A Case of a 2-Year-Old with Tinea Capitis Associated with Tinea Faceii and Corporis

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ABSTRACT

Superficial fungal infections are a common reason for patients to present to a primary care or dermatology clinic. Dermatophytes represent the most prevalent subgroup of superficial fungal infections, and they can affect the skin, hair, and nails. Dermatophytoses are most frequently seen in post-pubertal patients. Tinea capitis, however, is the one form of tinea that is more common in children. Early recognition and prompt treatment will eliminate the fungal infection and prevent the spread of infection to other individuals. Here we will address these topics with the case presentation of a 2-year-old female diagnosed with tinea faceii, tinea corporis, and tinea capitis.

INTRODUCTION

Superficial fungal infections affect the stratum corneum, the outer layer of the epidermis of the skin, hair, and nails. They are distinct from the deeper subcutaneous mycoses and the systemic or deep mycoses that spread hematogenously. The superficial mycoses can be further classified as non-inflammatory mycoses like pityriasis versicolor and inflammatory mycoses that include cutaneous candidiasis and dermatophytoses.¹

Dermatophytes are the most common superficial fungal infections that affect the skin, hair, and nails. They are commonly seen in primary care and dermatology offices.² These fungal infections, colloquially known as ringworm, are typically caused by species within three genera of fungi: Microsporum, Trichophyton, or Epidermophyton. These genera are able to infect the skin by invading, and subsequently multiplying within keratinized tissue. Clinically, ringworm presents as itchy, red plaques with a ring of white scale around the periphery; however, tinea capitis is most commonly seen as alopecia with or without scale.¹³ A classification based on the location of infection is commonly used because the clinical findings are distinctive at each site (Figure 1). This article focuses on the “ringworm” dermatophytoses, which are clinically referred to as “tinea” and emphasizes that tinea faceii and tinea corporis in children can be associated with tinea capitis.⁴

CASE PRESENTATION

A 2-year-old Caucasian female presented with a five-month history of scaling in the scalp and hair loss that failed to respond to ketoconazole 2% shampoo. Two months prior to presentation, multiple, slowly expanding, pruritic lesions appeared on the right cheek, unilateral buttock, and right shoulder. The buttock lesion resolved using over-the-counter clotrimazole cream. The scaling and erythema persisted on the right...
shoulder, right cheek and scalp. Treatment with oral griseofulvin 10 mg/kg/day for 6 weeks led to fading of all lesions, but some scale persisted. There were no household pets. It was noted that the patient attends a group daycare facility. The patient has a past medical history significant for otitis media s/p bilateral tympanostomy tube placement and gastroesophageal reflux disease. She has no known allergies. There is no family history of psoriasis, eczema, or other skin conditions.

Physical examination revealed a subtle pink macule on the right posterior shoulder and slight scaling and erythema with central clearing on the right cheek. (Figure 2). A circular patch of alopecia and scaling was noted on the right apical scalp (Figure 3). A potassium hydroxide (KOH) preparation was performed with scale from the right pre-auricular cheek revealing septate hyphae (Figure 4). The direct visualization of septate hyphae indicates the presence of fungi, and the diagnosis of tinea faciei, tinea corporis, and tinea capitis were made. Treatment with ketoconazole 2% shampoo twice weekly for 5 minutes in the shower and griseofulvin 125 mg/cc at a dose of 20mg/kg in a single daily dose was used for 6 weeks with complete clearing of all scaled patches.

**Figure 1:** Diagram depicting the clinical classification of cutaneous fungal infections. Tinea capitis (scalp), tinea faciei (face), tinea barbae (beard), tinea corporis (trunk and extremities), tinea cruris (groin), tinea unguium (nails), tinea manum (hands), tinea pedis (feet). *Artwork courtesy of Jason*

**Figure 2:** Pink, oval, thin plaque with fine white scale around the periphery on the right pre-auricular cheek.

**DISCUSSION**

Dermatophytes infect the skin by invading, and subsequently multiplying within keratinized tissue.1,3-5 Tinea corporis and tinea faciei present with itchy, red papules and plaques demonstrating a ring of white scale around the
Tinea capitis is most commonly associated with infection by *Trichophyton tonsurans*, followed by *Microsporum canis.* The differential diagnosis for tinea corporis should include nummular eczema, pityriasis rosea, psoriasis, atopic dermatitis, impetigo, subacute cutaneous lupus erythematosus, and granuloma annulare. The differential diagnoses for tinea capitis differs slightly and some other dermatologic conditions of the scalp to consider are seborrheic dermatitis, alopecia areata, scalp psoriasis, dissecting cellulitis, folliculitis decalvans, and bacterial folliculitis.

While many physicians elect to treat dermatophytoses empirically, a quick and accurate diagnosis can be made within minutes in the office using direct visualization of branching hyphae under microscopy (KOH preparation). This simple test has been used for over 100 years to confirm the diagnosis of superficial fungal infections with a sensitivity ranging from 87% to 91%. Prompt specific treatment can then be initiated. A positive KOH preparation demonstrates branching, septate hyphae on microscopy. The optimal technique involves the following steps:

1. **Wipe the area to be examined with soap and water or an alcohol pad.** This will help to moisten the area and the scale will adhere to the blade in the following step.

2. **Use a no. 15 scalpel blade to scrape the leading edge of the lesion.**

3. **Collect the scale by smearing the blade on a glass microscope slide and place a coverslip over the scale.**

4. **Place 2-3 drops of potassium hydroxide (5-20%) solution at the edge of the coverslip.**

5. **Hold slide over a low flame until bubbles expand.** This allows the potassium hydroxide to dissolve material that holds the cells together without affecting the structure of the skin cells or fungi.

6. **Place the microscope slide on the microscope stage and focus the slide.** Be sure to look at the entire slide before determining it is negative.

In the case of tinea capitis, a Wood’s lamp can also be used to confirm the diagnosis when the infection is caused by the fluorescent *Microsporum* dermatophyte. However, Wood’s lamp is not helpful for *Trichophyton* species.
infections, which account for 95% of tinea capitis in the United States.\textsuperscript{3} If dermatophyte infection is suspected based on clinical findings and confirmed by potassium hydroxide preparation, it is important to initiate treatment to prevent progression or spread to other individuals.\textsuperscript{3,9} Topical antifungals like ketoconazole, miconazole, terbinafine, and naftifine are useful for treatment of non-hair bearing areas such as tinea corporis and tinea cruris.\textsuperscript{6} Treatment with a topical steroid cream in combination with a topical antifungal cream (e.g. clotrimazole 1% and betamethasone dipropionate 0.05% cream) has been demonstrated to decrease the likelihood of clearing when compared to an antifungal cream alone.\textsuperscript{10-12} Oral antifungal therapies such as griseofulvin, terbinafine, itraconazole, and fluconazole are used for severe or widespread tinea, infection in hair bearing areas (tinea capitis and tinea barbae), and for onychomycosis.\textsuperscript{1,6-8} The Cochrane Review of systemic therapy for tinea capitis in children concluded that griseofulvin or terbinafine should be considered first-line therapy for tinea capitis caused by \textit{Trichophyton} or \textit{Microsporum} species. The efficacy of griseofulvin as compared to terbinafine has been investigated and concludes the following: griseofulvin is the preferred systemic therapy for tinea capitis caused by \textit{Microsporum canis}, while terbinafine is more efficacious in treating tinea capitis due to \textit{Trichophyton tonsurans}.\textsuperscript{6-8} Itraconazole and fluconazole are important alternative options.\textsuperscript{8} Topical agents such as ketoconazole or selenium sulfide shampoo can be used as an adjunct to the management of tinea capitis; however, treatment with topical antifungals alone is insufficient. While the signs and symptoms of tinea capitis may improve for a short time, the rate of relapse is high. These topical agents are still useful as they can clear fungus in the stratum corneum and more quickly decrease the risk of spread to family and friends when compared to systemic treatment alone.\textsuperscript{6,7,13} Shampoos can also be used for treatment of asymptomatic carriers.\textsuperscript{6,7} The importance of adequate treatment is demonstrated in our case where tinea capitis was treated ineffectively with a topical antifungal shampoo leading to autoinoculation of other body areas. It is quite possible that the patient transmitted the infection to other children at her day school during this period. Oral antifungals are the mainstay of treatment of tinea capitis due to the fact that topical antifungal treatments are unable to penetrate the hair follicle root to achieve adequate treatment.\textsuperscript{7,13,14} For our patient and other similar cases, griseofulvin is a logical first option. Unfortunately, the patient was treated with the FDA recommended dosing regimen for tinea capitis using griseofulvin 10 mg/kg/day. Experts now recommend griseofulvin 20mg/kg/day for tinea capitis, the dose proven to be effective in this case.\textsuperscript{13-16} Terbinafine may be slightly more effective for treating \textit{Trichophyton} infections compared to griseofulvin, while fluconazole is equivalent to the higher dosing regimen of griseofulvin.\textsuperscript{8} Of note, fluconazole is not FDA approved for this indication.\textsuperscript{6,8} Patients should also be encouraged to avoid sharing hats, combs, and brushes with others. Bleach can be used to disinfect these fomites. After starting appropriate combination treatment, the likelihood of transmission is greatly reduced and children can return to school.\textsuperscript{5} The case of this 2-year-old female with tinea capitis, tinea faceii, and tinea corporis demonstrates the importance of identification of fungal infections and adequate treatment for successful eradication. In our case, tinea capitis was initially treated ineffectively with antifungal shampoo and ultramicrosize griseofulvin 10 mg/kg/day for 6 weeks. This led to further spread of the infection on the patient, and possible spread to other individuals that come in close contact with the patient. This highlights the need for higher doses of griseofulvin in
children with tinea capitis, despite the FDA recommendation of 7.3 mg/kg/day of ultramicrosize griseofulvin.

**LEARNING POINTS**

- When the possibility of tinea is considered, a potassium hydroxide preparation is recommended to immediately confirm the diagnosis.
- A positive potassium hydroxide preparation demonstrates branching, septate hyphae.
- Dermatophytoes occur more commonly in adults, with the exception of tinea capitis, which occurs more frequently in children.
- Treatment of tinea capitis and other dermatophytoses on hair bearing areas requires the use of an oral agent.
- Many experts recommend a higher dose of ultramicrosize griseofulvin (20 mg/kg/day) than what is currently recommended by the FDA (7.3 mg/kg/day).
- Anti-fungal shampoos are often used in conjunction with systemic treatment in tinea capitis to minimize the risk of spread and get patients promptly back to school.

**REFERENCES**

CONFLICTS OF INTEREST

Robert Brodell, MD, FAAD has the following conflicts of interest: Multicenter Clinical Trials: Novartis – Principal Investigator; Corrona psoriasis biologic registry. Editorial Boards: Faculty Advisor, American Medical Student Research Journal; Editor-in-Chief, Practice Update Dermatology; Associate Editor, Journal of the American Academy of Dermatology; Practical Dermatology; Journal of the Mississippi State Medical Society; SKIN: The Journal of Cutaneous Medicine; Archives of Dermatological Research. Advisory Boards: Bracco Diagnostics, Inc. (Gadolinium-based Contrast Agent Litigation); Chairperson of REGN3500 AD independent monitoring committee (iDMC) (Sanofi Genzyme/Regeneron); SunPharma; and, Cassiopea.
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