Clinical Diagnosis of Common Scalp Disorders

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Scalp skin is unique on the body due to the density of hair follicles and high rate of sebum production. These features make it susceptible to superficial mycotic conditions (dandruff, seborrheic dermatitis, and tinea capitis), parasitic infestation (pediculosis capitis), and inflammatory conditions (psoriasis). Because these scalp conditions share similar clinical manifestations of scaling, inflammation, hair loss, and pruritus, differential diagnosis is critically important. Diagnostic techniques and effective treatment strategies for each of the above conditions will be discussed.

Key words: dandruff/pediculosis/psoriasis/seborrheic dermatitis/tinea capitis
J Investig Dermatol Symp Proc 10:190–193, 2005

The skin of the scalp has several unique features that aid in its critical role of protecting the head. First, the follicular density is much higher, creating a dark, warm and moist environment. This provides thermal insulation, but also creates an environment conducive to parasitic infestation. Second, in adults there is a high rate of sebum production, which along with desquamated skin cells can provide a food source for microorganisms. Finally, the scalp skin is subjected to brushing and contact with other styling implements that can cause friction injury and may introduce microorganisms.

These unique features of the scalp make it susceptible to superficial mycotic conditions (dandruff, seborrheic dermatitis, and tinea capitis), parasitic infestation (pediculosis capitis) and inflammatory conditions (psoriasis). These disease processes of the scalp can have significant overlap in clinical symptomatology. Hyperkeratosis (scaling), pruritus, alopecia, and inflammatory signs (erythema, purulence) are common symptoms of scalp disorders. Scaling and pruritus are extremely common complaints. In a survey of 735 adults in the United States, 39% reported having experienced some flaking, and almost 50% complained of scalp itch (data on file at Procter & Gamble). Therefore, a clear understanding of each disease process and its unique clinical manifestations is key to developing an accurate differential diagnosis.

Mycotic Conditions

Seborrheic dermatitis and pityriasis capitis (dandruff) Seborrheic dermatitis and dandruff are now known to be two ends of a single disease spectrum caused by *Malassezia* species (Gemmer *et al*, 2002; Erchiga and Florencio, 2002). Dandruff is extremely common, affecting close to 50% of the world's population (Cardin, 1998). Because the *Malassezias* feed off of lipids, they are found most commonly in patients with high levels of sebaceous secretions and occur in locations where post-pubertal sebaceous gland activity is highest. Dandruff is therefore most prevalent between ages 15 and 50. Like dandruff, seborrheic dermatitis is rare between infancy and puberty because of immaturity of sebaceous glands; however, it often persists well past age 50 (Sinclair *et al*, 1999b). It is a chronic, recurrent condition, and patients generally experience frequent relapses.

Dandruff is characterized by fine, loosely adherent, white or gray flakes that occur either diffusely or in localized patches on the hair-bearing portions of the scalp. Approximately 49% of patients with dandruff experience this flaking. Patients with dandruff also frequently experience pruritus (66%), irritation (25%), and a tight or dry feeling scalp (59%) (data on file at Procter & Gamble).

Seborrheic dermatitis is characterized by inflammatory changes (erythema) covered by larger, yellow, greasy scales that accumulate to form crusts (Fig 1). Patients with seborrheic dermatitis may experience mild pruritus as well. Seborrheic dermatitis is often not confined to the scalp, but occurs in other areas such as the face (particularly in the nasolabial folds, eyelid margins (blepharitis) and eyebrows), inside and behind the ears, the axilla, groin, and anterior chest. It occurs with increased frequency in immunocompromised patients, especially those with AIDS (Farthing *et al*, 1985), and in patients with neurologic disorders such as Parkinson's disease and stroke.

The mainstay of treatment of both dandruff and seborrheic dermatitis is anti-fungal shampoos that have minimum inhibitory concentrations against *Malassezia* (pyrithione zinc, ciclopirox, selenium sulfide, ketoconazole). Some patients may benefit from a keratolytic (salicylic acid) or an anti-proliferative (coal tar) shampoo. Finally, corticosteroids are generally effective at treating severe seborrheic dermatitis.

Tinea capitis Tinea capitis (ringworm of the scalp) is a dermatophytosis of the scalp hair follicle. It is primarily a disease of pre-pubescent children (Herbert, 1988). It has, however, recently been described in post-menopausal

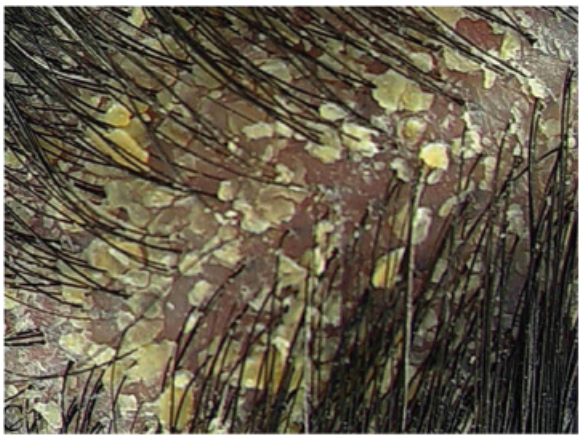

Figure 1
Seborrheic dermatitis on the scalp.

women (Fig 2), perhaps because of the protective effect of sebaceous secretions during earlier adult life (Martin and Elewski, 2003). Dermatophytes can be grouped according to habitat—anthropophilic (human), zoophilic (animal), or geophilic (soil). Since most of these can infect hair, tinea capitis can be spread by contact with infected people, animals, or soil. It can, however, also be spread by sharing pillows, brushes, and clothing.

There are three genera of dermatophytes: *Microsporum*, *Trichophyton*, and *Epidermophyton*. Both *Microsporum* and *Trichophyton* can invade the hair follicle. The species, however, involved tend to vary by time and region. *T. tonsurans* is found primarily in North America and Western Europe. In recent years there has been an increased incidence of *T. tonsurans* infection in urban areas of the United States (Elewski, 2000). This particular fungus is anthropophilic, and often is associated with socioeconomic status and overcrowding (Babel and Baughman, 1989). Children of African and Hispanic descent are also more likely to exhibit *T. tonsurans* (Elewski, 2000). At this time, *M. canis* is a global problem. It is a zoophilic fungus, and may be passed from pets (especially cats) or other animals to children.

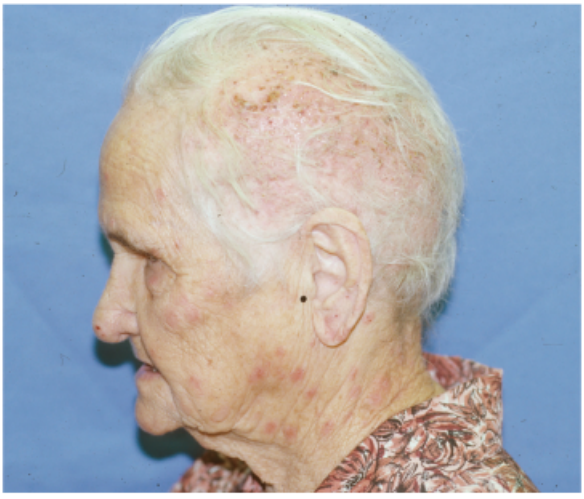

Figure 2
Tinea capitis in a post-menopausal female. Note erythema, pustules, and scaling.

There are two varieties of tinea capitis infection: inflammatory and non-inflammatory. The inflammatory variety can range from a few pustules in the scalp to widespread abscesses. Occasionally a kerion, which is a boggy, purulent, painful mass, may develop. Alopecia and tender cervical and post-auricular lymphadenopathy are often associated with the inflammatory process.

The non-inflammatory variety usually presents with round or oval patches of alopecia. Fine scaling is often present, as well as prominent cervical and post-auricular adenopathy. The appearance of the alopecia differs depending on the type of hair invasion. Ectothrix infection is defined by fragmenting of hyphae into spores outside the hair shaft. This can lead to cuticle destruction and hair breakage a few millimeters from the scalp. Endothrix infection is characterized by hyphae that form spores within the hair cortex. These severely damaged hairs tend to break off at the surface of the scalp, leaving the patient with a characteristic "black dot" appearance of the affected scalp. *T. tonsurans* produces an endothrix infection that is usually associated with minimal scaling or inflammation.

The presence of scalp fluorescence varies with the infecting dermatophyte. *T. tonsurans* and other endothrix infections do not fluoresce. *M. canis* and some other ectothrix infections do fluoresce. Therefore, Wood's light examination does not confirm or rule out the diagnosis of tinea capitis. Direct microscopy of skin scrapings (KOH) and fungal culture of hairs can both confirm dermatophytic infection.

The current treatment of choice in the United States for all tinea of the scalp is griseofulvin (Sinclair *et al*, 1999a). Alternatives are itraconazole, fluconazole, or terbinafine. Tinea capitis is generally treated until the patient is culture negative and the hair is regrowing, and with griseofulvin, the duration of therapy is generally 8 wk or more (Elewski, 2000). The patient and family members should be treated with anti-fungal shampoo to prevent re-infection. The source of exposure should also be identified. If it is a pet, the animal should be treated with an oral anti-fungal agent as well.

Parasitic Conditions

Pediculosis capitis Pediculosis capitis is caused by infestation with *Pediculosis humanus capitis*, or the head louse. It occurs most commonly in school-aged children, and its prevalence has been rising (Chosidow, 2000). Head lice are much more common in white than in black children in North America, apparently because the lice do not grab tightly to curled hair as well (Sinclair *et al*, 2000a, b). They are transmitted most efficiently by head to head contact, but can also be passed by sharing clothing, headgear, pillows, or combs and brushes.

Head lice are usually confined to the scalp, especially the occipital and post-auricular regions. The adult lice measure 3–4 mm and can be seen with the naked eye. Nits (eggs) are firmly attached to the hair shaft close to the scalp. They may also be seen with the naked eye, but can be identified more easily using examination with a Wood's light.

Symptoms develop a few weeks after the initial infestation. Pruritus is the cardinal symptom, and can be severe.

Table I. Comparison of clinical characteristics of common scalp disorders

	Mycotic			Parasitic	Inflammatory
	Dandruff	**Seborrheic dermatitis**	**Tinea capitis**	**Pediculosis capitis**	**Psoriasis**
Age	After puberty	Infancy (cradle cap) After puberty	Children, occasionally adults (more common post-menopausal women)	School age children	Any
Fluorescence (Wood's lamp)	N/A	N/A (not available)	Occasionally (*M. canis*, *M. adouinii*, *M. distortum*, *M. ferrugineum* all fluoresce)	Yes (nits)	No
Pruritus	Varies	Mild	Occasionally	Severe	Mild
Scaling	Fine White or gray	Large, greasy Yellow	Variable (Mild to dense)	No (nits may resemble scales)	Well-demarcated Silver-gray
Inflammation	No	Yes	May occur	Only with superinfection	Yes
Alopecia	No	No	Yes	No	Occasionally
Adenopathy	No	No	Cervical and post-auricular	Only with superinfection Usually occipital	Generally no
History	Hair washing habits	Recurrence	Exposure to infected individuals and animals	Exposure	Family history Recalcitrant to treatment
Other	Responds well to over-the-counter shampoo	Post-auricular region Immunocompromise Neurologic disease	Affects all races, more common in children of African and Hispanic descent	More common in Caucasians	Nail pitting/onycholysis Non-scalp lesions Rare on face

Scratching may cause exudates and crusting. Prolonged infestation may lead to secondary bacterial infection, which can be accompanied by occipital lymphadenopathy and fever.

Treatment of head lice is topical (shampoos, lotions, creams). There are several effective topical insecticides including malathion, carboryl, and permethrin. These are applied once, and then repeated again in 7–10 d to kill any remaining nits. These drugs are generally rotated every 3 y to decrease resistance. There are multiresistant head lice emerging, however, in which case oral treatment with cotrimoxazole or ivermectin can be used (Sinclair *et al*, 1999a,b). After topical treatment, nits need to be removed physically using a fine-toothed comb. This can be time consuming and painful, and pre-treatment with a conditioner is helpful. All clothes and bed linens should be washed in hot water and tumble dried on the hot cycle. Family members should be treated as well to prevent re-infestation.

Inflammatory Conditions

Psoriasis Psoriasis is a chronic, relapsing inflammatory disease that occurs in approximately 2% of the population; 50% of those affected will have scalp involvement (Sinclair *et al*, 1999b). The scalp is a prime area for psoriasis because of the incidence of friction injury/trauma and the lack of UV exposure. In some cases, the scalp is the only involved area. There is a genetic predisposition to psoriasis and family history is therefore important.

Psoriasis is characterized by discrete erythematous plaques covered by a silver-gray scale. These plaques may be seen at the hair margins as well as on hair-bearing areas. Pruritis may be present, but is usually not severe. Early on, the plaques may appear similar to dandruff, and with disease progression, scalp lesions may be similar to those found in seborrheic dermatitis. Extensive hair loss may occur in severe erythrodermic and pustular psoriasis. Nail lesions such as pitting or onycholysis are frequent in patients with psoriasis.

Scalp psoriasis can be very difficult to treat. Most mild cases of scalp psoriasis are treated with tar shampoo. Salicylic acid may be used as well to break down scales; topical corticosteroids may also be effective. Severe cases, or those associated with significant hair loss, may require systemic anti-psoriatic therapy such as methotrexate or cyclosporine.

Conclusion

Although the differential diagnosis of itchy, scaly scalp is extensive, the primary causes are dandruff/seborrheic dermatitis, psoriasis, pediculosis capitis, and tinea capitis. The individual features of each are summarized in Table I. Developing an accurate differential diagnosis based on these unique clinical manifestations is critically important so that proper treatment can be instituted.

DOI: 10.1111/j.1087-0024.2005.10103.x

Manuscript received September 20, 2004; accepted for publication September 28, 2004

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