

Scalp Hyperkeratosis in Children With Skin of Color: Diagnostic and Therapeutic Considerations

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Practice Points

- Scalp hyperkeratosis is a common finding in children, especially those with skin of color.
- Fungal culture may be helpful in the diagnosis of scalp hyperkeratosis in children of any age but should be performed in patients aged 3 to 11 years with skin of color.
- Therapy of scalp disease in children with skin of color should be adjusted based on hair type and disease features.

Scalp hyperkeratosis is common in childhood and adolescence. Diagnosis is affected by age, race, and history of infectious exposure, and associated symptoms including atopic features, alopecia, inflammatory nodules, presence and type of cutaneous lesions outside of the scalp, and nuchal lymphadenopathy. Tinea capitis is common in children with skin of color, especially black and Hispanic children. In adolescents, seborrheic dermatitis predominates as the cause of scalp hyperkeratosis, but tinea is still of concern. This article aims to help the practitioner comfortably diagnose and treat scalp hyperkeratosis in children with skin of color.

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Scalp hyperkeratosis (scaling or flaking) is a common symptom in childhood and is typified by fine to thick hyperkeratosis of the scalp with or without underlying erythema. The causes of scalp hyperkeratosis in childhood vary based on the demographics of the population. In a population where approximately half of the pediatric patients were white, scaling of the scalp was more common in patients with seborrheic dermatitis and/or atopic dermatitis (AD) who were aged 0 to 2 years, and tinea capitis was only noted in children who were black.¹ In children with skin of color, scalp hyperkeratosis has been noted as a marker of tinea capitis, especially in patients aged 3 to 11 years,^{2,3} and the level of suspicion should consistently remain high for this age group. In another study of an all-black population of schoolchildren aged 5 to 13 years (N=224), 3% demonstrated signs and symptoms of tinea capitis and 14% were found to be asymptomatic carriers.⁴ Although generally benign in nature, scalp hyperkeratosis can be associated with systemic illnesses such as juvenile dermatomyositis and Langerhans cell histiocytosis.⁵ This article addresses the diagnosis and treatment of scalp hyperkeratosis in children with skin of color, focusing on differences in exposure to contagious cases, hairstyling

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practices, and biological factors that may impact the disease process.

CAUSES OF SCALP HYPERKERATOSIS IN CHILDHOOD

Scalp hyperkeratosis in childhood usually is caused by common benign conditions, but some level of suspicion should be maintained for more severe etiologic conditions such as Langerhans cell histiocytosis and collagen vascular diseases (eg, juvenile dermatomyositis).⁶ Langerhans cell histiocytosis of the scalp might be obscured by background pigmentation in black children.

Scalp scaling can be a minor criterion in the diagnosis of AD. Atopic dermatitis should be suspected in Asian children with scalp scaling. Although one study in Bangladesh revealed scalp involvement in only 5.2% of pediatric patients with AD,⁷ a study in China reported an incidence rate as high as 49.7% (with a similarly high incidence of eyelid dermatitis).⁸ Children with AD also may have dry hair.⁹ Atopic dermatitis of the scalp is typified by itching, fine hyperkeratosis, and notably eczematous scalp lesions ranging from excoriated or oozing erythematous plaques to lichenification with hair miniaturization, primarily from scratch-induced breakage.¹⁰ The latter finding often is noted in black adolescent girls with long-term moderate to severe AD (personal observation).

Seborrheic dermatitis is a hypersensitivity response to yeast colonization of the scalp with *Malassezia* species. The infantile form is extremely common (also known as cradle cap). Characteristically, greasy yellow hyperkeratosis in fine to thick sheets is noted on the scalp in children younger than 2 years, especially infants, often with involvement of skin folds. One study noted that seborrheic dermatitis occurs in 6% of school-aged children as opposed to 19% of children younger than 2 years.¹ Severe seborrheic dermatitis in infancy may be a prelude to AD, with the incidence being 3 times higher in children with prior seborrheic dermatitis.¹¹ In teenagers, seborrheic dermatitis often accompanies acne onset in the early pubertal years.¹²

Psoriasis is an autoimmune inflammatory dermatosis that most commonly affects white children. In childhood, pityriasis amiantacea, psoriasiform scalp hyperkeratosis, is more common than in adulthood, with thick, stuck-on scales bound to the hairs. This variant is uncommon in Hispanic and Asian children and is almost never seen in black children but has been reported in cohorts of Turkish children.¹³ In a series of 85 Egyptian children with pityriasis amiantacea, diagnosis of scalp psoriasis was made in 35.3%, eczematous dermatitis in 34.2%, and tinea capitis in

12.9%.¹⁴ Consequently, a high degree of suspicion for tinea capitis should be held if pityriasis amiantacea is found in children with skin of color.^{15,16}

Tinea capitis is a dermatophyte infection of the scalp, hair, and surrounding skin. The presence of tinea capitis on the scalp is associated with environmental exposure to dermatophytes (eg, school, household).^{4,17} The infection is largely caused by *Trichophyton tonsurans* in the United States, which causes a seborrheic appearance and less commonly alopecia (black dot or thinning), plaques with scale, or kerion. The presence of cervical lymph nodes and/or alopecia increases the chances of tinea being the diagnosis. Potassium hydroxide preparation and fungal culture can be performed to corroborate the diagnosis.¹⁻³ Other etiologies of scalp hyperkeratosis such as juvenile pityriasis rubra pilaris and lice are extremely uncommon in black children, but lice may be seen in Hispanic and Asian girls with long straight hair who attend school. Discoid lupus is more common in children with skin of color but is rare overall. When noted, accompanying mottled dyspigmentation and scarring alopecia are noted in addition to a high risk for developing systemic lupus erythematosus. Biopsy and screening for systemic lupus are necessary, as the risk for progression from discoid lupus to systemic disease is 26% over 3 years.¹⁸

THE BIOLOGY OF HAIR IN CHILDREN WITH SKIN OF COLOR

To some extent, the biology of hair impacts the occurrence, appearance, and treatment of scalp hyperkeratosis in children with skin of color. First, it is important to remember that follicular density is lower in black patients as compared to Asian patients with a consequently lower hair count overall, which results in the easy appearance of hair loss, particularly at the margins of the scalp.^{19,20} Second, the shape of the hair follicle differs among races and ethnicities. Asian patients have round hair shafts coming from straight follicles, which allows for greater natural hair hydration, resulting in somewhat less aggressive scalp disease. Hispanic patients may have similarly straight hair or may have elliptical or curled shafts, the latter being noted in black patients. Furthermore, a curled hair shaft results in poor flow of sebum across the hair, resulting in greater scalp xerosis, more susceptibility to traction alopecia, and ultimately a greater risk for infections.²⁰⁻²³ Finally, the scalp is continuous with the face and neck, and Asian patients have greater sensitivity to skin care products in these areas, resulting in difficulty of treatment in this patient population and the need for use of gentle products.

HAIR CARE PRACTICES IN CHILDREN WITH SKIN OF COLOR

Hair care in patients with skin of color can be costly, difficult, and potentially damaging, with 99% of black girls reporting pomade or oil usage. Costly and complex hair care practices begin in childhood for patients with skin of color. In a series of 201 surveyed black girls with a mean age of 9.8 years, 80% had used hot combs and 42% used relaxers.²⁴ Traction styles were common with 81% using ponytails, 67% braids, and 49% cornrows in the last 12 months. These styles are thought to affect hair health, particularly through induction of traction-related damage, folliculitis, and alopecia. Furthermore, chemical relaxers, hot combs, blowouts, and hair setting may be introduced during childhood.²⁴ These practices appear to disturb the integrity of the hair follicle, leaving it more susceptible to irritation and infection.

Hair care in the pediatric population often is complicated by the fact that multiple children are being styled in tandem, either at home or in a salon, resulting in shared equipment and fomite spread. Even just proximity to a case of tinea capitis in the household will increase risk for tinea capitis. Furthermore, it is quite commonplace for black patients to use pomades and shampoos that contain antifungals, especially selenium sulfide, which makes it difficult to obtain accurate culture results. In India, use of mustard oil also has been linked to increased risk for tinea capitis.²⁵

Other issues related to hair care include frequent dry scalp in patients with skin of color due to poor sebum distribution along the hair shaft. As a result, frequent washing may exacerbate scalp xerosis and further irritate seborrheic dermatitis and/or AD.

DIAGNOSTIC CONSIDERATIONS FOR SCALP HYPERKERATOSIS IN CHILDHOOD

Dermatologists should have a greater level of suspicion for tinea capitis in black and Hispanic children compared to white children. The index of suspicion should be high given that antifungal shampoos and pomades may minimize the clinical appearance. Although trends in overall incidence in the United States suggest tinea capitis is becoming less common, there still is a stronger representation of the disease in black patients.²⁶ A study of positive fungal cultures from one clinic in Mississippi (N=1220) showed that two-thirds of patients were children younger than 13 years; 87% of patients with positive cultures for dermatophytes were black.²⁷ The endothrix type of tinea capitis caused by *T tonsurans* often presents with a seborrheic appearance, and fungal culture is warranted in all pediatric patients with skin of color who have scalp hyperkeratosis. Asian children

can be regarded with a lower level of suspicion for tinea capitis, similar to white patients in the United States. Variation in incidence of tinea capitis does exist worldwide and the practitioner may need to address these issues in patients who travel or are recent immigrants.

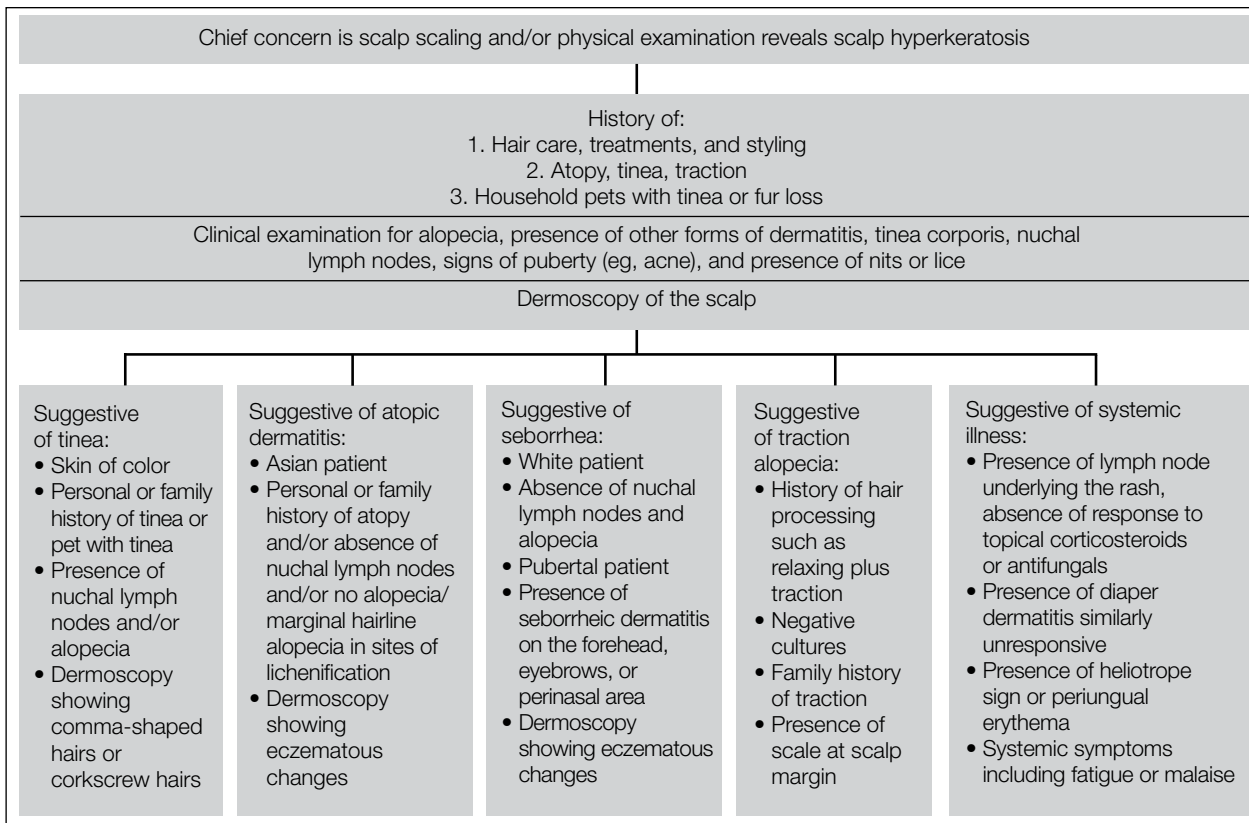
When identifying tinea capitis infections in children with skin of color, physicians should consider the patient's personal and family history, comorbid skin disorders, dermoscopy, microscopy and fungal staining, and fungal culture (Figure).

Personal and Family History

The first diagnostic consideration is the patient's personal and family history. A history of AD, asthma, or allergies will support but not confirm the diagnosis of AD. Prior tinea capitis infections and household contacts with tinea infections support the presence of tinea capitis.¹⁷ Recent implementation of anti-tumor necrosis factor α inhibitor therapy in a psoriatic child can flare scalp disease, mimicking tinea capitis.²⁸ The patient's guardians should be queried about potential infectious contacts, whether they themselves have signs of scalp disease or tinea corporis (ringworm) or whether they have a pet with problematic fur. Physicians also should query patients and their guardians about recent use of topical antifungal shampoos, pomades, creams (both over-the-counter [OTC] and prescription), and/or oral antifungals. When these agents are used, there is a possibility that fungal examinations may be negative in the presence of true infection with tinea capitis. Traction alopecia, often preceded by fine scale, is more likely to present in patients who wear their hair in cornrows, while seborrheic dermatitis may be associated with hair extensions, reduced frequency of washing (61% of black girls surveyed wash every 2 weeks), and/or reduced usage of hair oils in black girls.²⁴ Knowledge of the patient's personal hair care history, such as use of pomades; frequency and method of washing/drying hair; types of hair care products used daily to wash and style hair; use of chemical relaxers; or recent hairstyling with cornrows, braids, or hair extensions, also is essential to the diagnosis of tinea capitis. Usage of traction-related styling practices in patients with chemically relaxed hair can enhance the risk for traction alopecia.²⁹

Comorbid Skin Disorders

The patient also should be examined for comorbid skin disorders, including tinea corporis, alopecia (particularly in the areas of hyperkeratosis), and the presence of nuchal lymphadenopathy. For each extra clinical finding, the chances of a final diagnosis of



A paradigm for the diagnosis of scalp hyperkeratosis in children with skin of color.

tinea capitis rises, allowing for empiric diagnosis to be made that can be confirmed by a variety of tests.¹⁻³

Dermoscopy

Next, the patient should undergo dermoscopic evaluation. On dermoscopy, tinea capitis typically presents with broken hairs, black dots on the scalp, comma-shaped hairs, and short corkscrew hairs, all of which should clear with therapy.³⁰⁻³³ Dermoscopic findings of AD would reveal underlying xerosis and prominent vasculature due to inflammation, and alopecia areata would present with yellow dots at the orifices of the hair follicles, exclamation point hairs, and vellus hairs.^{34,35} Traction alopecia may be noted by retained hairs along the hairline, which is known as the fringe sign.³⁶

Microscopy and Fungal Staining

Microscopic preparations can be performed to identify tinea capitis using fungal stains of slide-based specimens. Breakage of short hairs onto the slide and/or cotton swab is a soft sign corroborating endo-thrix infection of the hairs. Potassium hydroxide can enhance visualization of the hyperkeratotic scalp, but for most black patients, use of antifungal agents reduces

fungal hyphae and spores in the areas of hyperkeratosis and may limit the utility of examining the skin microscopically. Assessment of the broken hairs obtained by gentle friction with one glass slide and catching the scales onto another glass slide may yield the best results in the evaluation of tinea capitis (a technique taught to me by Robin Hornung, MD, Everett, Washington). Hairs obtained in this manner often are fragile and break due to endo-thrix infection replacing and weakening the shaft of the hairs. In the United States, fungal samples usually are obtained with cotton swabs, but a recent study suggested that brushing is superior to scraping to obtain samples; the combination of sampling techniques may improve the yield of a culture.³⁷ Because topical agents are unable to enter the hair cortex, the hair shaft is the most likely to show fungal spores under the microscope when antifungal shampoos or pomades are used. Other testing methods such as Swartz-Lamkins or calcofluor white staining can be used on similar scrapings. Biopsy and periodic acid-Schiff staining of thick scales or crust can help differentiate tinea capitis from pityriasis amiantacea when the crust is too thick to be softened via potassium hydroxide preparation.³⁸

Fungal Culture

Fungal culture onto media that contains nutrients for dermatophyte growth can be used for 4 purposes in tinea capitis: (1) to confirm infection, (2) to identify species of infection, (3) to confirm mycological cure when difficulty in clearance of disease has been noted, and (4) to obtain a specimen for sensitivity screening regarding antifungals when necessary, an uncommon but occasionally useful test in individuals with disease that has failed treatment with 1 or more antifungals.²⁷

THERAPY FOR SCALP HYPERKERATOSIS IN CHILDREN WITH SKIN OF COLOR

In patients with scalp hyperkeratosis, it is important to address the specific cause of the disease. Therapy for scalp hyperkeratosis in children with skin of color includes altered hair care practices, use of OTC and prescription agents, and containment of fomites in the case of infections. Biopsy of atypical scalp hyperkeratosis cases is needed to diagnose rare etiologies such as discoid lupus or Langerhans cell histiocytosis. For individuals with systemic disease including Langerhans cell histiocytosis, which is generally accompanied by nodes and plaques in the inguinal region or other intertriginous sites, immediate hematology and oncology workup is required.³⁹ For collagen vascular diseases such as lupus or dermatomyositis, appropriate referral to rheumatology and systemic therapy is warranted.

Altered Hair Care Practices

The use of prophylactic ketoconazole 1% shampoo may not reduce the risk for recurrence of tinea capitis over standard good hygiene, removal of fomites, and adherence to prescribed therapy.⁴⁰ Use of selenium sulfide has been shown to effectively reduce contagion risk.⁴¹

Fragrance- and dye-free shampoos can be helpful in providing gentle cleansing of the scalp, which is especially important in Asian patients who have greater facial and eyelid sensitivity. Free-and-clear shampoos can be used alternatively with shampoos containing selenium sulfide or sulfur to eliminate comorbid seborrhea. Black patients should be advised to shampoo and condition their hair once weekly, and Asian and Hispanic patients should shampoo and condition 2 to 3 times weekly to remove scale and potentially reduce risk for tinea acquisition.⁴² Children with straight hair should shampoo with increased frequency in the summer to manually remove sweat-induced macerated hyperkeratosis. Conditioners also should be used consistently after shampooing to enhance hair health.

Use of OTC and Prescription Agents

Atopic Dermatitis—Topical corticosteroid agents can be used in increasing strengths to treat AD of the scalp in children with skin of color, from OTC scalp products containing hydrocortisone 1% to prescription-based agents. Hydration of the hair also is needed to counteract reduced water content.⁴³ Due to the innate xerosis of the scalp in black patients and atopic patients, the use of oil-based or lotion products may provide the most hydration for patients with scalp disease.⁴⁴ Alcohol-based agents, either drops or foams, may enhance xerosis and should be used sparingly.

Seborrheic Dermatitis—Alternating treatment with medicated shampoos containing selenium sulfide and ketoconazole can aid in the removal of seborrhea. Pomades including borage seed oil-based agents can be massaged into the scalp,⁴⁵ particularly for treatment of infantile seborrhea, and should not necessarily be washed off daily in dark-skinned patients. Additional focused application of topical corticosteroids to the scalp also is helpful. Due to innate scalp xerosis in black children, therapy should be similar to AD.

Psoriasis—In the setting of pityriasis amiantacea, albeit rare in children with skin of color, oil-based agents can soften hyperkeratosis for removal. Sterile mineral oil or commercially available scalp preparations of peanut oil with fluocinolone or mineral oil with glycerin can aid in the removal of scales without harming the hair, but usage must be age appropriate. The addition of focused application of age-appropriate topical corticosteroids for areas of severe hyperkeratosis can aid in clearance of the lesions.⁴⁴ Recently, a stable combination of calcipotriene 0.005%–betamethasone dipropionate 0.064% has been approved in the United States for the therapy of scalp psoriasis in adolescents.⁴⁶

Tinea Capitis—Antifungal shampoos including selenium sulfide will reduce contagion risk when used by both the patient and his/her family members. Frequency of shampooing is similar to that described for AD. Between shampooing, pomades with selenium sulfide can be applied to the scalp to enhance overall clearance.

Oral antifungals are the basis of treatment and use of griseofulvin is the gold standard. Terbinafine has been approved by the US Food and Drug Administration for treatment of tinea capitis; for children weighing less than 25 kg the dosage is 125 mg daily, for 25 to 35 kg the dosage is 187.5 mg daily, and for more than 35 kg the dosage is 250 mg daily. Shorter therapeutic courses may be required, making it a good second-line agent. Laboratory screening in children prior to therapy is not

always performed but should be done in cases where fatty liver might be suspected.⁴⁷ Monitoring liver function tests is best when exceeding 3 months of usage or shifting from one antifungal to another.³

Containment of Fomites

There are several procedures that should be followed to contain scalp infection in children with skin of color. First, all objects that come into contact with the scalp (eg, hats, hoods, brushes, pillow-cases) should be washed with hot water or replaced weekly. Sharing these objects with friends or family should be strongly discouraged. Patients and their family members also should be instructed to use medicated (eg, selenium sulfide) shampoos and conditioners. Finally, patients are advised to avoid use of shared classroom garments or mats for sleeping.

LONG-TERM SEQUELAE OF SCALP HYPERKERATOSIS

Long-term sequelae of scalp hyperkeratosis often are discounted in children, but the disease can have lasting and damaging effects on the scalp. Sequelae include discomfort from chronicity and psychological distress. In particular, years of scalp pruritus can promote lichenification of the scalp and miniaturization of the hair follicles. Furthermore, itching due to sweating can limit participation in sports. Finally, tinea capitis is thought to be a risk factor for central centrifugal cicatricial alopecia (or can occur comorbidly with central centrifugal cicatricial alopecia causing severe pruritus), a chronic scarring hair loss that is seen primarily in black adult females.⁴⁸ Erythema nodosum also has been reported as an associated finding in the case of kerion.⁴⁹ One study reported associated findings that included thyroid cancer in individuals irradiated for tinea capitis in the 1950s.⁵⁰

CONCLUSION

Scalp hyperkeratosis in children with skin of color, especially black patients, is more likely to be associated with tinea capitis and is more challenging to treat due to innate scalp xerosis in black patients and increased sensitivity of facial skin in Asian children. Ultimately, institution of therapy when needed and good scalp and hair care may prevent long-term sequelae.

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