandemic rates reported in many Third World countries.^{6,7} The highest prevalence is in children and adolescents.⁸ Epidemics of scabies tend to occur in long-term care institutional facilities.⁹ With increased iatrogenic immunosuppression and the rise in patients infected with human immunodeficiency virus (HIV), an atypical form known as Norwegian, or crusted, scabies has become more common.¹⁰ This form of scabies was originally described by Danielssen and Boeck in 1848. They believed the disease to be a form of leprosy, which was endemic in Norway at the time.¹¹

Clinical Features

Generalized pruritus with nocturnal predominance is a prominent symptom that occurs secondary to host sensitization to the scabies mite, its saliva, eggs, or excrement (scybala).⁸ With initial infestation, symptoms may be delayed up to 3 weeks. Subsequent occurrences result in immediate symptoms within 1 to 3 days.⁷ The itching is often severe enough to interrupt sleep.

A pathognomonic sign of this disease is the presence of a burrow several millimeters in length. These serpiginous, gray-white lines may, upon close inspection, reveal a black speck at its leading end, indicating the presence of the adult mite. Burrows are typically located on the interdigital spaces of the hand, the flexor surfaces of the wrists and elbows, and genitalia.¹ Furthermore, the axillae, umbilicus, belt line, nipples, and buttocks may be affected.^{1,8} Although burrows are highly specific for scabies, they may be few in number or even absent⁸; and, therefore, the presence of other lesions, usually more numerous, aids the diagnosis. For example, scabies often is

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accompanied by erythematous papules on the trunk, probably representing an immune response.³ In infants, scabies usually affects the axillae, head, diaper region, and, occasionally, the palms and soles. The morphologic features are often altered by excoriations, and depending on cutaneous reactivity, eczematous lesions may be present.¹² In hot, humid climates, pyoderma is a common complication.¹³ Secondary infection may produce pustule formation.

A variety of special forms of scabies exist. In scabies incognito, corticosteroid administration may markedly diminish the number of papules, though the number of mites is unchanged.¹⁴ In infants and young children, the head, face, palms, and soles are not spared as they are in adults. The morphology is often atypical, including vesicles, pustules, and nodules.

Nodular scabies is a clinical variant in which extremely pruritic nodules are present on the male genitalia and in the groin and axillary regions. These nodules are reddish-brown and probably represent an intense hypersensitivity reaction to the mite or its products. These lesions are not contagious and may persist for weeks after treatment, thereby requiring corticosteroid injections.^{2,8} Infection and secondary eczematous changes are common and may make diagnosis difficult.^{2,7}

Crusted, or Norwegian, scabies is a highly contagious form. This variant occurs in the immunocompromised population, including patients who are receiving topical or systemic corticosteroids, patients who are infected with HIV or T-cell lymphotropic virus type I, and those who have received organ transplants. Crusted scabies also occurs in patients with mental retardation and patients with disability.⁷ Index cases of scabies outbreaks at institutions usually are crusted scabies.¹⁰ This disorder is a psoriasiform dermatosis with an acral distribution of crusted lesions and a variable erythematous scaling eruption. There is accentuation of hyperkeratosis on the body, particularly in subungual areas. The nails are both thickened and dystrophic.¹⁰ Notably, the mite population averages 2 million per person—whereas a nonimmunocompromised individual has only 10 to 25 mites—yet there is typically minimal pruritus.¹⁵

The immune system of newborns is not fully developed. Scabies in neonates may be evident as the crusted form seen in adults. Heavy involvement of palms and hands is notable. Neonatal scabies also may present in an atypical fashion in which lesions may be found on the scalp, face, and neck. These lesions may be in the form of vesicles, nodules, or pustules.¹²

Animal-transmitted scabies also may result in pruritic papules. However, scabies caused by, for example, *S scabiei* var *canis* does not result in burrows, and the infestation resolves with removal of the host animal.⁸

Diagnosis

Intense pruritus should raise the suspicion that an individual may have scabies. The index of suspicion should be further heightened if several members of a family report similar symptoms. Scabies may be diagnosed from physical examination revealing burrows in typical locations, including the hands, wrists, elbows, and genitalia. Burrows may be barely visible to the naked eye. The burrow ink test may aid in identification. In this procedure, a washable felt-tip marker is rubbed across the typical locations, and the ink is subsequently removed with alcohol or water. If burrows are present, they will absorb ink and be readily apparent.^{14,16}

Diagnosis of scabies should be confirmed by the presence of the mite, its eggs, or its scybala. The mite may be visible at the leading end of a burrow. Direct microscopic examination of skin scrapings mounted on a slide is ideal for identifying the mite and its products. Potassium hydroxide, saline, and mineral oil are possible solutions for the preparation. Potassium hydroxide provides the clearest visualization of the mites and eggs, but this is at the expense of dissolving the scybala. Because the fecal material is the most sensitive product to detect, saline or mineral oil may be better solutions to use in the procedure.¹⁶

Differential Diagnosis

The differential diagnosis (Table)^{1,8} includes atopic dermatitis, contact dermatitis, and lichen planus, which often have pruritic papules.⁸ Furthermore, dermatitis herpetiformis or bullous pemphigoid should be considered when vesicles and bullae are present.⁸ Also, animal scabies is an important consideration. These mites cannot complete their life cycle on the human host. But even though they don't create burrows, they may still cause pruritic papules. Other insect manifestations—including fleas, bedbugs, chiggers, cheese mites, grain mites, fowl mites, rat mites, and other dog and cat parasites—may cause pruritic lesions as the result of hypersensitivity to the bites, referred to as papular urticaria.^{17,18} However, there are no burrows in papular urticaria. In infants and children, linear IgA bullous dermatosis, vesicular pemphigoid, herpes gestationis, seborrheic dermatitis, folliculitis, syphilis, pityriasis rosea, and infantile acropustulosis are also in the differential diagnosis.⁷ Nodular scabies may be mimicked by neurodermatitis or prurigo nodularis.⁸

Treatment

Proper eradication of scabies infestation requires adherence to therapeutic guidelines. It is important that all household contacts and involved healthcare workers and their families be treated simultaneously,

Human Scabies: Differential Diagnosis

Animal scabies
 Atopic dermatitis
 Bullous pemphigoid
 Contact dermatitis
 Dermatitis herpetiformis
 Folliculitis
 Herpes gestationis
 Infantile acropustulosis
 Lichen planus
 Linear IgA bullous dermatosis
 Neurodermatitis
 Papular urticaria
 Pityriasis rosea
 Prurigo nodularis
 Pruritic urticarial papules and
 plaques of pregnancy
 Seborrheic dermatitis
 Syphilis
 Vesicular pemphigoid

regardless of symptoms. Furthermore, fomites should be decontaminated (by washing clothing and linens in soap and hot water, for example, or dry-cleaning or placing these items in a closed container for 5 to 7 days).³ Clean clothing should be worn after treatment.

A variety of topical scabicides are available to treat scabies. These medicines should be applied to the whole body, including the scalp and face but avoiding contact with the eyes or mouth because acute poisoning has been reported after the inadvertent oral administration of lindane, one of the scabicides.¹⁹ Furthermore, with the notable exception of lindane, these medications should be applied after taking a tepid bath or shower and drying off. Lindane should not be used after a bath because of increased transcutaneous absorption, which has resulted in toxicologic events including aplastic anemia and seizures.²⁰ Individuals with crusted scabies should receive applications of a keratolytic agent, such as salicylic acid, to break down the hyperkeratotic scales.¹⁷ After appropriate therapy, pruritus, which might persist for 1 to 2 weeks, may be managed with topical corticosteroids or oral antihistamines.¹⁴ It is important to inform patients that further application of the scabicide could be harmful. Itching that continues after 2 weeks may suggest cutaneous irritation from overtreatment or from severe eczematous scabies, contact dermatitis, or treatment failure.⁷ Treatment

failure may be due to noncompliance with therapeutic guidelines, including whole body application and treatment of contacts, or due to resistance of the mite to the particular scabicide.⁷

The most effective and least toxic scabicide currently available is permethrin 5% cream. Permethrin is a pyrethroid, a synthetic compound derived from pyrethrins, which are the active insecticidal components of the flowers in the genus *Chrysanthemum*.²¹ The cream should be applied to the whole body, left on overnight, and washed off the next day.²² Permethrin has repeatedly demonstrated efficacy against scabies infestations. Permethrin 5% cream has demonstrated greater effectiveness than crotamiton 10% cream in reducing pruritus and secondary bacterial infections and may be used in infants.¹³ In another comparative study, permethrin 5% cream was found to be as efficacious as lindane 1% lotion and was superior in the reduction of pruritus.²³ Only 2% of topically applied permethrin is absorbed percutaneously, and it is rapidly detoxified in the blood.²¹ These features render permethrin 5% the drug of choice in treating scabies.

There are several other topical scabicides available. However, these alternatives have certain caveats. Although lindane 1% lotion is efficacious in treating scabies, numerous cases of lindane-resistant scabies have been described.^{14,24,25} Lindane toxicity with neurologic or hematologic sequelae may occur following prolonged dermal absorption or ingestion.^{19,20} Recently, a clinical study demonstrated that topical ivermectin may offer another alternative in eradicating the infestation.²⁶ Older treatments that are less commonly used include crotamiton 10% cream and topical sulfur.²⁷

An oral agent, ivermectin, may soon prove to be a simpler alternative to the topical scabicides. Ivermectin is an antiparasitic drug that has been shown to be effective in treating onchocerciasis in humans.²⁷⁻²⁹ Numerous studies have demonstrated that ivermectin at a dose of 200 µg/kg of body weight is effective in treating the scabies infestation.^{28,30} Furthermore, ivermectin can be used to treat patients with crusted scabies and those with concomitant HIV infection.^{28,29,31} Reported side effects from ivermectin are few and include nausea, pruritus, and dizziness.³² However, safety is a concern for the use of this drug in the elderly and in those with a compromised blood-brain barrier.^{33,34} Also, in a comparative study, a single application of permethrin was found to be superior to a single dose of ivermectin.³⁵ The US Food and Drug Administration has yet to approve ivermectin for the treatment of scabies, and the safety of this drug in children has not been investigated. We

recommend ivermectin use only when the diagnosis of scabies is established.

In addition to eradicating scabies in individuals, these medications have been successful in the treatment of outbreaks. For example, in an Australian Aboriginal community, the prevalence of scabies was reduced from 28.8% to less than 10% when treatment with permethrin was offered to all residents.³⁶ Outbreaks of scabies in institutions require synchronous treatment with permethrin of all individuals in contact with infested individuals and quarantine of index cases, who should be treated with either permethrin alone or in combination with ivermectin.³⁷

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