ARTICLE

Inflammatory Tinea Pedis/Manuum Masquerading as Bacterial Cellulitis

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Background: Tinea pedis and tinea manuum in children are more common than previously recognized. Clinical presentations of dermatophyte infections may vary in children and may be difficult to diagnose.

Objective: To show the necessity of potassium hydroxide preparations and/or fungal cultures in assessing suspicious cases of cellulitis in children who may have dermatophyte infections.

Patients: We describe 4 children with inflammatory tinea pedis or tinea manuum who were initially misdiagnosed as having bacterial cellulitis.

Intervention: A potassium hydroxide examination was performed on 3 patients. Fungal cultures were performed on 2 patients.

Results: Inflammatory/bullous dermatophyte infections were detected by potassium hydroxide examination in all 4 patients and all 4 children successfully responded to topical antifungal therapy.

Conclusions: These cases demonstrate that inflammatory tinnea pedis/manuum can masquerade as cellulitis in children. Early potassium hydroxide examination can allow appropriate antifungal treatment to be initiated before fungal culture results are finalized.

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TINEA PEDIS and tinea manuum were thought to be rare cutaneous infections in prepubertal children.[1,2] More recent reports in the dermatologic literature suggest that dermatophyte infections of the feet and hands are more common in children than previously recognized.[3,4] The clinical presentation of superficial fungal infections in children may be varied, nonspecific, and somewhat confusing.[5]

We describe 4 children with tinea pedis or tinea manuum who were initially misdiagnosed as having bullous impetigo with bacterial cellulitis. The correct diagnosis was made after a potassium hydroxide (KOH) examination was performed. These patients are described to encourage pediatricians to perform KOH preparations and/or fungal cultures in suspicious cases of cellulitis in children.

METHODS

PATIENT 1

A 6-year-old white male visited his pediatrician with a 1-day history of a painful and pruritic enlarging blister with surrounding erythema and edema on the right plantar foot. He was treated with oral amoxicillin–clavulanic acid for presumed mild cellulitis. After 3 days of taking oral antibiotics, there was no improvement. A pediatric surgeon performed incision and drainage of the lesion but the blister promptly recurred. Three days later, the patient was seen in the emergency department of Children's Hospital (Boston, Mass). He was diagnosed as having refractory bacterial cellulitis and scheduled for hospital admission for intravenous antibiotics. A bacterial culture was performed and complete blood cell count revealed no evidence of eosinophilia. Just prior to his hospitalization, he was referred to the dermatology clinic, where a physical examination revealed an afebrile young boy with a 2-cm bulla surrounded by erythema and microvesicles on the right plantar foot (**Figure 1** and **Figure 2**). A KOH examination was performed.

PATIENT 2

An 8-year-old white female was seen in the dermatology clinic at St Louis Children's Hospital (St Louis, Mo) with a 12-month history of a 1- to 2-cm recurrent lesion on her foot. According to her parents, the lesion appeared as a blister, became swollen and tender, and then resolved spontaneously, with episodes occurring approximately every month. The family history revealed recurrent bouts of herpes labialis in both parents and a tinea pedis infec-

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Figure 1. Bulla with surrounding erythema on the right plantar foot.

Figure 2. Closer view of bulla seen in Figure 1 with surrounding microvesicles.

Figure 3. Bulla with surrounding erythema and edema on the left lateral foot.

tion in the patient's father. On physical examination, a 1.5-cm bulla with surrounding erythema and edema was present on the left lateral foot (**Figure 3**). The differential diagnoses included herpes simplex infection, inflammatory tinea pedis, and bullous impetigo with cellulitis. A KOH examination and fungal and viral cultures were performed.

PATIENT 3

A 6-year-old white female was brought to the dermatology clinic at St Louis Children's Hospital with a several-week history of blisters on her left palm. The blisters appeared first, followed

Figure 4. Vesicles and bullae on the thenar eminence of the left hand.

Figure 5. Annular collection of vesicles with surrounding erythema on the right plantar foot.

by lymphangitic streaking. Individual blisters healed but new ones promptly formed in the same areas. Outpatient treatment with oral erythromycin, oral cephalexin, topical polymixin B sulfate/Bacitracin zinc ointment, and topical mupirocin for presumed bullous impetigo with cellulitis and lymphangitis resulted in minimal improvement. On physical examination, the girl was afebrile and had a 4-cm collection of vesicles and bullae with crusting on the thenar eminence (**Figure 4**). Surrounding erythema extended onto the forearm. There was no evidence of tinea pedis. Viral, bacterial, and fungal cultures were performed.

PATIENT 4

A 10-year-old white female was hospitalized at St Louis Children's Hospital for presumed bacterial or herpetic cellulitis on the plantar surface of the right foot. She was treated with intravenous antibiotics and intravenous acyclovir for 1 week, with minimal improvement. Dermatology consultation was obtained. A physical examination demonstrated a 3-cm annular collection of vesicles with surrounding erythema (**Figure 5**). A KOH examination was performed.

RESULTS

PATIENT 1

The KOH preparation revealed multiple branched hyphae. A fungal culture was not obtained. He was diagnosed as having inflammatory/bullous tinea pedis and

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treated with 1% naftifine hydrochloride cream twice daily on an outpatient basis, with improvement of symptoms within 3 days. Review of histopathologic studies of a skin sample obtained during the incision and drainage procedure revealed vesiculopustular dermatitis with hyphal elements in the stratum corneum, consistent with tinea pedis.

PATIENT 2

The viral culture was negative. Hyphae were revealed by KOH preparation and the fungal culture demonstrated *Trichophyton rubrum*. The patient was treated with 2% miconazole nitrate cream twice daily, with prompt resolution.

PATIENT 3

The viral and bacterial cultures were negative for organisms. A fungal culture grew *T rubrum*. She was treated with 1% terbinafine hydrochloride cream twice daily, with complete resolution. The patient is a gymnast and frequently works out using the parallel bars, possibly exposing her to dermatophytes.

PATIENT 4

The KOH preparation revealed multiple hyphae. A fungal culture was not obtained. The patient was diagnosed as having inflammatory/bullous tinea pedis. All antibiotics were discontinued. She was treated with 1% terbinafine hydrochloride cream twice daily, with complete resolution.

COMMENT

Tinea pedis may be more common in young children than previously believed.[3,5] Recent reports stress the importance of performing KOH examinations and fungal cultures in pediatric patients with foot dermatitis.[6,7] Kearse and Miller[3] described 15 children (2-13 years old) with presumed foot dermatitis; 8 of those patients were found to have dermatophyte infections, identified with KOH preparations.

Although the clinical features of tinea pedis may be similar to those seen in adults with interdigital erythema and scaling, signs of dermatophyte infection in children are often nonspecific and mimic other conditions, such as psoriasis, atopic dermatitis, contact dermatitis, dyshidrotic eczema, juvenile plantar dermatosis, impetigo, herpetic infection, and cellulitis.[1,4,5] Vesicles and bullae may also be more common in children with tinea pedis.[8] Terragni et al[7] found that in a study of 80 children younger than 14 years with tinea pedis, 64% of patients had vesicular lesions. In addition, asymmetric involvement of the hands and feet or lesions resistant to antibiotic treatment may indicate a fungal infection. A recent case report described 5 children with unilateral inflammatory plantar lesions (blisters) as a manifestation of tinea pedis.[9]

Unfortunately, many physicians may not consider a dermatophyte infection on initial examination of these children. Consequently, cases of tinea pedis are often misdiagnosed. We report 4 cases of inflammatory/bullous tinea pedis or tinea manuum that were mistaken for bacterial or herpetic cellulitis. In the first case, a young boy underwent a surgical procedure and was almost hospitalized for parenteral antibiotic treatment of refractory cellulitis before the correct diagnosis was discovered. Similarly, patient 4 was treated unsuccessfully with a week of parenteral antibiotics (including acyclovir) before a KOH preparation was performed.

What This Study Adds

Inflammatory tinea pedis/manuum can be difficult to diagnose in children, as it may mimic several other skin conditions, including cellulitis. Pediatricians who consider fungal infection as a possible cause of vesicles and bullae are more likely to perform a KOH examination or fungal culture. In this manner, children with inflammatory tinea pedis/manuum can receive antifungal treatment early in the course of the disease, thus expediting the recovery process.

The KOH preparation is simple, inexpensive, efficient, and widely available to all physicians. By gently scraping the infected skin or blister roof with a sterile scalpel blade, a KOH mount can be easily prepared on a glass slide with 1 to 2 drops of 10% KOH. The sample is then examined under the microscope for the presence of hyphae. Although an inexperienced physician may have some difficulty identifying hyphae, most clinical laboratories can perform a standard KOH preparation or calcofluor white on scrapings sent in a sterile container. *T rubrum*, *Trichophyton mentagrophytes*, and, less commonly, *Epidermophyton floccosum* are the most common dermatophytes isolated in tinea pedis.[9]

Superficial dermatophyte infections of the skin typically respond well to a variety of topical antifungal agents, including clotrimazole, econazole, oxiconazole, miconazole, terbinafine, and naftifine applied to the affected areas twice daily for 2 to 4 weeks.[10,11] The duration of treatment may be ultimately determined by continuing topical application for 1 week after the clinical signs and symptoms have completely resolved.[10] Adjunctive measures to promote healing include Burow solution compresses to dry out vesicles and topical corticosteroid creams to alleviate severe pruritus associated with inflammation.[10] Systemic agents are usually reserved for patients with hair or nail involvement.[11] The choice of therapy may depend primarily on the cost and availability of a particular medication.

Dermatophytes can live on surfaces and in the soil for years. It is somewhat difficult to know when a patient may no longer spread infection after treatment is initiated. Thus, preventative measures, such as changing footwear frequently, drying feet well after bathing (especially between toes), refraining from sharing articles of clothing, and appropriately treating friends and family members of affected patients, can be very helpful in minimizing risks of exposure and reinfection.[11]

These patients have been described with the goal of encouraging physicians to recognize that inflammatory/bullous dermatophyte infections can masquerade as cellulitis in children. A KOH preparation revealing hyphae can allow antifungal treatment to be initiated long be-

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fore fungal culture results are finalized, thus expediting the recovery process.

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Correction

Error in Authorship. In the article titled "Pediatric and Young Adult Exposure to Chemiluminescent Glow Sticks" in the September issue of the ARCHIVES (2002; 156:901-904), the third author should have been Robert S. Hoffman, MD, New York City Poison Control Center, New York, NY. The ARCHIVES regrets the error.

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