International Journal of Biomedicine 13(1) (2023) 26-30
http://dx.doi.org/10.21103/Article13(1)_RA4

REVIEW ARTICLE

INTERNATIONAL JOURNAL OF BIOMEDICINE

Telogen Effluvium, Diagnosis and Management: A Narrative Review

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Abstract

Telogen effluvium is a type of alopecia characterized by diffuse, frequently acute hair shedding. Another chronic type with a more gradual onset is also observed. Telogen effluvium is the most prevalent cause of non-scarring diffuse hair shedding. It is a reactive process induced by hormonal changes, metabolic stress, or drugs. An increase in telogen hair loss does not imply a reason because telogen effluvium may be confused with other hair disorders. Dermoscopy, a modern diagnostic method, can be used to distinguish a variety of hair diseases. This review discusses the putative causal variables, clinical manifestations, diagnostic techniques, and therapeutic approaches.(**International Journal of Biomedicine. 2023;13(1):26-30.**)

Keywords: telogen effluvium • trichoscopy • treatment

For citation: Hussein RS, Dayel SB. Telogen Effluvium, Diagnosis and Management: A Narrative Review. International Journal of Biomedicine. 2023;13(1):26-30. doi:10.21103/Article13(1)_RA4

Abbreviations

ATE, acute telogen effluvium; **TE**, telogen effluvium; **CTE**, chronic telogen effluvium.

Introduction

Hair is an ectodermal structure with a significant aesthetic value. Hair loss is an issue for everyone, regardless of age or gender. In a normal hair cycle, each hair on the head replaces itself after three to five years. Telogen effluvium (TE) is a prolonged transition away from the anagen phase of the hair cycle. Although some telogen hair loss is natural, severe telogen hair shedding manifests as an increase in hair loss or a dispersed decrease in hair volume. Metabolic stress, hormonal shifts, or medication may cause TE, an excessive loss of telogen, or resting hair.[1] Acute telogen effluvium (ATE) is the most common cause of diffuse hair shedding. Numerous other conditions that result in widespread hair loss include androgenetic alopecia, chronic telogen effluvium (CTE), loose anagen hair syndrome, anagen effluvium, a diffuse form of alopecia areata, congenital hypotrichosis, and anomalies of the hair shaft.[2] TE is the most prevalent hair-loss condition, and diagnosing this type of alopecia may be difficult. Trichoscopy may aid in the differential diagnosis.[3] This article examines the etiology and treatment of TE, and the diagnostic function of trichoscopy.

Physiology of Scalp Hair Shedding

Each follicle passes through consecutive periods of development and rest, including the active hair growth (anagen), involution (catagen), and resting (telogen) phases, as part of the scalp hair cycle. During the anagen phase, every hair grows roughly 1cm each month. The overall number of follicles on a healthy scalp remains constant over time, and the percentage of follicles in the telogen stage is controlled by the duration of anagen because the telogen duration is constant. Normal scalp bronchograms have revealed that 86% of the hairs were in anagen, 1% were in catagen, and 13% were in the telogen phase, with 100-150 hairs falling out daily.[4] The biological clock that controls the completion of the anagen phase and the start of the catagen/telogen phase is complicated and may be affected by a pregnancy, starvation, and other stressful events. Anagen lasts 2-8 years, catagen 4-6 weeks,

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and telogen 2-3 months. At the beginning of the catagen phase, apoptosis of hair bulb keratinocytes causes the involution of the transitory follicle below the arrector pili muscle. It takes two weeks to complete the procedure. The reduced follicle remains inactive for two more months until the next anagen cycle begins. The follicle releases dead hair (exogen) either late in telogen or early in anagen.[5] However, the underlying molecular mechanisms are still emerging; it is known that the hair follicle itself contains an autonomous clock that controls its cycle. Autocrine, paracrine, and endocrine signaling systems control it. Variations in the rhythmic signal transducer of the dermal papilla and bulging zones encourage hair cycling. [2] Wnt-family signaling molecules, FGF, TGF-, and the Hedgehog (Hh) signaling pathway influence the hair cycle. The β-catenin pathway, proteins of the Wnt family, noggin, and the transcription factor Stat3 are essential anagen inducers. In addition, SHH protein and HGF enhance anagen growth. IGF-1, VEGF, and TRH prolong the duration of the anagen phase. Polyamine spermidine is a significant catagen inhibitor and anagen prolongator. Spermidine is a powerful inducer of hair growth in humans and a previously unidentified regulator of epithelial stem cell biology. Anagen ends by simultaneously reducing anagen-supporting factors (IGF-1, HGF, and FGF-5S) and enhancing hair growth inhibitors, such as TGF-β1, TGF-β2, and FGF. The Dickkopf-1 (DKK-1) controls the activity of follicular keratinocytes, which play a role in the anagen-catagen transition of the hair cycle. Neurotrophins NT-3 and NT-4, retinoids, and prolactin are other chemicals that regulate the anagen-catagen transition. Prolactin, which is produced by the follicle itself, plays a role in controlling anagen and telogen initiation. Resting hair cycle control signaling remains partially understood. In contrast, telogen is likely a crucial step in controlling the hair cycle. BMP4 inhibits hair follicles in the telogen phase. The resting stage of the hair cycle is controlled by the cyclic epithelial FGF18. Exogen has own regulatory mechanisms, and it is assumed that the proteases cathepsin L and Msx-2 are its regulators.[6]

Pathogenesis of TE

TE is a disease state of hair follicles defined by diffuse shedding of telogen hair from the scalp, which develops approximately 3 months after a precipitating event and lasts approximately 6 months, on average. In TE, hair loss often affects not more than half of the scalp hair. Follicles are often characterized by early triggered anagen cessation. Subsequently, the follicle enters the catagen phase and turns into a telogen-like resting phase. Excessive hair loss has been observed around 2–3 months following the first insult. Multiple potential precipitants have been linked to the pathophysiology. Establishing the cause requires obtaining a pertinent history and performing appropriate laboratory tests to rule out endocrine, nutritional, and immunological disorders.[7] Five functional changes affect the hair cycle, leading to more hair loss during the telogen phase:

Immediate anagen release: This is a short-onset TE, in which a trigger prematurely ends the anagen phase. It is a frequent type of TE caused by physiological stress, such as high fever episodes. During fever, cytokines trigger hair follicle keratinocyte apoptosis, beginning with catagen and subsequently progressing to the telogen stage. Reversal is linked to regular cycle resumption

Delayed anagen release: This form of TE is often associated with postpartum hair shedding by the mother. This is caused by the high quantity of placental estrogen in circulation, which prolongs the anagen phase. The cessation of these trophic hormones during birth causes all anagen hairs to concurrently enter the catagen phase. This results in increased telogen hair loss a few months after giving birth.[8]

Short anagen phase: This is characterized by an idiopathic, short anagen phase that hinders the growth of long hair. It also occurs in loose anagen syndrome, familial hypotrichosis, ectodermal dysplasia, and healthy children as an independent condition, leading to resistant TE.[9]

Immediate telogen release: This occurs because of a shortened telogen cycle. Typically, this kind of hair loss begins 2–8 weeks after the initiation of topical minoxidil treatment. This paradoxical result occurs due to stimulation of the anagen phase, which results in the release of dormant exogen hairs.[8]

Delayed telogen release: Instead of shedding and returning to anagen, hair follicles of this type remain in telogen for an extended period. When teloptosis ultimately develops, a clinical indication of increased clubhair loss is detected. During the process of losing their winter coats, animals with a synchronized hair cycle experience this phenomenon. Seasonal occurrence is possible in humans.[8]

Clinical Features

TE was first defined as extensive hair loss beginning 2–3 months after a precipitating factor, such as surgical trauma, malnutrition, high fever, hemorrhage, or starting a new therapy. Approximately 33% of TE cases have no identifiable causes. However, ATE is often associated with emotional stress; this hypothesis has little evidence. Immediate anagen release is a functional shedding mechanism. It is unknown how these incidents at the molecular level induce hair to fall.[10] High circulating placental hormones extend anagen, and after delivery, loss of trophic hormones leads to overdue anagen hairs entering the catagen phase. A few months later, telogen hairs are lost, producing telogen gravidarum.[11]

Telogen hair loss lasting more than six months was diagnosed as CTE. This could be secondary to a variety of factors or related to a primary persistent CTE. The diagnosis can be confirmed if the link between the cause and hair shedding is reversible and repeatable.[12]

Primary CTE is an unexplained, self-limiting illness characterized by at least six months of elevated telogen shedding. It is prevalent in women aged between 30 and 50 years. Some episodes of CTE are preceded by ATE with a recognized cause; in the majority of cases, the cause cannot be established. CTE may be caused by any of the functional categories of TE, but it is considered to be associated with a reduced anagen of the hair cycle.[13] Affected women often exhibit significant chronic shedding for various reasons for many years. They often lack a familial history of androgenetic alopecia, and physical examination indicates significant temporal recession without central portion widening; however, these standards are not rigid, and androgenetic alopecia may imitate this presenting feature.[14]

Secondary chronic telogen hair loss is often attributed to thyroid conditions, severe iron-deficiency anemia, malnutrition, and acrodermatitis enteropathica.[15]

Hyperthyroidism and hypothyroidism, as well as drug-induced hypothyroidism, may induce widespread hair shedding in about 50% and 33% of individuals, respectively. Hypothyroidism is hypothesized to impair both the epidermis and skin appendage cell division. This suppression of mitosis produces the catagen phase and slows the re-entry of telogen hairs into the anagen phase in a subset of individuals. It is unclear how hyperthyroidism causes hair loss. Hair shedding may appear months before the appearance of other symptoms. Replacement medication often stops hair loss, except for hypothyroidism with long-term atrophic hair follicles.[15]

Severe iron-deficiency anemia is associated with diffuse hair shedding. Iron insufficiency occurs in approximately 20% of cases without anemia and appears primarily at a serum ferritin level below 20 g/L. Iron is a key cofactor of DNA-synthesizing ribonuclease reductase. Iron deficiency was assumed to inhibit matrix cell proliferation. Consequently, hair follicles that lose their hair at the completion of the telogen phase could momentarily fail to re-enter the anagen phase, resulting in diffuse hair shedding with slow onset.[2]

Acrodermatitis enteropathy with zinc deficiency can result in severe TE. Nevertheless, asymptomatic zinc insufficiency without other symptoms does not result in the spread of hair loss.[15]

Rapid weight loss accompanied by acute protein-calorie deprivation may cause hair shedding. Marasmus may cause thin, dry, straight, lustreless hair that is readily plucked. Kwashiorkor causes episodes of halted hair development in which the hair either enters the telogen phase or, if less severe, the quality of the hair is affected more than its linear development, resulting in the formation of numerous Pohl Pinkus lines. The change in hair color is an additional distinguishing trait. Black hair turns brown, while brown hair becomes blonde. Kwashiorkor “flag signs” consist of this color change and periodic constriction. Deficits in essential fatty acids also cause significant hair loss and fading of hair color.[16]

Liver diseases and chronic renal failure are metabolic disorders that cause scant scalp hair. In advanced malignant illnesses, hair loss may be attributed to hypoproteinemia rather than cancer itself, although alopecia is an early sign of Hodgkin’s disease. Dermatomyositis and systemic lupus erythematosusmay also induce telogen hair loss. Secondary syphilis may cause diffuse hair loss, although a typical moth-eaten sign is not usually evident.[17]

Medication-induced telogen hair shedding often begins 6–12 weeks after drug administration and continues for as long as the drug is used. Most often, it is related to quick anagen release. With acitretin, telogen hair loss is more prominent than with isotretinoin, which seems to be dose related. Retinoids seem to create a telogen anchoring defect and diminish anagen duration. Individual sensitivity exists in drug-induced TE. Retinoids, heparin, propranolol, allopurinol, captopril, and gold are all examples of drugs that have been linked to TE.[18]

Evaluation of Hair Shedding

In acute TE, the hair pull test is positive, with clumps of telogen hair easily retrieved from the vertex and scalp edge. Anagen and telogen hairs can differentiate visually. Unlike anagen hairs, telogen hairs have depigmented bulbs and no inner root sheaths. Beau’s nail line may coexist. A hair pluck trichogram often reveals more than 25% telogen hairs. A 60-second hair count test often exceeded 100 hairs (the normal value was 10 hairs). This procedure, which consists of combing the hair forward for 60 seconds over a contrasting towel before washing, may be used to evaluate the course and resolution of a condition. [5]

Trichoscopy is a cutting-edge diagnostic method that is straightforward and noninvasive and may be used as a convenient bedside tool for identifying common hair and scalp conditions. In addition to detecting alopecia, it may prevent needless biopsies and, if required, assist in selecting the best location for a biopsy. Moreover, trichoscopy is a useful technique for photographically assessing the therapy response at each follow-up trichoscopy in cases with ATE, revealing reduced hair density and the existence of empty follicles. Because there is no change in the hair shaft diameter and no peripilar halo, it is simple to distinguish it from androgenetic alopecia. TE is a diagnostic criterion for exclusion during trichoscopy.[19]

To rule out any further reasons for diffuse telogen hair loss, a complete blood count, iron, syphilis serology, anti-nuclear antibody, serum zinc, and, thyroid tests must be carried out.[5]

Although seldom necessary in acute instances, a biopsy may provide a fearful patient encouraging prognostic information. Additionally, it may rule out conditions that manifest with increased hair shedding, such as androgenetic alopecia, secondary syphilis, diffuse alopecia areata, dermatomyositis, andsystemic lupus erythematosus. ATE histology demonstrates an increase in telogen hairs without inflammation, and no appreciable increase in the amount of vellus hairs, implying androgenetic alopecia.[5]

Drug-induced TE is diagnosed by establishing a compatible chronology between drug exposure and the development of hair shedding. Testing requires stopping the use of any suspected drugs for at least three months. If regrowth follows withdrawal and recurrence follows re-exposure, a conclusion can be drawn.[18]

CTE is frequently diagnosed based on the patient’s history and physical assessment; however, a scalp biopsy is necessary to distinguish it from androgenetic alopecia. The best scalp biopsy is a 4 mm punch biopsy obtained from the vertex for horizontal embedding. Because androgenetic alopecia is a pattern-based condition that favorably impacts the scalp’s vertex, this region has the highest diagnostic value. Scalp sample histology reveals an 8:1 anagen-to-telogen ratio, as opposed to a 14:1 ratio in a normal scalp. In CTE, the overall quantity of hair is identical to that of normal scalps, and the terminal-to-vellus hair ratio is 8:1. In androgenetic alopecia, the ratio of the terminal-to-vellus-like hair is 1.9:1.[20]

General Treatment

The most crucial component of TE treatment is educating patients about their natural course. The hair cycle and link

between hair loss causes and time must be explained, and attempts should be made to determine the precise cause. Once established, this must be remedied. Stopping hair loss takes 3-6 months, and regrowth may be seen 3-6 months after elimination of the cause, although aesthetically significant regrowth can take 12-18 months.[21] Typically, CTE spontaneously improves within 3-4 years. Rarely, the illness persists for more than 10 years. Stress is one of the most significant contributors to TE. There is no particular treatment that may halt the early initiation of catagen due to stress. Psychological counseling is considered the safest and most effective treatment because it is the least intrusive and requires the least effort to address psychological consequences. The patient requires a concise presentation of the diagnosis and available therapeutic alternatives. Depending on the pathophysiology of TE, potential treatment approaches include anagen induction and catagen inhibition.[22] Currently, no FDA-approved anagen inducer or catagen inhibitor is effective. However, catagen-inducing medicines (retinoids, beta-blockers, antithyroid, or anticoagulant therapies) and endocrine abnormalities (hyperprolactinemia, thyroid dysfunction, or hyperandrogenism) should be avoided and managed. It is also possible to commence replacement treatment for catagen-induced deficits (iron, zinc, protein, and estrogen). There is continuing debate as to whether low serum ferritin levels constitute a dietary shortage that causes hair loss.[18] Some experts advise maintaining serum ferritin levels >40 ng/dl or 70 ng/dl to reverse severe hair loss. Effective first therapy has consisted of adequate nutritional status and 3–4 times daily oral delivery of 300 mg ferrous sulfate. Iron supplements are administered for 3–6 months until reserves are regenerated.[23] The efficacy of thyroxine or iron replacement on the TE outcome is limited; however, some advantages have been shown in a small number of controlled studies.[24] Some have also attempted topical minoxidil, a medicine that is a potential contender because of its ability to extend the anagen phase.[25]

New Treatments

There have been reports of new cosmetic treatments for TE. It contains a leave-on technology mix (caffeine, niacin amide, panthenol, dimethazone, and an acrylate polymer (CNPDA)) that greatly improves hair diameter by 2-3 μm, increasing the cross-sectional area by around 10%. Furthermore, thicker CNPDA fibers can withstand pressure without breaking. However, the effectiveness of TE must be determined.[26] Stemoxydine is a revolutionary strategy for maintaining hair growth and cycling because it mimics hypoxic signaling. It is a strong P4H inhibitor. It can activate signaling pathways in a manner similar to hypoxia. Based on in vitro research, it has been postulated that sustaining the activity of hair follicle stem cells may require induction of hypoxic signaling. Compared with volunteers receiving a placebo, in vivo clinical investigations have demonstrated that daily topical treatment with a 5% solution for three months enhanced follicular density.[27]

Conclusion

TE is the most prevalent reason for diffuse scalp hair shedding. Because ATE is a self-limiting condition, an observational strategy is required until the situation is resolved. CTE must be established only when other types of long-standing diffuse hair shedding, such as androgenetic alopecia, are ruled out. Trichoscopy is a cutting-edge, noninvasive diagnostic method that may be used as a convenient bedside tool for identifying common hair and scalp disorders. The most crucial component of treatment is educating the patients about the natural course of TE.

Acknowledgments

This study was supported by Prince Sattam Bin Abdulaziz University (Project PSAU/2023/R/1444).

Competing Interests

The authors declare that they have no competing interests.

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