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# Tinea Cruris in Children

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*Tinea cruris is an intensely pruritic fungal infection of the groin and adjacent skin. Also known as crotch rot and jock itch, it can be a troubling important entity that at times is a clinical, diagnostic, and therapeutic challenge. Predisposing factors include heat, humidity, and hyperhidrosis, common accompaniments of high school-aged athletes. Furthermore, obesity and diabetes mellitus, additional risk factors for tinea cruris, are reaching unprecedented levels in adolescents. Treatment options range from improving hygiene to topical antifungal agents and systemic antifungal agents, the latter with potentially dangerous side effects.*

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## Pathophysiology

Tinea infections are among the most common skin conditions throughout the world. These dermatophyte infections are categorized by location (eg, capitis [head], corporis [body], cruris [groin], pedis [foot], unguium [nail]). Tinea corporis and tinea cruris are commonly referred to as ringworm. Tinea cruris is a pruritic superficial fungal infection that specifically involves the genitalia, pubic region, and perineal and perianal skin.<sup>1</sup> The spectrum of dermatophyte infections may vary by geographic region; for example, tinea cruris comprised 7.6%, 13.5%, and 15.1% of superficial fungal infections in Crete, Greece; Singapore; and Saudi Arabia, respectively.<sup>2-4</sup> In a Saudi Arabian study, tinea cruris was the second most common tinea infection in children, with tinea capitis as the most common.<sup>2</sup> The primary causative fungal agents of tinea cruris include *Epidermophyton floccosum* and *Trichophyton rubrum*, with *Trichophyton mentagrophytes*, *Trichophyton verrucosum*, and *Trichophyton interdigitale* less commonly involved.

*Epidermophyton floccosum* is most associated with outbreaks, while *T rubrum* remains the most common cause worldwide (Table 1).<sup>5</sup> In economically poor and endemic areas, these infections are primarily found in children. Medical access issues also lead to high rates of treatment failure in these areas.<sup>5</sup>

The dermatophytes of tinea cruris grow in keratinized dead tissue with their metabolites, enzymes (keratinases), and antigens spreading throughout adjacent living tissue and generating an immune reaction. The stratum corneum and terminal hair most frequently are affected and result in the typical clinical presentation. The lesions expand centrifugally with most growth at the periphery.

Tinea cruris is a contagious infection spread by fomites or by autoinoculation from another fungal infection of the hands or feet (eg, tinea manuum, tinea pedis, or tinea unguium). The main factors responsible for dermatophyte spread include poor living conditions, urban areas with dense population, and social activities of traveling and sports. Additional risk factors include tight-fitting or wet clothing as well as obesity and diabetes mellitus, which suppress immune control over infection. Prison inmates, dormitory residents, military recruits, and athletes are most susceptible (Table 2). Although adults are affected more frequently than children, the incidence in young adults and teenagers is higher. Tinea cruris is 3 times more common in men than women.<sup>6</sup> Young males are more commonly affected than young females, though there is a growing number of cases in postpubertal females who are overweight or wear tight jeans or panty hose.<sup>7</sup> Obesity rates in children and teenagers have tripled over the last 30 years, increasing the susceptibility of this age group.<sup>8</sup> Although mortality is not likely with tinea cruris, associated morbidities include lichenification, secondary bacterial infection, and contact dermatitis from topical medications.

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## Medical History and Physical Examination

Patients usually describe a rash in the groin area. Key contributory factors to review include recent visits

Table 1.

### Tinea Cruris Pathogens

#### Common Pathogens

*Epidermophyton floccosum*

*Trichophyton rubrum*

#### Uncommon Pathogens

*Trichophyton mentagrophytes*

*Trichophyton verrucosum*

*Trichophyton interdigitale*



Tinea cruris in crural fold demonstrating unilateral erythematous papulovesicles with well-defined raised borders and peripheral scale.

Table 2.

### Risk Factors for Tinea Cruris Infection or Reinfection

Poor living conditions

Urban areas with dense population

Membership on athletic team

Prolonged wearing of tight or wet clothing in groin area

Obesity

Diabetes mellitus

Prison sentence

Dormitory residence

Membership in armed forces

Fungal infection in another anatomic location (eg, tinea pedis)

Gender (male)

Puberty

begins at the crural fold but may advance onto the thigh. Scaling is sharply demarcated at the periphery. Acute presentation may be exudative, whereas chronic infection is dry, papular, annular, or arch shaped, with mild border scaling. The genitalia usually are spared. Lichenification, secondary excoriation, and infection may complicate tinea cruris.<sup>9</sup> Chronic infections may include follicular pustules that can evolve into Majocchi granuloma.<sup>10</sup> Geographic distribution can relate to the causative fungal agent. *Epidermophyton floccosum* often is limited to the upper thigh and crural fold between the groin and leg and also shows central clearing. *Trichophyton rubrum* infections extend to the pubic, perianal, buttock, and lower abdominal regions with coalescence.<sup>11</sup>

### Differential Diagnosis

There is a broad differential diagnosis for a scaling rash of the groin (Table 3). Psoriasis vulgaris, seborrheic dermatitis, intertrigo, contact dermatitis, lichen simplex chronicus, tinea versicolor, Darier disease, Majocchi granuloma, Langerhans cell histiocytosis, and pemphigus vegetans may resemble tinea cruris.<sup>11</sup> Cutaneous candidiasis often affects women; in men, it is distinguished by its involvement of the scrotum with satellite lesions, uniform redness, white pustules, and lack of central clearing. Erythrasma, caused by *Corynebacterium minutissimum* in intertriginous areas, generates coral red fluorescence under Wood lamp and is more uniformly brown with minimal scaling and no active border.<sup>7,11</sup> Intertrigo is more erythematous, less scaly, and often found in the moist body folds of patients who are obese, with minimal extension onto the thighs. Tinea versicolor may be distinguished by potassium hydroxide preparation, whereas other differential diagnoses, such as psoriasis, will have negative potassium hydroxide study results.

to a tropical climate, tight pants or undergarments, extended use of bathing suits or wet clothes, team sport participation, and systemic medical issues of obesity and diabetes mellitus.<sup>9</sup>

Tinea cruris often presents as a collection of several erythematous papulovesicles with distinct raised borders (Figure). It often is unilateral and

Table 3.

**Differential Diagnosis of Tinea Cruris**

Psoriasis vulgaris
Seborrheic dermatitis
Intertrigo
Contact dermatitis
Lichen simplex chronicus
Tinea versicolor
Darier disease
Majocchi granuloma
Langerhans cell histiocytosis
Pemphigus vegetans
Cutaneous candidiasis
Erythrasma

**Diagnostic Workup**

Skin scrapings for microscopic examination are critical to confirm diagnosis. Scrapings are best obtained from the periphery of the lesion where active growth is occurring before administration of topical or systemic antifungal medication. Although glass slides and scalpel blades may be used, a dermal curette is preferred for scraping. Vinyl skin tape is an option for sensitive areas or children. Potassium hydroxide (10%–15%) wet mount of scraped scales will reveal branching hyphae. Congo red stain or fluorochromes such as calcofluor white stain viewed under a fluorescence microscope are helpful for visualization. If biopsied, histologic examination shows mild spongiotic dermatitis with periodic acid–Schiff stain revealing deep red hyphae and yeast forms in the stratum corneum. Hyperkeratosis or orthokeratosis that denote the presence of neutrophils in the stratum corneum are clues of a dermatophyte infection. The “sandwich sign”—hyphae caught in the middle of a healthy-appearing superficial stratum corneum and a deeper parakeratotic or hyperkeratotic stratum corneum—is an important clue.<sup>12</sup> The underlying dermis may contain a sparse lymphohistiocytic infiltrate. Cultures on special media (eg, Sabouraud agar) also can be used to confirm the diagnosis.

The feet always should be examined in a patient with tinea cruris, as coexistent fungal infections are

possible. One Polish study showed that onychomycosis occurred with tinea cruris in 4.2% of more than 2700 patients.<sup>13</sup>

**Treatment**

Tinea cruris often can be cured using topical antifungal medications. Generally, topical antifungal treatment requires once or twice daily dosing for 2 weeks.<sup>14</sup> Systemic medication is an alternative for patients who are unable to use topical treatment or for those with resistant or extensive disease. Any other areas of the body with dermatophyte infection must be treated simultaneously to control spread.

The 2 main classes of antifungal medications are azoles and allylamines. Azoles inhibit the enzyme lanosterol 14 $\alpha$ -demethylase, thus reducing the formation of ergosterol, a critical component of fungal cell walls. Membrane damage and permeability leads to a fungistatic effect. Allylamines inhibit the enzyme squalene epoxidase that generates ergosterol from squalene, leading to fungicidal buildup of toxic levels of squalene in the cells. The US Food and Drug Administration–approved azole treatments include ketoconazole, econazole, oxiconazole, clotrimazole, and miconazole.<sup>9</sup> Terbinafine and naftifine are allylamine treatment options, whereas butenafine is a benzylamine antifungal agent that is structurally similar to allylamines. Ciclopirox olamine also is an effective antifungal commonly recommended for twice daily use for 4 weeks.<sup>15</sup> Its unique mechanism of action involves disrupting iron-dependent enzyme systems and cytoplasmic membranes.<sup>16</sup>

The choice of azoles, allylamines, or other antifungal agents often depends on product cost, which may affect patient compliance; allylamines usually are more expensive but require shorter duration of use than azoles.<sup>17</sup> Basic topical antifungals initially utilized by many patients include miconazole, clotrimazole, and tolnaftate, all available in certain over-the-counter formulations. Clotrimazole is recommended as first-line treatment for tinea cruris.<sup>9</sup> In one randomized controlled trial, clotrimazole was 69% effective compared to 64% efficacy of ciclopirox olamine at 4 weeks of treatment.<sup>18</sup> Topical butenafine, a benzylamine antifungal, was shown in a noncomparative study to be 88% to 93% effective.<sup>19</sup> Similarly, in a study with 76 participants with tinea cruris, 78% (59/76) were mycologically cured with butenafine.<sup>20</sup> For resistant or extensive disease, oral itraconazole, terbinafine, and fluconazole can be used and are preferred over oral ketoconazole because of its hepatic side effects. Griseofulvin, an agent that inhibits microtubule function and mitosis, also is infrequently recommended because of its poor adherence to keratinocytes of the stratum

corneum.<sup>15</sup> Studies also have shown increased efficacy of oral itraconazole over griseofulvin.<sup>21</sup>

Side effects for topical treatments are low, with the main contraindication being documented hypersensitivity. Side effects of oral forms of itraconazole, ketoconazole, and griseofulvin include headache and nausea. Certain antifungal treatments have US Food and Drug Administration black box warnings including itraconazole for congestive heart failure risk and oral ketoconazole for hepatotoxicity.<sup>22</sup> The most common adverse effects of fluconazole are headache, nausea, abdominal pain, skin rash, vomiting, and diarrhea, though reports of QT interval prolongation and Stevens-Johnson syndrome have been noted.<sup>23,24</sup> Some reports have described toxic epidermal necrolysis following terbinafine administration.<sup>25,26</sup>

Topical therapy with combination corticosteroid and antifungal agents (ie, clotrimazole and betamethasone), requires vigilance and caution.<sup>14</sup> Nondermatologists often resort to combination preparations for superficial fungal infections in patients of all ages without considering monotherapies that are utilized by dermatologists 96% of the time.<sup>27</sup> One should be aware of the possibility of higher costs, lower antifungal efficacy, and greater adverse effects of combination therapy. Several general recommendations include using monotherapy in clinically and mycologically defined dermatophyte infections, avoiding steroid use in immunocompromised patients, and using appropriate short-term combination therapy in inflammatory-type tinea infections in healthy adult and adolescent patients.<sup>14,27</sup>

Novel treatment modalities are being investigated, including 5-aminolevulinic acid in photodynamic therapy<sup>28</sup> and newer azoles, such as pramiconazole.<sup>29</sup>

## Patient Education

Topical medications should be applied once or twice daily, as prescribed, to affected areas as well as the 2- to 3-cm unaffected areas beyond the scale. The groin area must be kept dry, tight-fitting clothing should be avoided, and weight should be decreased to avoid moisture buildup and recurrence of infection. If a concurrent superficial fungal infection is present on any other area, especially the feet (tinea pedis), separate towels for each region should be used after bathing. Putting on socks before undergarments or using disposable gloves when cleaning the feet also can be helpful techniques to decrease spread of infection to the groin.<sup>30</sup> Antifungal powders are useful, as they have the added benefit of drying affected regions.

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