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The Effectiveness of Systemic Co-Enzyme Q10 in Vitiligo

Mohammed F Hameed[1] *BSc MSc*, **Ahmed R Abu-Raghif**[1] *MBChB PhD*, **Iqbal Gh Farhood**[2] *MBChB FICMS*, **Noor M Ali**[3] *BSc PhD*

[1]Dept. Pharmacology & Therapeutics, [2]Dept. of Medicine, [3]Medical Research Center, College of Medicine-Al-Nahrain University, Baghdad, Iraq

Abstract

Background Vitiligo is the most frequent depigmentation disorder of the skin. None of the therapeutic alternatives is satisfactory.

Objective To evaluate the effectiveness of systemic Co-enzyme Q10 in patients with vitiligo.

Methods Twelve patients received Co-enzyme Q10 75 mg twice daily compared with 12 patients received placebo capsule twice daily orally for 8 weeks in the Department of Dermatology, Al-Kadhimiya Teaching Hospital (November 2011 to march 2012). History of patients was taken and measurement for serum glutathione (S. GSH) (by Elleman methods), malonialdehyde (S. MDA) (by Stocks and Dormandy methods) and VASI score at baseline, 4 and 8 weeks interval.

Results No significant difference in S. GSH was found between Co-enzyme and placebo group after 4 and 8 weeks. High significant decrease in S. MDA occurred after 4 and 8 weeks with significant decrease in VASI were found after 8 weeks.

Conclusion Co-enzyme Q10 may have a role in treatment of vitiligo.

Keywords Co-enzyme Q 10, Vitiligo, Antioxidant.

Introduction

Vitiligo is an acquired pigmentary anomaly of the skin manifested by depigmented white patches surrounded by normal hyperpigmented border [(1)]. It is one of the main cutaneous diseases in which psychological factors are thought to trigger the onset or substantially influence the course [(2)].

Different studies suggest that there is some genetic mechanism involved in the etiology of vitiligo and it is polygenic in nature [(3)] with a positive family history in at least 30% of cases [(4)]. The course of the disease is unpredictable, and is often associated with periods of remission and exacerbation [(5)].

Vitiligo is a multifactorial polygenic disorder with a complex pathogenesis. Several theories have been proposed to explain the loss of epidermal melanocytes in vitiligo; they include autoimmune, cytotoxic, biochemical, oxidant-antioxidant, neural, and viral mechanisms for destruction of epidermal melanocytes [(6)]. The putative association of vitiligo with autoimmune diseases has suggested an immunologic basis for vitiligo [(7)].

The best evidence that vitiligo antibodies play a role in melanocyte destruction is the observation of the disappearance of melanocytes from normal human skin engrafted onto nude mice injected with vitiligo patient sera [(8)]. IL-6 is an important cytokine for skin and is

subject to dysregulation in several human diseases including some with skin manifestations [9].

According to the self-destruction hypothesis initially put forward by Lerner [7], melanocytes in vitiligo have lost an intrinsic protective mechanism that eliminates toxic intermediates or metabolites in the melanogenesis pathway. Several reports provide evidence for increased oxidative stress in the entire epidermis of vitiligo patients [7]. Although greater oxidative stress is observed in the active vitiligo group, this is probably correlated with increased intracellular reactive oxygen species (ROS) production in the tissues of these patients [10]. Excessive free radical generation, leading to lipid peroxidation in vitiligo, may be related to a decrease of superoxide dismutases (SOD) and an increase of xanthine oxidase (XO) activities. In addition, an increased level of malondialdehyde (MDA) can support these findings. Lipid peroxidation in the cellular membrane of melanocytes may play an important role in depigmentation of generalized vitiligo [11], whereas the neural hypothesis [7] was based initially on anecdotal observations suggesting that stress and severe emotional trauma may initiate or precipitate vitiligo.

The conventional treatment for vitiligo include photo chemotherapy (PUVA), phototherapy (UVB), vitamin D3 analogues, topical corticosteroids, topical immunomodulators, excimer laser, and surgery. These treatment options have limited success [12-14], and some present significant risks, including suspected increases in skin cancer risk by PUVA, skin atrophy with corticosteroids, and skin boils with UVB therapy [12-14]; so probable useful therapeutic effects of Co-enzyme Q10 will be evaluated in patients with vitiligo.

Coenzyme Q10 (CoQ10) is a fat-soluble, vitamin-like, ubiquitous compound that functions as an electron carrier in the mitochondrial respiratory chain, as well as serving as an important intracellular antioxidant. CoQ10 protects phospholipids and mitochondrial membrane proteins from peroxidation and protects DNA against the oxidative damage that accompanies lipid peroxidation [15-17]. Coenzyme Q10 is one of the antioxidants found in the skin [18]. Coenzyme Q10 in its reduced form as the hydroquinone (called ubiquinol) is a potent lipophilic antioxidant and is capable of recycling and regenerating other antioxidants such as tocopherol and ascorbate [17,19]. CoQ10 is able to act as an antioxidant against the effects of hydrogen peroxide and UVA in cultured epidermal keratinocytes and UVA in dermal fibroblasts [20].

The aim of this study was to measure the oxidative stress parameters (glutathione and MDA) in patients with vitiligo and to evaluate the effectiveness of systemic Co-enzyme Q10 in them.

Methods

Clinical Study design: This prospective, randomized, single blind and placebo study was done in the Department of Dermatology and Venereology, Al-Kadhimiya Teaching Hospital between November 2011 and March 2012. The total number of patients sharing in this study was 26. Only 24 patients completed the study successfully while 2 patients were unable to do so for unknown reasons. All included subjects have consented to be enrolled in this study and approval of College Council at Al-Nahrain Medical College was taken under order number 1093 in 1/12/2011.

All patients were subjected to detailed examination including the general, physical and mainly the skin examination. The diagnosis was made clinically by dermatologist. For all the patients at the initial visit, baseline characteristics had been made and involve age, sex, medical history, family history and drug allergy.

Participants and Setting: A new onset(less than 2 years), localized small patches vitiligo of both sexes that the affected body surface area of 10-20% and age range 12-58 years were included in this trail.

Along the course of treatment, each patient should satisfy three visits at 0, 4 and 8 weeks. In each visit, the assessment of response of vitiligo

lesion toward treatment was performed by using VASI (Vitiligo Area Scoring Index) calculation which is a quantitative parametric score conceptually derived from the PASI score widely used in psoriasis assessment. The total body VASI is calculated using a formula that includes contributions from all body regions [21].

VASI = All Body Sites [Hand Units] × Residual Depigmentation

A blood sample (5 ml) was obtained to determine Serum Glutathione (S. GSH) (It is based on the reaction of aliphatic compounds with dithio 2-nitrobenzoic acid at ph 8.0 to give p-nitro thiolphenol anion which is highly, colored at 412nm) [22], and S. MDA (its measurement is based on the reaction of thiobarbituric acid with MDA forming a pink- colored adduct that its light absorbance measured at 535 nm) [23].

The patients were allocated into 2 groups and all the patients were given Vaseline and asked to apply it topically two times daily.

Group I: Included 12 patients (8 females and 4 males) were given 75 mg Co-enzyme Q10 (1 soft gel two times daily) orally with food for 8 weeks.

Group II: Included 12 patients 8 females and 4 males were given sucrose as placebo capsule two times daily orally after meal for 8 weeks.

Statistical analyses: The data collected and analyzed using computer facilities of SPSS-18 and Microsoft Excel 2010.

The following measurements and tests were used (1) Mean and standard deviation. (2) Unpaired t-test and was considered statistically significant if the *P* value was less or equal to 0.05 and highly significant if the *P* value was less or equal to 0.001 [24,25].

Results

Table 1 shows the descriptive parameters of all patients in this study. Both the treated groups are comparable with no significant difference in the parameters at baseline (before treatments).

Table 1. Descriptive parameters of all patients with vitiligo

Parameters		Placebo group N = 12		Co-enzyme Q10 group N = 12	
		Frequency	%	Frequency	%
Sex	M/F	4/8	33.3/66.7	4/8	33.3/66.7
Smoking	Yes/No	2/10	16.7/83.3	3/9	25/75
Other skin disease	Yes/No	6/6	50/50	6/6	50/50
Family history	Yes/No	6/6	50/50	6/6	50/50
Drug allergy	Yes/No	0/12	0/100	0/12	0/100

No significant difference in S. GSH was found between Co-enzyme group and placebo group after 4 and 8 weeks, but a highly significant decrease in S. MDA (*P* value ≤ 0.001) in the Co-enzyme group from the placebo group after 4 and 8 weeks (Table 2).

Regarding clinical parameters; no significant difference in VASI between Co-enzyme group and placebo group after 4 weeks while significant decrease in VASI after 8 weeks was found (Table 3).

Discussion

Vitiligo is the most frequent depigmentation disorder of the skin and is cosmetically and psychologically devastating [26]. None of the therapeutic alternatives is fully satisfactory either because its improvement is unpredictable or the treatment is long or because of the side effects and operational difficulty of application of the medication [27].

Table 2. Effect of Co-enzyme Q10 on S. GSH and S. MDA concentration in patient with vitiligo in comparison with placebo-treated group

Parameters	Placebo N = 12	Q10 N = 12	P value
Serum GSH (mmol/l) baseline	1.43±0.22	1.42 ± 0.1	0.8509
Serum GSH (mmol/l) 4wk	1.44±0.23	1.47 ± 0.12	0.7126
Serum GSH (mmol/l) 8wk	1.44±0.23	1.52 ± 0.11	0.3181
Serum MDA (mmol/l) baseline	2.58±0.21	2.51 ± 0.11	0.309
Serum MDA (mmol/l) 4wk	2.58±0.2	1.7 ± 0.13	< 0.0001
Serum MDA (mmol/l) 8wk	2.65±0.24	1.58 ± 0.11	< 0.0001

Table 3. Effects of Co-enzyme Q10 on clinical feature (vasi score) in patients with vitiligo in comparison with placebo-treated patients

Parameters	Placebo N = 12	Q10 N = 12	*P* value
VASI baseline	3.75±2.81	2.33±0.72	0.073
VASI 4wk	3.75±2.81	2.33±0.72	0.073
VASI 8wk	3.88±2.77	2.08±0.9	0.018

No significant difference in S. GSH was found between Co-enzyme group and placebo group after 4 and 8 weeks. In vitiligo, both an imbalance of the intracellular redox status and a significant depletion of enzymatic and non-enzymatic antioxidants feature of vitiligo patients, and an abnormal oxidative stress might be the causes of melanocyte degeneration [28].

High significant decrease in S. MDA between Co-enzyme Q10 group and placebo group after 4 and 8 week was found. This effect was in agreement with the result of Lee et al [29] who showed patients with coronary artery disease on CoQ10 treatment having significantly lower malondialdehyde levels. Co-enzyme Q 10 in its reduced form has long been known to inhibit lipid peroxidation [30]. Co-enzyme Q10 in its reduced form is a potent lipophilic antioxidant and is capable of recycling and regenerating other antioxidants such as tocopherol and ascorbate [31].

The levels of CoQ10 in skin decline with age and UV irradiation [20] and thereby also compromise the skin's antioxidant features, leading to an increased ROS concentration at advanced age. In skin, the epidermis contains a 10-fold higher level of CoQ10 than the dermis [18].

No significant difference in VASI between Co-enzyme group and placebo group after 4 weeks was found, while significant decrease in VASI after 8 weeks occurred.

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Address correspondence to Mohammed F Hameed
E-mail: mohammad_hadaad2000@yahoo.com
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