**BRIEF ARTICLES**

**Interdigital Tinea: The Forerunner of Infectious Eczematoid Dermatitis**

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**ABSTRACT**

Infectious eczematoid dermatitis (IED) is defined as an acute, eczematous eruption that occurs secondary to autosensitization to purulent drainage from a primary infected site. The condition is believed to develop when bacterial products, most often the result of *Staphylococcal* or *Streptococcal* species, act as haptens and stimulate an immune response. IED typically manifests as a plaque with associated vesicles and pustules surrounding drainage from a central infectious source, or as oozing, erythema, crusting, and scaling spreading peripherally from a central infectious source. Management of IED includes both targeting the causative primary infection and suppressing the immune response producing a hypersensitivity reaction. This report details two cases. Case 1 describes a common presentation of tinea pedis. Case 2 is that of a 28 year-old-male who presented with an acute onset tender, pruritic, weeping rash after wearing boots for two straight days, and who was subsequently diagnosed and treated for IED.

**CASE PRESENTATION**

Case 1 is a male patient who presented with chronic scaling of the pedal interdigital spaces associated with mild intermittent pruritus. (Figure 1A and 1B).

Case 2 is of a 28 year-old-male that presented with an acute onset erythematous eruption bilaterally on the feet. He had a long history of mildly pruritic and intermittently painful cracking between the fourth and fifth toes with associated thick, moist scaling. During a hunting trip, he walked through wetlands and wore his boots for two straight days, even while sleeping. When the boots were removed, he discovered a bilateral, tender, pruritic, weeping rash across his toes and distal foot. On physical exam, a well-demarcated, erythematous, oozing, edematous eruption with erosion was present on the plantar and dorsal surface of the feet and toes (Figure 2A and 2B).

**Figure 1.** (A) Scaling and erythema of the interdigital skin typical of tinea pedis.
Figure 1. (B) Scaling of subdigital skin typical of tinea pedis.

Figure 2. Oozing, erythematous eruption with interdigital and subdigital purulence overlying edematous toes of a male patient after two straight days without removing boots.

Table 1. Diagnostic Criteria for Infectious Eczematoid Dermatitis as Proposed by Yamany and Schwartz. © 2014 European Academy of Dermatology and Venereology - Reproduced with permission from John Wiley and Sons.

<table>
<thead>
<tr>
<th>Clinical Characteristics</th>
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<tr>
<td><strong>Major Criteria</strong></td>
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<td>(2 of 2 must be present)</td>
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<td>1. A primary infected lesion with purulent drainage.</td>
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<td>2. Eruption spreading peripherally from primary lesion.</td>
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<td><strong>Minor Criteria</strong></td>
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<td>(1 of 2 must be present)</td>
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<td>1. Peripheral vesicles and pustules with central oozing, crusting, and scaling.</td>
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<td>2. Oozing, crusting, and scaling throughout entirety of eruption.</td>
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DISCUSSION

In case 1, the patient had a symbiotic relationship with a non-complicated tinea pedis infection, with fungal culture revealing *Trichophyton rubrum*. Tinea pedis is the most common dermatophytosis, affecting up to 25% of the population in the United States. It is most commonly associated with *Trichophyton rubrum*, though *Epidermophyton*, *Microsporum*, and other *Trichophyton* species have also been implicated. Though dermatophytes are viewed as the causative organisms of tinea pedis, associated overgrowth of coinhabiting bacterial species is common, especially in more severe disease states. As disease severity increases, fungi are less frequently recoverable: fungi were demonstrated in 84% of mild and asymptomatic tinea pedis cases; 55% of moderately symptomatic cases; and 36% of severe cases. In these severe cases, increased rates of overgrowth of various bacterial species, including gram-positive *Staphylococcus* species and gram-negative *Proteus* were found. These interdigital bacteria have higher rates of...
antibiotic resistance, which can be attributed
to dermatophyte production of penicillin-like
and streptomycin-like antibiotic
substances.\textsuperscript{4,5} Clinical presentation of
intertriginous tinea pedis infection is highly
variable. Erythema, fissures, and pruritus
may be present between the 4\textsuperscript{th} and 5\textsuperscript{th} toes,
though some patients may be entirely
asymptomatic. Tinea pedis is typically
treated with topical antifungals and hygiene
measures to keep affected areas clean and
dry. Systemic antifungals may be used in
severe or treatment-resistant cases.\textsuperscript{6} As the
tinea is cleared, the bacterial component
usually resolves without specific treatment.

In case 2, a bacterial culture revealed
\textit{Staphylococcus aureus}, while fungal culture
was negative likely due to bacterial
suppression of fungal growth. This patient’s
presentation is consistent with infectious
eczematoid dermatitis (IED). This condition
is defined as an acute, eczematous eruption
that occurs secondary to autosensitization to
purulent drainage from a primary infected
site.\textsuperscript{7} In a 1902 study of 1200 new patients
to an outpatient dermatology clinic, Engman
reported that 35, or 2.9\%, had presentations
consistent with IED.\textsuperscript{8} A study at the Mayo
Clinic examining inpatient dermatology
admissions from 2000-2010 reported similar
results, finding that 2.9\% of 2216
admissions were due to IED.\textsuperscript{9} IED is
believed to develop when purulent drainage
from a primary infection causes
autosensitization, with hypersensitivity
developing as bacterial products act as
haptens and stimulate an immune
response.\textsuperscript{7} \textit{Staphylococcal} and/or
\textit{Streptococcal} species are most commonly
associated with IED.\textsuperscript{10} In this case,
interdigital tinea pedis, and associated
bacterial infection, flourished in the warm,
moist environment of the patient’s wet boots
over two days. An immune response
stimulated the subsequent acute,
eczematous eruption.

The differential diagnosis for case 2 includes
cellulitis and contact dermatitis. The clinical
presentation of a pruritic and oozing,
erythematous eruption was not consistent
with cellulitis. Though the eczematous
eruption may have been attributed to contact
dermatitis, the patient did not have a history
of allergic contact dermatitis to leather or
any other contactants. IED accounts for all
aspects of the patient’s presentation, namely
the initial fungal infection, secondary
bacterial infection, and autosensitization and
subsequent eczematous response.

It is important to note that IED is distinct
from auto-eczematization (dermatophytid or
\textit{id} reaction), a \textit{generalized} process in which
vesicles or pustules appear at distant sites
in a patient with a localized tinea infection.
These dermatophytid reactions may be the
only presenting sign in an otherwise
asymptomatic patient and typically resolve
with treatment of the primary tinea
infection.\textsuperscript{11} IED is a \textit{localized} process that
occurs adjacent to and surrounding the
primary infectious locus.\textsuperscript{7}

IED often initially presents as a plaque with
associated vesicles and pustules
surrounding a central source of infectious
drainage. The lesion may spread
peripherally, and older areas are
distinguished by oozing, erythema, scaling,
and crusting.\textsuperscript{7} Alternatively, patients may
present with oozing, erythema, crusting, and
scaling that spreads peripherally from the
central infectious source but with no
evidence of vesicles or pustules.\textsuperscript{8} The
patient from case 2 presented as the latter
type. Though IED can affect any part of the
body, it is commonly found on the ears in
patients with otitis externa, on the face and
the nares in children with nasal
Staphylococcus, and on the lower extremities in adults. In a 2015 comprehensive review of IED, Yamany and Schwartz proposed the major and minor diagnostic criteria found in Table 1. The patient from case 2 met both the major criteria and the second minor criteria.

The management of IED requires targeting the causative infection and suppressing the immune response producing a type IV hypersensitivity reaction. In addition, local wound care should be optimized. The patient’s primary tinea pedis infection was treated with oral terbinafine 250mg daily for 2 weeks. Because of the severity of this condition, the secondary Staphylococcal aureus infection was treated with oral doxycycline 100mg twice daily for 10 days. In order to quell the associated allergic contact dermatitis, the patient was placed on oral prednisone 60 mg [1 mg/kg], which was tapered off over 2 weeks. Substantial improvement was noted in just 24 hours. Local skin care included Burrow’s solution applied three times daily, and the application of mupirocin ointment to promote barrier protection and fight superficial bacterial infection. The patient’s feet showed only post inflammatory erythema at 2 weeks. Ketoconazole cream weekly between the toes was recommended to prevent recurrent tinea.

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