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Original Article

Assessment of hypothyroidism in diffuse nonscarring alopecia

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Abstract

Background Alopecia, clinically as well as etiologically, is a heterogeneous group. Several hormonal etiologies may cause alopecia including hyperthyroidism, hypothyroidism etc. Thyroid diseases show a wide range of clinical signs in skin, hair and nails. Several reports document a significant correlation between thyroid diseases especially hypothyroidism with alopecia. Thyroid function test is one of the useful indices to assess the cause of alopecia.

Objective The aim of our study was to evaluate the frequency of alopecia in hypothyroid cases by performing the thyroid function tests (T3, T4, TSH).

Patients and methods Twenty diagnosed patients of hypothyroidism were assessed for alopecia (according to the Hamilton and Norwood grading scale) and thyroid function tests. 20 healthy controls were recruited for comparison.

Results Out of 20 hypothyroid patients, 10 (50%) showed alopecia of variable grades. On laboratory investigations, significantly decreased levels of T_3 and increased levels of TSH were noticed.

Conclusions Alopecia is quite frequent in hypothyroid patients. Similarly, thyroid profile is one of the useful diagnostic index for screening patients with alopecia.

Keywords
Alopecia, hypothyroidism, triidothyronine, tetraidothyronine, thyroid stimulating hormone.

Introduction

Alopecia can occur as a result of injury to the living hair root or to the keratinized hair shaft. If the damage is limited to the hair shaft, the hair loss will be temporary. If hair root is damaged, the resulting alopecia may be temporary or permanent. Diffuse non-scarring alopecia has a multifactorial etiology. Any chronic systemic illness, endocrinopathies, pregnancy, lactation and drugs can give rise to diffuse nonscarring alopecia. Amongst endocrine disorders, thyroid disease, both hypo- and hyperthyroidism are associated with alopecia.[1]

Thyroid hormones T_3 and T_4 are essential for normal growth of all tissues including skin, hair and nails.[2,3] They promote incorporation of amino acids into proteins, which is depressed after thyroidectomy and may be restored to normal by appropriate replacement therapy. The term

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hypothyroidism refers to a condition where insufficient thyroid hormones are produced. Hypothyroidism has protean clinical manifestations.[3] The skin is puffy, waxy yellow, cool and dry. The hair is dry, brittle and grows slowly.[3]

With this background, a study was designed to find out the occurrence of alopecia in hypothyroidism.

Patients and methods

This study was conducted in the Department of Biochemistry, Basic Medical Sciences Institute, Karachi and Jinnah Postgraduate Medical Centre, Karachi. Twenty diagnosed patients of hypothyroidism of any age and either sex were selected (7 males and 13 females; mean age, 32.6±1.92 years). Pregnant or lactating mothers, cigarette smokers and alcoholics and patients having any history of liver disease, renal impairment, diabetes mellitus, hypertension, cardiovascular and cerebrovascular disease, any psychiatric illness and any other endocrine disorder and use of any medical therapy were excluded. A control group of 20 healthy subjects (without alopecia, hypothyroidism or any causative factor) of the same age group was also recruited for comparison. The participants were selected from JPMC, Kulsoom Bai Valeeka Social Security Hospital, Karachi and Skin Cure Centre, Federal B Area, Karachi. All these belonged to different socio-economic status and classes of either sex.

A detailed history was taken and a meticulous clinical examination was carried out with special reference to alopecia. Alopecia was assessed according to the Hamilton and Norwood grading scale by using vernier. The thyroid function tests were estimated by enzymatic kit methods using commercially available kits i.e. Cat # LKT 31, code # 6119 of violet in colour for serum total triiodothyronin (T_3), Cat # LKT 41, code # 6109 of light blue in colour for serum total thyroxine (T_4) and Cat # LKT S 1, code # 6106 of red in colour for thyrotropin (TSH), of CDC Test System Code # 10159, CLIA Complexity Category of moderate type, made by Immulite Systems®, USA. The procedure of estimating T_3, T_4 and TSH was carried out on Immulite Autoanalyzer.

Mean values of hormones were compared using student t test and a cut off value of 5% was used for a significant *p*.

Results

Table 1 depicts the distribution of various grades of alopecia in hypothyroid patients. In hypothyroid group, 5 (25%) had grade 1 alopecia, 4 (20%) had grade 2 alopecia and only 1 (5%) had grade 3 alopecia. **Table 2** shows the biochemical observations in hypothyroid patients with alopecia (n=10). Significantly decreased mean serum total T3 and increased mean TSH were noticed ($p<0.001$). There was no significant change in the mean serum total T4 levels as compared to the controls.

Discussion

Our results show that alopecia is quite frequent in hypothyroidism. This is in agreement with many other studies. Leye *et al*.[4] reported alopecia in 57.9% of their hypothyroid patients. However, relatively

Table 1
Distribution of various grades of alopecia of hypothyroid and alopecic subjects.
(Values are expressed in ± SEM)

Groups	*Alopecia grade 0*	*Alopecia grade 1*	*Alopecia grade 2*	*Alopecia grade 3*
Control (n = 20)	20(100%)	-	-	-
Hypothyroidism (n = 20)	10 (50%)	05 (25%)	04 (20%)	01 (5%)
Generalized alopecia (n = 20)	-	10 (50%)	07 (35%)	03 (15%)

Table 2
Biochemical observations of hypothyroid group appeared with alopecia.
(Values are expressed in ± SEM)

Groups	*No. of alopecia subjects*	*T3*	*T4*	*TSH*
Control (n = 20)	-	1.035 ± 0.067	7.42 ± 0.74	1.54 ± 0.21
Hypothyroid. (n = 20)	10 (50%)	0.43 ± 0.12**	7.2 ± 0.9	6.2 ± 0.19**

** (p<0.001) highly significant when compared to the control.

lower figures of 32% and 6% were reported by Sidibe *et al.*[5] and Djroli *et al.*[6], respectively. Different figures by different researchers may be partly explained by the vigilance of examiners.

Many endocrinal etiologies may cause alopecia e.g. hyperthyroidism, hypothyroidism, hyperpituitarism, hypopituitarism, androgen secreting tumors, pregnancy and diabetes mellitus. Thyroid gland is responsible for the control of rate of metabolism and therefore the functions of every organ in the body. These hormones are responsible for normal growth, brain development and the development of sex organs.[6]

In animals, thyroxine increases the rate of hair growth in sheep and other animals.[8] Using DNA flow cytometry, Schell *et al.*[9] observed that cell proliferation indices were reduced in hair bulbs of hypothyroid subjects and increased in hyperthyroidism compared with normal subjects.

The exact cause of alopecia in hyperthyroidism is not fully elucidated but different pathological processes may lead to alopecia. Thyroid hormones regulate a wide range of cellular functions including growth, differentiation, metabolism and thermogenesis. In peripheral tissues, T4, the main product of the gland, is deiodinized to T3. The action of T3 on responsive cells is mediated through nuclear thyroid hormone receptors (alpha and beta) which act as transcription factors by binding to DNA and modulate gene expression. Although not confirmed, a link between the action of thyroid hormone on hair growth and expression of the hairless gene is speculated. Hence, thyroid hormones can directly affect hair growth rather than through an intermediate mechanism e.g. general metabolic state.

Conclusion

The occurrence of alopecia is frequent in clinical practice. We suggest that thyroid functions should be assessed in all patients of alopecia to find a potentially curable cause.

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