

Assessment of Hair and Scalp Disorders

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The diagnosis and management of hair and scalp disorders in the clinic or office presents a unique challenge for the physician. In addition to identifying and treating the underlying cause of the disorder, the physician also needs to take into account the impact of these disorders on the patient's self-esteem and quality of life. The first stage in determining the correct treatment strategy is to evaluate the underlying cause of the condition; and to that end, there are a number of invasive and non-invasive methods available to the office physician. These methods range from traditional biopsy and microscopic techniques to new optical methods such as videodermoscopy. Once the type and cause of the condition have been identified, the next stage is to determine the most appropriate holistic treatment strategy. In addition to any prescribed medical treatment, the use of cosmetic hair care products can often play an important role in improving the patient's quality of life. These products (particularly conditioners and styling aids) have been shown to provide the patient with improvements in hair feel, appearance, behavior, and protection against damage. Many of these cosmetic benefits can be measured directly on the hair fiber, using a variety of techniques.

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INTRODUCTION

The office dermatologist may often be confronted with patients presenting a wide range of different hair and scalp disorders, ranging from rare congenital hair fiber abnormalities, pattern loss, chronic effluvium, or indeed simply the effects of chronic weathering. Generally, hair and scalp disorders are not associated with any systemic biological impairment. However, given hair's important role in determining self-image, social perception, and psychosocial functioning, the psychological impact of such conditions may be high. For that reason, hair and scalp disorders can prove distressing for both men and women.

The importance of hair to our self-esteem has been demonstrated by a recent study among male subjects in five European countries (Gray, 2007). Of the 1,536 male respondents, over 70% reported hair to be an important feature of their personal image, and 62% agreed that hair loss could affect their self-esteem, with some 43% of men afraid of becoming bald. The few men among the group who pursued a successful treatment ($n=73$) also experienced improvements in self-esteem and their perception of personal attractiveness. Among female respondents, the negative effects of hair issues on self-esteem have been shown to be greater still, with the myth of the 'bad hair day' shown to have a firm basis in reality, and in some cases linked to the menstrual cycle (Birch and Messenger, 2004).

Given the importance of hair to our sense of self-esteem, when presented with a patient with a hair or scalp disorder, the physician also needs to deal with the problem of setting realistic expectations with their patients. In addition, wherever possible and appropriate, the physician might also

consider educating their patients on the use of cosmetic treatments, which can be used to help improve the appearance of their hair and their overall sense of self-esteem.

In general, the most common complaints seen by the office dermatologist are linked to hair loss or thinning. In addition, a smaller number of patients may present with hair shaft defects. These are primarily caused by excessive weathering, and only rarely due to congenital hair shaft abnormalities. Diagnosis usually involves piecing together clues from the patient's history, a visual examination, and often samples of blood, hair, or skin. This in-depth diagnosis allows the physician, to treat the underlying cause, wherever possible, and additionally provide advice on appropriate cosmetic treatments, to improve the look, feel, and behavior of their hair.

DISCUSSION

Conditions relating to hair loss/thinning

This is the most common type of condition experienced by the office physician resulting from a variety of conditions, such as androgenetic alopecia, telogen effluvium, and cicatricial alopecia. A variety of diagnostic tools has been developed to help the office physician differentiate between the different underlying conditions (Table 1).

Non- and semi-invasive methods. By far, the easiest and most common method is the standard *hair pull* test. This involves pulling hairs gently between thumb and finger over 6–8 areas of the scalp. Normally, between 2 and 6 hairs may be pulled out on recently washed hair, with greater loss indicating

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Table 1. Comparison of clinical characteristics of common hair disorders

	History	Clinical features	Pull test	Microscope analysis	Other testing	Possible causes or associations
Acute telogen effluvium	The causative event can be traced 3 months before onset of hair loss	Normal or slightly decreased hair density	Positive	Telogen hairs	Thyroid function	Diets, drugs, fever, infections, stress, and iron levels
Chronic telogen effluvium	Patients complain of relapsing episodes of increased shedding over months/years	Bitemporal thinning with reduced hair mass	Variable	Telogen hairs	—	Usually remains undetermined
Anagen effluvium	Sudden or severe hair loss	Diffuse alopecia	Positive	Broken dystrophic hairs	—	Chemotherapy and scalp radiation
Androgenetic alopecia	Slowly progressive hair loss	Alopecia limited to the frontotemporal region and vertex	Positive in the affected area	Telogen hairs	—	Polycystic ovarian syndrome in women
Alopecia areata	Sudden loss of all hairs in round areas	Non-inflamed smooth patches completely devoid of hair	Positive	Broken dystrophic hairs	—	Autoimmune thyroid disease
Lichen plano pilaris	Slowly progressive alopecia	Atrophic bald areas, perifollicular erythema, and plugging at the margin	Variable	Anagen hairs with thick sheaths	—	—
Discoid lupus erythematosus alopecia	Slowly progressive alopecia	Irregular bald patches with erythema, edema, scaling, atrophy, and teleangiectasia	Variable	Anagen hairs with thick sheaths	ANA	—
Folliculitis decalvans	Slowly progressive alopecia	Cicatricial alopecia, papulopustular lesions, and tufted folliculitis	Variable	Telogen hairs	—	Bacterial cultures
Trichotillomania	—	Irregular patches with short hairs	Negative	—	—	—

ANA, anti-nuclear antibodies.

excessive shedding. Once obtained, the root end of plucked fibers may be inspected by the naked eye or using a range of microscopic techniques.

The first step is to determine whether the sample can be characterized as anagen or telogen. Consistent with a normal hair growth cycle, plucked hair are telogen. The presence of anagen roots resulting from a sudden interruption during the growing phase is indicative of an underlying serious conditions. Therefore in addition to knowing the nature of the plucked hair fiber, a more thorough examination of the hair fiber under the microscope is necessary to provide further diagnostic information (Table 1).

Typical telogen fibres, consistent with normal hair loss present an absence of epithelial sac, a characteristic club shape and complete keratinization (Figure 1). The most commonly observed type of telogen abnormality is the presence of short-tipped terminal hairs, usually associated with telogen effluvium and androgenetic alopecia.

Normal anagen hairs, which must be plucked to extract, are fuller than telogen hairs (Figure 2). Pulled samples containing anagen hairs are most associated with the after effects of chemotherapy, resulting from a gross interruption of the hair cycle during the anagen phase. However, on closer



Figure 1. A normal telogen bulb.

inspection, there are a number of specific diagnostic characteristics, indicative of other underlying conditions.

For example, an excessive thickening of the sheath is typically observed in the case of cicatricial alopecia, and anagen roots totally devoid of sheaths are indicative of *loose anagen syndrome*. Finally, dystrophic hair roots (where the fiber is broken at the level of the keratogenous zone and a fractured proximal end), are diagnostic for alopecia areata (Figure 3).

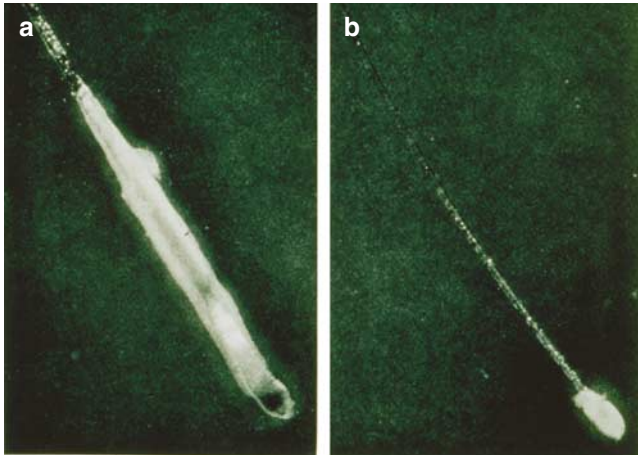


Figure 2. Comparison of anagen (a) and telogen (b) bulbs.



Figure 3. Dystrophic roots.

In addition, there are a number of other investigative methods, which are available to the physician. A standard *trichogram*, involves plucking a minimum of 50 hairs from the patient's scalp, followed by a visual assessment of the nature of the plucked fibers. Sometimes it may be difficult to distinguish between anagen and telogen fibers based on their microscopic appearance alone; however, this can be facilitated using the dye 4-dimethylaminocinnamaldehyde. A standard trichogram can be used to determine chronic forms of hair loss like telogen effluvium (e.g., post-partum effluvium) and androgenetic alopecia (Headington, 1993; Tosti *et al.*, 1999). However, although a trichogram can provide a fair amount of quantitative information, it is time-consuming, not highly diagnostic, unpopular with patients, and increasingly less popular with dermatologists.

One of the latest non-invasive techniques is known as *videodermoscopy*, a high-definition video technique, involving a direct, real-time examination of the scalp under $\times 20$ – 80 magnification (Ross *et al.*, 2006). Videodermoscopy is particularly useful in differentiating between competing diagnoses. For example, the presence of tightly coiled capillary loops can permit the physician to distinguish psoriasis and seborrheic dermatitis from seborrheic dermatitis



Figure 4. Scalp psoriasis.



Figure 5. Alopecia areata – characteristic exclamation mark hairs.

(Figure 4). Alopecia areata can be distinguished from other causes of patchy alopecia by the presence of numerous monomorphic yellow dots (Figure 5). Finally, the technique can be useful in differentiating the various types of primary cicatricial alopecia (Table 1).

Invasive methods. With non- and semi-invasive methods alone, it is sometimes difficult to differentiate between different diagnoses. The dermatologist then needs to resort to invasive techniques such as blood tests or biopsies. A biopsy allows the physician to look directly at the subject of the problem – the hair follicles. Depending on the condition in question, the size of the biopsy can vary, but it is almost never more than 8 mm in diameter. On examination, any specific changes in the nature of the follicles and the surrounding skin are often indicative of the underlying condition. Although providing a wealth of diagnostic information, and being more objective and reproducible than many non-invasive methods, the technique is somewhat unpopular with patients, and generally considered a last resort among many physicians.

Conditions relating to hair shaft defects

After hair loss and thinning, this is the most common type of case presenting the office physician. However, only in very few cases, is the condition related to a congenital hair shaft abnormality, such as pili torti. In the majority of cases, the

damage observed is a result of excessive *weathering*. This is the progressive deterioration of the hair shaft from root to tip, where the loss of cuticular protection leads to a reduction in the ability of the cortex to maintain moisture and a decrease in hair's shine or luster. Indeed, recent studies have shown how loss of hair shine has a significant negative impact on the perception of hair and appearance (Gray, 2007). Further damage leads to a loss of elasticity and strength, and ultimately cortical degeneration, complete loss of structural integrity, and finally hair breakage. This damage progression can easily be observed using scanning electron microscopy.

Weathering can arise from a variety of different sources, but most 'cosmetic hair loss' complaints can be attributed to poor or incorrect cosmetic procedures (Gummer, 1999, 2002), split into three main groups:

1. *Aggressive mechanical manipulation*. This can lead to increased hair loss due to hair pull, and also causes increased cuticular damage. This in turn makes hair increasingly more difficult to manage and therefore prone to further mechanical damage (Gummer, 2002).
2. *Exposure to excessive heat*. The so-called "bubble hair" can be formed when damp hair is heated locally, due to the formation of steam and hydrolyzed keratin (Gummer, 1994).
3. *Inexpert use of chemical procedures*. Chemical treatments by their very nature are designed to cause permanent changes to the hair fiber. Therefore if used inexpertly, these processes are capable of causing structural damage to the hair fiber (Gummer, 2002; Harrison and Sinclair, 2004).

From a diagnostic point of view, an examination of the patient's habits and practices is critically important in pinpointing cosmetic weathering as the underlying cause. In some cases, the office physician may send the hair fiber away for analysis using a scanning electron microscope.

The role of cosmetic products in the holistic treatment of hair disorders

Having identified and prescribed treatment for the underlying condition, the physician might also want to consider the use of cosmetic products as part of the holistic treatment plan. This is particularly important in cases where the condition is primarily due to self-inflicted weathering caused by inexpert cosmetic procedures (Gummer 1999, 2002).

In addition to shampoos, conditioning products and styling aids can be very beneficial for patients suffering from a variety of hair conditions. First, these products can improve the appearance, feel, and behavior of hair, helping to improve the patient's sense of self-esteem. In addition, longer-term use of products, such as conditioners, can actively protect the hair fiber from the effects of weathering.

Conditioning products. Conditioners generally contain a complex network of ingredients, designed to deposit onto the surface of hair fiber. Typical ingredients include silicones and fatty alcohols for lubrication, and cationic surfactants and

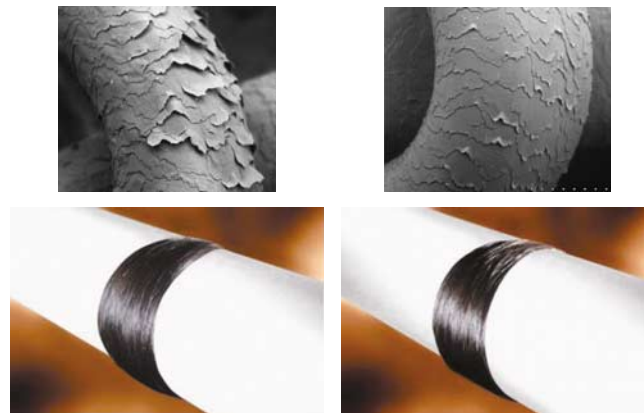


Figure 6. Benefits of conditioning ingredients on fiber surface condition and hair shine (no conditioner LHS; conditioner RHS).

polymers for static control. Modern conditioning products can be formulated to provide different types and levels of benefit to meet the needs of any patient, and are available in a number of different forms (e.g., rinse-out or leave-in).

Once deposited on the surface of the hair fiber, conditioning ingredients help to align and smooth-roughened cuticular edges and reduce the hair's surface friction. An increasing alignment of the individual and bulk hair fibers will help to restore the soft touch and shiny appearance of unweathered hair. Perhaps even more importantly, through reducing the surface friction, conditioners can also improve the ease of wet and dry combing, which can help prevent further mechanical damage and unwanted hair breakage.

The benefits of conditioners have been measured using a number of different techniques, from sensory assessment to complex analytical techniques. Visually, the benefits of conditioning products can be seen from scanning electron microscope pictures of hair fibers, with those treated with conditioner over several washing cycles, exhibiting significantly less weathering (Figure 6). The resulting increase in shine is clearly visible by a naïve sensory panel, and has been measured using laser techniques (Procter & Gamble – data on file).

One recent study has used highly sensitive microscopic techniques to measure the tribological properties of conditioning ingredients (LaTorre *et al.*, 2006). The results of this study demonstrated that the deposition of conditioning ingredients can cause a significant impact in the hair's surface properties, with increased smoothness and reduced friction, especially at the damaged cuticular edges.

Conditioners can form an important part of the holistic treatment regime for patients with either hair thinning or hair shaft conditions. In the case of patients with hair loss, conditioning products can be beneficial in protecting vulnerable new growth from the effects of weathering. Here, it is important to advise the patient to use products designed for finer hair to ensure the right level of conditioning. For patients presenting with cosmetic weathering, the use of conditioners is perhaps even more critical to help prevent further unnecessary hair breakage, while also improving the

appearance of the remaining hair. For these patients, more intensive conditioning products or leave in treatments would prove beneficial.

Styling aids. As with conditioning products, styling aids can be found in a number of different forms (e.g., mousses, sprays, and gels). The main purpose of styling products is to create and hold a specific hair look. The correct use of styling aids can form a very important part of the holistic treatment plan for those patients presenting with hair loss concerns, and can have a significant impact on the patient's perception of their hair and overall appearance. More specifically, a styling mousse or hairspray can be used to increase the *perception* of volume; with the styling polymers present in the product, helping to create a support network around the remaining hair fibers. In fact a trip to the hair salon, to understand how to style their hair appropriately can have a big impact on the patient's sense of self-esteem.

SUMMARY

When treating a patient suffering from a hair condition, the physician is presented with a large range of potential conditions, all with different underlying causes and potential treatment strategies. There are a number of different techniques specifically developed to help the office physician to identify the exact underlying condition. In addition to any medical intervention, the use of cosmetic hair products can form an important part of the holistic treatment strategy and

used in conjunction with the prescribed treatment can provide significant benefits for the patient's sense of self-esteem quality of life. In particular, conditioning products and styling aids can be used to improve the appearance, feel, and behavior of the hair and provide protection against further weathering.

CONFLICT OF INTEREST

A Tosti received an honorarium for consultant's services from Procter & Gamble towards the preparation of this article.

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