

Evaluation the effect of NB–UVB phototherapy on thyroid function in sera of vitiligo patients

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Abstract

Background: Vitiligo is a relatively common dermatologic finding observed since ancient times. The cause of this disease is unknown yet. Narrow-band ultraviolet B (NB-UVB) is an emerging, promising phototherapy for vitiligo. **Methods:** A total of 31 patients with vitiligo and 32 control subjects were the participant of the present study. Vitiligo patients were received NB-UVB treatment for three days weekly. T3, T4 and TSH were assayed in each sample using radioimmunoassay technique. **Results:** There was a significant difference in T3 level in the patients with vitiligo before treatment compared with its level in the control group ($P=0.018$), but no significant differences were found in T4 and TSH levels. When the comparison of these parameters levels were done according the gender within each group, no

significant difference was observed. The results of the treatment on the measured hormones indicated that this type of treatment has no effect on the level of T3, T4 and TSH in vitiligo patients. **Conclusion:** On the bases of current study results, NB-UVB seems to be considered as a suitable therapeutic treatment of vitiligo as far as on thyroid function.

Key words: Vitiligo, NB-UVB, T3, T4, TSH.

تقييم تأثير المعالجة الضوئية بواسطة الاشعة فوق بنفسجية الضيقة النطاق نوع ب على وظيفة الغدة الدرقية في امصال مرضى البهاق

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الخلاصة

يعتبر البهاق من الامراض الجلدية الشائعة نسبيا. سبب هذا المرض غير معروف لحد الان. تعتبر المعالجة بواسطة الاشعة البنفسجية ضيقة النطاق نوع ب من المعالجات الواعدة للبهاق. بلغ اجمالي مرضى البهاق في هذه الدراسة ٣١ مرضيا مع مشاركة ٣٢ شخصا كعينات سيطرة. تلقى مرضى البهاق العلاج بالاشعة فوق البنفسجية ضيقة النطاق نوع ب ثلاث مرات اسبوعيا. و تم قياس تراكيز T3 و T4 و TSH لكل عينة باستخدام تقنية Radoimmunoassy. اظهرت النتائج وجود فرق معنوي في مستوى T3 لدى مرضى البهاق عند مقارنتهم مع مجموعة السيطرة (P=0.018) بينما لم تظهر فروق معنوية في مستويات T4 و TSH. كما لم تلاحظ فروق معنوية عند مقارنة هذه المعايير بين مرضى البهاق و عينات السيطرة بالنظر الى جنسهم. بينت نتائج العلاج على الهرمونات المقاسة انه لا تأثير لهذا النوع من العلاج على مستويات هورمونات T3 و T4 و TSH على مرضى البهاق. على اساس نتائج هذه الدراسة يمكن اعتبار العلاج بالاشعة فوق البنفسجية ضيقة النطاق نوع ب من العلاجات المناسبة لمرضى البهاق من دون تأثير على وظيفة الغدة الدرقية.

الكلمات المفتاحية: البهاق ، الاشعة البنفسجية ضيقة النطاق نوع ب ، T3 ، T4 ، TSH.

Introduction

Vitiligo is an epidemic dermatologic finding observed since ancient times ⁽¹⁾. It is an acquired skin disorder, characterized by white macula of variable shapes and sizes, with a tendency to increase in size with time⁽²⁾. About 0.38%-2.9% of the world population suffer from this disease ⁽³⁾, and its distribution changes depending to the region studied ^(3, 4).

Many classifications have been suggested to follow this pigmentation disorder since not all cases behave in the same way. Among them a classification that based on the distribution and size of white lesions in which the disease is classified into localized, generalized and universal ⁽⁵⁾.

The exact etiology of this disease remains unknown but different pathogenesis were suggested. An autoimmune disorder is the most common suggested theory where some of the patients have antibodies to melanocytes or melanocytic proteins ⁽⁶⁾. Even though no clear evidence is present that point out the involvement of these antibodies in causing the disease or melanocyte destruction, there are some works which suggest that cell-mediated immunity plays a role in melanocyte destruction ⁽⁷⁻⁹⁾. Genetic disorders, toxic metabolites, oxidative stress stimuli also have been suggested as main factors. In addition the nervous system and/or lacking the melanocyte growth factor may be involved ⁽¹⁰⁾. Moreover autoimmune thyroid disease were suggested to accompany up to 30% of vitiligo patients, from which hypothyroidism has been suggested to be one of the most common disorder companion with vitiligo disease⁽¹¹⁾.

Several studies concerned with the vitiligo treatment consider narrow band ultraviolet B (NB-UVB) as an active and safe phototherapy for treatment vitiligo ⁽¹²⁻¹⁵⁾. The first study on the effect of NB-UVB on vitiligo patients was done in 1997 by Westerhof and Nieuweboer-Krobotova⁽¹⁶⁾ when they compared the efficacy and safety of two treatment modalities, topical psoralen plus UV-A (PUVA) with unsubstituted psoralen and 311-nm UV-B radiation, in patients with vitiligo. Our article will focus on the effect of NBUVB treatment on thyroid function in vitiligo patients.

Material and Methods

The present study was done on 31 vitiligo patients and 32 healthy control. The cases of vitiligo were selected from Dermatology Department in Baghdad Teaching

Hospital include 16 males and 15 females with the mean ages of 30.16 and 26.33 years respectively. A careful history including personal (age and gender), past, present (onset and duration), family history was checked. Also each person was subjected to clinical examination to exclude any other skin or systemic diseases and other autoimmune diseases. Blood samples were drawn twice from patients before and after 20 sessions of phototherapy with NB-UVB while the blood sample was drawn once from control subjects. Treatment with a NB-UVB was usually administered 3 days weekly, but never on 2 consecutive days, for an average of 7 weeks which was the response in the treated patients was observed. Usually a standard starting dose of 200 (mJ/cm²) was used with increments 20% per treatment depending on skin photo type. For each sample T3, T4 and TSH were assayed using radioimmunoassay technique [ELFA (Enzyme Linked Fluorescent Assay)] commercially available kits (Mini VIDAS Report, BioMerieux, France). The results were expressed in terms of nmol/dl, for T3 and T4 while micro-units/ml for TSH. Statistical program IBM SPSS version 20 was used in the statistical calculations. The t-test (independent samples) was used for analysis the differences between the control group and patient group before treatment, while the t-test (paired samples) was used for the analysis differences between patient before and after treatment with NB-UVB. A value of the $p < 0.05$ was used for considering the significant differences.

Results

The normal values range for the T3 concentration were reported to be within the range 1.8-3 nmol/L, and for the T4 concentration within the range 65-150 nmol/L, while for TSH concentration within the range 0.5-5 μ IU/mL for euthyroid⁽¹⁷⁾. The measured levels of the above parameters in the present study were found to be within the reference limit.

A total of 31 patients with vitiligo (16 male) and 32 healthy controls (12 male) were included in the present study. The patients with vitiligo were 14–55 years old. Thyroid function test were carried out to measure T3, T4, and TSH concentration as described in material and methods section, the levels of T4 and TSH concentration in vitiligo patients before UV treatment are not significantly different compared with their levels in the control group ($P=0.367$ and $P= 0.147$ respectively), while a significant difference is observed in T3 level compared with its level in the control group ($P=0.018$). These results presented in table 1.

Table 1 Comparison of T3, T4 and TSH concentration levels using independent samples t-test for healthy control and vitiligo patients.

Group Statistics				
Measured Parameters	Groups	N	Mean ± SD	P value
T3 (nmol/L)	control	32	1.787 ± 0.381	0.018 *
	Patient	31	2.040 ± 0.444	
T4 (nmol/L)	control	32	84.639 ± 11.380	0.367
	Patient	31	87.779 ± 15.751	
TSH (μIU/mL)	control	32	1.623 ± 1.399	0.147
	Patient	31	2.632 ± 3.615	
* Correlation is significant at the 0.05 level (2-tailed).				

No significant differences were found in T3, T4, and TSH levels in the patient group before treatment and healthy group if the comparison done according the gender within each studied group. (Male: P= 0.067, P= 0.696, and P= 0.564 respectively, female: P= 0.232, P= 0.094, and P= 0.112 respectively).

When the effect of NB-UVB treatment on these parameters were examined, no differences in the levels of T3, T4 and TSH was observed in vitiligo patients before and after NB-UVB phototherapy treatment (P=0.092, P=2.144 and P= 1.278 respectively) as noticed in the table 2.

Table 2 Comparison of T3, T4 and TSH concentrations using paired samples t-test for vitiligo patients before and after NB-UVB phototherapy

Group Statistics				
	parameters	N	Mean ± SD	P value
Pair 1	T3 before treatment (nmol/L)	31	2.040 ± 0.444	0.092
	T3 after treatment (nmol/L)	31	2.032 ± 0.403	
Pair 2	T4 before treatment (nmol/L)	31	87.779 ± 15.751	2.144
	T4 after treatment (nmol/L)	31	86.666 ± 12.994	
Pair 3	TSH before treatment (μUI/mL)	31	2.632 ± 3.615	1.278
	TSH after treatment (μUI/mL)	31	3.934 ± 10.519	

Discussion

Several reports discuss the association between thyroid disorders and autoimmune thyroid diseases with vitiligo, and it looks like that the prevalence of clinical and subclinical thyroid involvement are less popular in healthy control than vitiligo patients^(18, 19). In addition, Cunliffe et al. reported that there is a significant relation between vitiligo and thyroid disorder⁽²⁰⁾.

Many studies have evaluated the association between vitiligo and thyroid disease, but none of those could exactly specify the pattern of this association. Sedighe and Gholamhossein⁽²¹⁾ analyzed thyroid function and antithyroid antibodies in Iranian vitiligo patients and found that hypothyroidism was located in 16 (15.7%) out of 109 cases. Amin et al.⁽²²⁾ found that some hormonal changes (thyroid hormones) occurred in the vitiligo patients as compared with the healthy control. Their results are not consistent with ours as illustrated in table 1 where a significant difference was measured just in the T3 level even though it was within the normal range comparing between healthy control group and vitiligo patients group, while no significant differences were observed in the T4 and TSH levels upon comparison their levels with that of healthy individuals. In agreement with current study results, Majumder et al.⁽²³⁾ did not find any association between thyroid disorders and vitiligo which is consistent with the present result.

The mechanism of action of NB-UVB phototherapy in vitiligo has not been completely understood. Vitiligo is characterized by the selective destruction of melanocytes; the exact cause is still unknown, but is generally believed to be due to the autoimmune process⁽²⁴⁾. Imokawa *et al.* found that expression of endothelin-1, IL-1, and tyrosinase in human keratinocytes *in vivo* and *in vitro* were increased after UVB irradiation, suggesting a possible mechanism of UVB-induced repigmentation⁽²⁵⁾.

Among the studied patient group there was just one vitiligo patient (3.33%) who before the treatment had abnormal high TSH level, and had abnormal low level of T4 as well as an obvious increase in TSH concentration after UV treatment. The observed elevation in TSH level in this patient reflects the presence of insufficient levels of circulating thyroid hormone. It is known that in early hypothyroidism, TSH levels are elevated with normal or low T4 level, and normal T3 level. So it seems that this patient may have a problem with his pituitary gland where is reflected on his TSH concentration level before any treatment. When this patient received the NB-UVB treatment TSH was found to be obviously increase (about three-fold) effect on thyroid function cause a decrease in the concentration of T4.

The possibility to explain the situation of this patient is that he suffers originally from hypothyroidism as well as vitiligo. Such result needs a further study where a large number of these type of patients included.

Conclusions

Based on our findings these conclusions can be listed:

1. Patients with vitiligo are not at higher risk as related to thyroid function disorders.

2. NB-UVB phototherapy may be considered as a suitable treatment of vitiligo without any effect on thyroid function.

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