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Is thyroid dysfunction a common cause of telogen effluvium?

A retrospective study

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Abstract

Telogen effluvium (TE) is a common cause of hair loss characterized by excessive resting hair shedding. Thyroid dysfunction is one of the possible causes of TE. On the other hand, the link between thyroid disorder and TE is still being debated. The aim of this retrospective is to investigate the link between thyroid dysfunction and TE. This retrospective study included 500 female patients with TE who had thyroid function testing between January 2012 and December 2022. Patients were eligible if they had a confirmed TE diagnosis and thyroid function tests within 3 months of being diagnosed with TE. The thyroid function of the participants was classified as euthyroid, hypothyroidism, or hyperthyroidism. The severity of hair loss was determined using the severity of alopecia tool (SALT) score. The study included 500 TE females, 248 of whom were euthyroid, 150 had hypothyroidism, and 102 had hyperthyroidism. The hypothyroid group had a significantly higher mean SALT score than the other 2 groups. Furthermore, patients in the hypothyroid group had a higher proportion of severe hair loss. The mean SALT score did not differ significantly between groups with normal thyroid function and those with hyperthyroidism. A common cause of TE is thyroid dysfunction, particularly hypothyroidism. Patients with hypothyroidism have more severe hair loss than those with normal thyroid function or hyperthyroidism. To effectively identify and manage such cases, thyroid function testing should be included in the diagnostic workup of patients with TE.

Abbreviations: SALT = severity of alopecia tool, TE = telogen effluvium.

Keywords: hyperthyroidism, hypothyroidism, telogen effluvium

1. Introduction

The thyroid hormone plays a pivotal role in regulating the body's metabolism and is crucial for numerous cellular activities, including growth, metabolism, and thermogenesis.[1] Thyroxine or tetra-iodothyronine (T4) is the primary or a prohormone produced by the thyroid gland, which is subsequently converted into the active hormone, triiodothyronine (T3), by deiodination enzymes in peripheral tissues.[2] The cellular response to T3 is mediated by nuclear thyroid hormone receptors, specifically, TRα and TRβ, acting as transcription factors that regulate gene expression by binding to deoxyribonucleic acid.[3] These receptors are found in various hair follicular cells, suggesting that thyroid hormone may directly influence hair growth rather than relying on intermediary mechanisms related to the body's metabolic status.[4,5]

Hair loss is a prevalent concern affecting individuals of all ages and genders. Hair follicles typically undergo a cyclic process of growth and replacement that lasts several years. Telogen effluvium (TE) is a hair loss condition characterized by an extended resting or telogen phase of the hair cycle.[6] While some hair shedding during this phase is normal, TE leads to excessive hair loss and a noticeable reduction in hair volume due to increased shedding of resting hair. Various factors can contribute to TE, including metabolic stress, hormonal changes, and medication use.[7]

Thyroid hormones are well-established regulators of hair growth, and thyroid dysfunction can lead to various hair disorders, including telogen effluvium.[8,9] Telogen effluvium occurs when a higher number of hair follicles transition from the active growth (anagen) phase to the resting (telogen) phase. This extended resting phase results in excessive hair shedding, leading to the characteristic hair loss observed in TE.[10] The association between thyroid dysfunction and hair loss, including TE, has been extensively investigated. While some studies

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have suggested a link between the 2 conditions,[11,12] others have yielded conflicting results.[13,14] These inconsistencies may be attributed to limitations such as small sample sizes, lack of control groups, and retrospective study designs.

We conducted a large-scale, well-designed retrospective study to address these limitations and shed more light on the relationship between thyroid dysfunction and TE. Our primary objective was to investigate the link between thyroid dysfunction and TE by analyzing a cohort of 500 female patients with confirmed TE, who had thyroid function testing. The study aimed to determine if thyroid dysfunction, particularly hypothyroidism, is a common cause of TE and how severe hair loss is in patients with different levels of thyroid function.

2. Methods

This study was carried out in accordance with medical research ethics and principles. The relevant institution's Ethical Approval Committee reviewed and approved the study protocol. Patients were informed about the study's objectives and procedures prior to enrollment and provided informed consent. The study protocol was approved by the institutional review board of Prince Sattam bin Abdulaziz University (No. SCBR-124/2023).

Between January 2012 and December 2022, this retrospective study encompassed 500 females aged 18 or older, diagnosed with either acute or chronic TE, who sought care at the dermatology clinic of Prince Sattam bin Abdulaziz University Hospital and underwent thyroid function testing. All cases had been diagnosed with TE by a dermatologist consultant, employing several crucial aspects of clinical criteria. Patients often manifest increased hair shedding diffusely across the scalp rather than in focal patches, lacking associated scalp scarring or inflammation. This shedding pattern typically emerges approximately 2 to 3 months subsequent to a triggering event, a diagnosis commonly supported by a positive pull test. Patients were required to have thyroid function testing within 3 months of receiving a diagnosis of TE in order to be eligible for inclusion in the study.

Blood samples were collected from all participants and centrifuged at 3000 rpm for 15 minutes after being clotted for 30 minutes at 25°C. Serum aliquots were separated and stored at −20°C until testing. Chemiluminescent Immunoassay (COBAS e411) was used to measure thyroid function tests such as free T3 (fT3), free T4 (fT4), and TSH.

The exclusion criteria were precisely documented and consistently applied during the participant selection process. Subsequently, the eligible patients were divided into 3 groups based on their thyroid function: euthyroid (normal thyroid function), hypothyroidism, or hyperthyroidism. Top of Form The severity of alopecia tool (SALT) score was used to assess the extent of hair loss in the participants. The SALT score is a standardized tool for determining the severity of alopecia. It entails dividing the scalp into 4 equal sections (top, front, right, and left) and calculating the percentage of hair loss in each. The overall SALT score is determined by adding the scores from all 4 areas, yielding a score ranging from 0 to 100%. A high SALT score indicates severe hair loss.[15]

2.1. Exclusion criteria

Patients with specific conditions known to potentially cause hair loss were excluded from the study to ensure the study's integrity and to reduce potential confounding factors. These conditions included chronic diseases as well as general factors linked to hair loss, such as physical or emotional stress, certain medications (such as anticoagulants, retinoids, and beta-blockers), hormonal fluctuations (e.g., postpartum, menopause), crash diets, chronic illnesses, and iron deficiency. In addition, individuals below 18 years of age were also excluded.

2.2. Statistical analysis

Was performed to analyze the data obtained from the participants. Descriptive statistics, such as mean and standard deviation, were used to summarize the characteristics of the study groups. Inferential statistics, such as *t* tests or chi-square tests, were employed to determine significant differences between the groups.

3. Results

Table 1 summarizes our findings. The study included 500 female TE patients, 248 of whom were euthyroid, 150 had hypothyroidism, and 102 had hyperthyroidism. The mean SALT score differed significantly ($P < .001$) between the hypothyroidism group and the other 2 groups, with the hypothyroidism group having a higher mean SALT score. The proportion of patients with severe hair loss (SALT score > 50) was also higher in the hypothyroidism group (34%) compared to the normal thyroid function group (18%) and hyperthyroidism group (20%) ($P = .02$). The mean SALT score did not differ significantly ($P = .25$) between the groups with normal thyroid function and hyperthyroidism.

4. Top of form

5. Discussion

Our comprehensive retrospective study aimed to investigate the relationship between thyroid dysfunction and TE. We have noticed that the hypothyroid group had a significantly higher mean SALT score than the euthyroid and hyperthyroid groups, indicating a significant association between hypothyroidism and TE. These findings support the hypothesis that hypothyroidism is a common underlying cause of TE, which is consistent with previous studies linking hypothyroidism to disruption of the hair growth cycle and increased hair shedding.[16,17] Hypothyroidism has been linked to a disruption in the hair growth cycle by inhibiting cell division in the epidermis and skin appendages, resulting in an increased number of hairs in the resting phase. The prolonged telogen phase eventually results in excessive shedding of resting hair, resulting in the typical hair loss seen in TE.[18]

Table 1

Summary of our result.

Thyroid function status	Number of patients (n = 500)	Mean SALT score	The proportion of patients with a SALT score > 50
Normal	248	25.6	18%
Hypothyroidism	150	44.2	34%
Hyperthyroidism	102	28.9	20%

Table 1 Showed that the hypothyroidism group had significantly higher mean SALT scores than both the euthyroid and hyperthyroidism groups ($P < .001$). Furthermore, when compared to the other two groups, the proportion of patients with severe hair loss (SALT score > 50) was significantly higher in the hypothyroidism group ($P = .02$). The mean SALT score did not differ significantly between the euthyroid and hyperthyroidism groups ($P = .25$).

SALT = severity of alopecia tool.

Hair loss has previously been linked to hyperthyroidism, a condition characterized by excessive thyroid hormone production.[15,19] However, the mechanisms underlying hair loss in hyperthyroidism are not completely understood. We found no statistically significant difference in hair loss severity between patients with euthyroid and hyperthyroidism in our study. These findings are consistent with previous studies that found conflicting results regarding the link between hyperthyroidism and hair loss.[20–22] We compared our findings to existing literature on hyperthyroidism and its impact on hair growth to gain more understanding. According to some studies, approximately 50% of hyperthyroid patients experience significant hair shedding.[19] Hair loss in hyperthyroidism may precede other clinical symptoms, and replacement medication is frequently effective in stopping hair loss.[19,23] Nonetheless, the precise mechanisms by which hyperthyroidism affects hair growth remain unknown. It is hypothesized that hyperthyroidism's accelerated metabolism will result in increased energy demands, which will divert resources away from hair follicles, resulting in hair shedding.[24,25] Furthermore, the influence of thyroid hormones on hair growth is complex, and the effects of hyperthyroidism may be modulated by individual differences in hormone sensitivity, genetic factors, and other underlying conditions.

Additionally, potential interactions between thyroid hormones and other hormones or mediators that may influence hair growth must be considered. For example, the balance of thyroid hormones and sex hormones such as estrogen and androgens may influence hair loss patterns.[26] Furthermore, the overall systemic effects of hyperthyroidism may affect hair growth differently in different people, resulting in varying degrees of hair loss severity.

It is important to note that hyperthyroidism is diagnosed using clinical and biochemical criteria, and thyroid function testing is essential for accurate identification. The timing and duration of thyroid hormone changes in hyperthyroidism, on the other hand, may influence the extent of hair loss. As a result, more research is needed to investigate the temporal relationship between hyperthyroidism and the onset of hair loss.

The lack of a significant difference in hair loss severity between the euthyroid and hyperthyroid groups in our study could be attributed to a variety of factors. First, the sample size in each group may affect the statistical power to detect differences. Second, because male-pattern hair loss and other forms of alopecia may exhibit different patterns of association with thyroid dysfunction, the study's focus on female patients with TE may have implications for the observed outcomes.

While the current study adds to our understanding of the link between hypothyroidism and TE, it also highlights the need for more research into the complex interactions between thyroid hormones and hair growth, particularly in the context of hyperthyroidism. Future research should look into different subtypes of hyperthyroidism, hormonal interactions, and potential mediators of hair loss in this specific population. Longitudinal studies with larger and more diverse cohorts may also provide a better understanding of the temporal relationship between thyroid dysfunction and the severity of hair loss.

6. Limitations

Retrospective design introduces the possibility of selection bias as well as reliance on existing medical records. The study only included female TE patients and was done in a single institution, limiting generalizability to other populations. The accuracy and consistency of TE diagnosis based on medical records and dermatologist assessments may vary. Because the SALT score is subjective, different assessors may score differently.

7. Conclusion

The significant association between hypothyroidism and TE was confirmed in this retrospective study, emphasizing the importance of thyroid function testing in the diagnostic workup for patients with hair loss. The link between hyperthyroidism and hair loss, on the other hand, is less clear, with our findings showing no significant difference in hair loss severity between euthyroid and hyperthyroidism patients. These findings highlight the importance of additional research into the complex interactions between thyroid hormones and hair growth, particularly in the context of hyperthyroidism. Increasing our understanding of these relationships may lead to better diagnosis and treatment of thyroid-related hair disorders.

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