Research Article

Relation analysis between triiodothyronine and thyroid-stimulating hormone in the serum of melasma patients

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ABSTRACT

Background: Melasma is a condition of hypomelanosis related to triiodothyronine (T3) and thyroid-stimulating hormone (TSH). **Methods:** The analysis was conducted by taking those hormones from the serum of melasma patients. This cross-sectional study comprised 45 melasma patients aged 45–64 years. The measurements conducted were melisma area and severity index and the stress levels. Stress levels were determined by the Depression Anxiety Stress Scale questionnaire. Furthermore, T3 and TSH levels in patient serum were investigated. **Results:** About three-quarters of the patients (34 patients) showed a malar pattern of melasma. Furthermore, around half of the patients (23 patients) were diagnosed as experiencing normal stress, while 40% (18 patients) were diagnosed with moderate–severe stress levels. An average level of T3 serum was 1.15 ± 0.25 in stressed patient and 1.11 ± 0.29 in normal patient. An average level of TSH serum was 1.73 ± 1.25 in stressed patient and 1.72 ± 1.05 in normal patient. **Conclusion:** The levels of both T3 and TSH in stressed patients were considerably higher than in normal patients. However, this difference was not statistically significant.

KEY WORDS: Melasma, Stress, Thyroid-stimulating hormone, Triiodothyronine

INTRODUCTION

Melasma is a condition of hypomelanosis in the form of irregular patterns in the skin. This commonly happens in the ultraviolet (UV) over-irradiated skin and appears as light-to-dark brown patches with sharp borders.[1,2] Commonly, these patterns occur on the lips, nose, chin, and cheeks. However, they can also appear in the neck area, chest, and arms. Epidemiologically, melasma can occur in every race of human, with almost 90% of cases occurring in adults aged from 30 to 50 years. Moreover, women are more likely to experience melasma than men.[3-5]

In cosmetic dermatology, this skin condition is considered to have a significant influence on the psychosocial and emotional well-being of patients.[6,7] It has been reported that there is a relationship between melasma severity level and patient quality of life.[8] Severe melasma is associated with poor prognosis, as treatment requires a longer duration and greater cost.[9-11] The complicated procedure involved in the treatment of melasma is associated with an increasing case of melasma disease. In addition, stress is a condition that leads to physiological and psychological disorders, through disruption to hormone levels in the body. Thyroid hormones are down-regulated during stress due to the inhibition of their secretion. For instance, stress inhibits thyroid-stimulating hormone (TSH) production as the effect of glucocorticoid activity in a central nerve.[12,13] The complex relationship between melasma pathogenesis and thyroid hormones has received substantial research attention, but the relationship between melasma and stress has not yet been revealed. The present study was designed to analyze the relationship between triiodothyronine (T3) and TSH in the serum of melasma patients.

Access this article online	
Website: jprsolutions.info	ISSN: 0975-7619

METHODS

Sample Preparation

This cross-sectional study comprised 45 melasma patients in Dr. M. Djamil General Hospital, Padang,

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Received on: 21-10-2018; Revised on: 13-12-2018; Accepted on: 26-01-2019

Indonesia. The participants were chosen according to the inclusion and exclusion criteria. Inclusion criteria included agreement to participate indicated by the signing of the informed consent form, female gender, aged above 18 years, and working indoor between 09.00 and 15.00 local time. Exclusion criteria included pregnancy or breastfeeding, use of oral contraception, hormonal therapy, melasma therapy, or use of other medicines such as systemic antifungal drugs (griseofulvin), photosensitizer drugs (amiodarone, tetracycline, minocycline, and chloroquine), cytostatic drugs (cyclophosphamide, 5-fluorouracil, doxorubicin, daunorubicin, and bleomycin), heavy metals, inorganic arsenic, or anticonvulsants (hydantoin, dilantin, phenytoin, phenothiazine, chlorpromazine, levodopa, and barbiturates).

Scoring of Melasma Area and Severity Index (MASI)

MASI score was mainly used in research for measuring severity in patients who had melasma. The severity of the melasma in each of the four regions (forehead, right malar region, left malar region, and chin) was assessed based on three variables: Percentage of the total area involved (A), darkness (D), and homogeneity (H).

A numerical value assigned for the corresponding percentage area involved is as follows: 0 = No involvement; 1 = <10% involvement; 2 = 10–29% involvement; 3 = 30–49% involvement; 4 = 50–69% involvement; 5 = 70–89% involvement; and 6 = 90–100% involvement. The darkness of the melasma (D) is compared to the normal skin and graded on a scale of 0–4 as follows: 0 = Normal skin color without evidence of hyperpigmentation, 1 = barely visible hyperpigmentation, 2 = mild hyperpigmentation, 3 = moderate hyperpigmentation, and 4 = severe hyperpigmentation. Homogeneity of the hyperpigmentation (H) is also graded on a scale of 0–4 as follows: 0 = Normal skin color without evidence of hyperpigmentation, 1 = specks of involvement, 2 = small patchy areas of involvement <1.5 cm diameter, 3 = patches of involvement >2 cm diameter, and 4 = uniform skin involvement without any clear areas).

To calculate the MASI score, the sum of the severity grade for darkness (D) and homogeneity (H) is multiplied by the numerical value of the areas (A) involved and by the percentages of the four facial areas (10–30%). Total MASI score: Forehead 0.3 (D+H) A + right malar 0.3 (D+H) A + left malar 0.3 (D+H) A + chin 0.1 (D+H) A.

Stress Level Examination

The stress level was determined with the Depression Anxiety Stress Scale developed by Lovibond (1995). This self-report questionnaire consists of 42 questions related to stress and anxiety.[14] Participants were given the DAAS questionnaire, and then, their blood was taken. The level of T3 and TSH in participants' serum was then measured. Samples were taken through consecutive sampling.

Data Analysis

The relationships between serum T3 and TSH also melasma severity were analyzed by analysis of variance. Data analysis was performed with SPSS version 17.0.

RESULTS

All participants were female melasma patients aged between 25 and 64 years; the majority (80%; 36 people) were aged between 45 and 64 years, as shown in Table 1. The most common melasma pattern type was the malar type, experienced by three-quarters of the sample (34 people). As shown in Table 2, melasma severity was correlated with stress level. For normal participants (i.e., those diagnosed with normal stress levels), there were 23 participants with low MASI scores and 18 participants with medium-high MASI scores. However, for stress-diagnosed participants, there were only one participant with a low MASI score and three with medium-high MASI scores. In other words, the more stressed subjects had a higher level of melasma severity. Finally, the levels of T3 and TSH in serum were slightly higher in stressed patients than among those with normal stress levels; however, this difference was not statistically significant [Table 3].

Table 1: The basic demographic and clinical characteristics of melasma patients

Characteristics	Melasma patients
	Female (*n*=45)(%)
Age	
25–44 years old	9 (20)
45–64 years old	36 (80)
Melasma type	
Malar	34 (75.5)
Centrofacial	11 (24.5)

Table 2: Representation of MASI and melisma pigment in stressed and normal patient with melasma

Stress level	MASI		*P*
	Low	Medium and high	
	n (%)	*n* (%)	
Normal	23 (56.1)	18 (43.9)	0.362
Stressed	1 (25)	3 (75)	
Stress level	**Melasma pigments (severity)**		***P***
Normal	22 (53.7)	19 (46.3)	1.000
Stressed	2 (50)	2 (50)	

MASI: Melasma Area and Severity Index

Table 3: Representation of T3 and TSH serum levels in stressed and normal patient with melasma

Stress level	*n*	Average T3	*P*
Normal	41	1.11±0.29	0.801
Stressed	4	1.15±0.25	
Total	45	23.60±7.40	
Stress level	***n***	**Average TSH**	***P***
Normal	41	1.72±1.05	0.983
Stressed	4	1.73±1.25	
Total	45	23.6±7.40	

T3: Triiodothyronine, TSH: Thyroid-stimulating hormone

DISCUSSION

Based on melasma epidemiology, this skin condition appears to more frequently occur in women than men, and 90% of patients are aged 30–50 years old.[1,2] Consistent with this, most patients with melasma in the current study were aged 45–64 years old. Further, all patients in this study worked for the same hours during the day, suggesting that they experienced the same UV irradiation intensity. The most common patterns of melasma in the literature are malar and centrofacial types. In the current study, only the malar and centrofacial pattern was observed among the sample.[2,3]

One of the factors that may be related to melasma severity is stress level. The results of the present study showed that stress level of the participants was related to melasma severity, number of pigments, and MASI scores. Melasma has a significant effect on physical appearance and the psychosocial and emotional pressure of this influences patients' quality of life.[14] In some cases, it probably motivates the patient to see a skin doctor for treatment. In general, patients will tell the doctor about their feelings, such as feelings of shyness, inferiority, anhedonia, dissatisfaction, low motivation for socialization, and even suicidal thoughts. Even though melasma has no medical risks, the disturbing physical appearance can lead to emotional instability for the patients, and the condition has been reported to cause social problems in many countries.[15-17] However, the etiology of melasma is not clearly described. Some factors that appear to be involved in melasma pathogenesis include UV irradiation, genetic predisposition, pregnancy, oral contraception, hormone therapy, cosmetics, phototoxic drugs, anticonvulsant drugs, and endocrine factors associated with thyroid abnormalities.[18]

Moreover, stress induces alterations in hormone levels, including glucocorticoids, catecholamines, growth hormone, and prolactin. Furthermore, thyroid hormone (T3 and T4) levels decrease as a result of stress. These hormones play a pivotal role in metabolism. Thyroid abnormalities may cause alterations in other organs in the body, including the skin. Alterations in skin structure and function are associated with thyroid hormone secretion changes (hyperthyroid and hypothyroid). In cases of thyroid hormone imbalance, the peroxidase is recruited, which is involved in melanogenesis polymerization; this causes hyperpigmentation. A decrease in the level of T3 and the T4 will cause a 40–50% decrease in the basal metabolic rate. On the other hand, an increase in these hormones elevates the metabolism rate by 60–100%. Thyroid hormone production is induced by TSH, which is secreted by the anterior hypophysis and is downregulated during stress. In this study, the levels of T3 and TSH were correlated with stress level. The levels of T3 and TSH were found to be higher in patients who were diagnosed with stress. It appears that most of the patients know how to avoid stress. The results may be different if the sample was drawn from the general community.

ACKNOWLEDGMENT

The author thanks Andalas University for facilitating this research.

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Source of support: Nil; Conflict of interest: None Declared