



EVALUATION OF ORAL ZINC SULPHATE IN TREATMENT OF CHRONIC DIFFUSE ALOPECIA OF UNKNOWN ORIGIN: AN OPEN THERAPEUTIC TRIAL

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ABSTRACT

This is an open therapeutic trial conducted at the outpatient Department of Dermatology and Venereology, Baghdad Teaching Hospital, Medicine City in the period between January 2002 and March 2003. The aim of the present work is to evaluate the efficacy and safety of oral zinc sulphate in treatment of diffuse alopecia of unknown origin. The study included thirty female patients who treated by zinc sulphate and followed up for two months. Results revealed that the means \pm SD of pull-test for all patients after one month of treatment (2.8 ± 1.3 hairs) and two months (2.8 ± 2.01) were decreased significantly ($P = 0.0026$ and 0.024 respectively) as compared with the mean (3.7 ± 2.5 hairs) before therapy. The correlation coefficients between serum zinc concentration and both pre-treatment and post-treatment were not significant. Patient's self-assessment showed that most of them considered that there are no changes in their hair appearance and they were unconvinced with the results. In conclusion: Although, the results of the present study showed a significant effect of using oral zinc sulphate in treatment, but these results did not convinced patients about its validity in treatment. In such case, conduct further studies is very necessary to get more reliable results.

KEY WORDS: Chronic diffuse alopecia, zinc sulphate.

INTRODUCTION

Chronic diffuse alopecia is an almost evenly distributed loss of hair occurring continuously, but sometimes fluctuating in severity, is common in both sexes. It was seen more frequently in women over the age of 25 (Dawber *et al.*, 1998). This clinical state may be brought about by a number of different factors, singly or in combination; in many cases no fully convincing cause can be established (Dawber *et al.*, 1998). When all possible causes are excluded such as androgenetic alopecia, telogen effluvium, endocrine causes, chemical alopecia, nutritional alopecia *etc.*, an entity called chronic diffuse alopecia of unknown origin is considered. This group of unexplained cases certainly does not represent a single uniform entity. In some, the alopecia fluctuates in severity over months or years but eventually recovers more or less completely. In others, notably those in whom the hair is becoming finer, the alopecia tends to be progressive, though often occurring extremely slowly (Mayes, 1988). The majority of cases are seen in women aged 30-50 years (Dawber *et al.*, 1998). Zinc is one of the essential trace elements (Mayes, 1988). Systems influenced by zinc include the reproductive, neurologic, immune, dermatologic and gastro-intestinal system (Underwood, 1977; Falchuk, 1998). Zinc is crucial to growth, development, and normal function of all living forms (Ulmer, 1985). Hair loss is frequent findings in poorly nourished patients. In some cases lack of zinc, iron and vitamins is the main cause. In the majority of patients the aetiology is probably multifactorial, and the exact cause remains unknown (Wells, 1962; Wormsley, 1964). However, alopecia is one of the main clinical manifestations of moderate to severe zinc deficiency conditions. Alopecia is a usual manifestation of acrodermatitis enteropathica and it

usually worsens with time (Neldner and Hambidge, 1975). Thus, there is a close relationship between zinc status and hair. In one study, two unrelated patients who had dry, brittle hair, alopecia, trichorrhexis nodosa, and dry scaly skin were treated with oral zinc. In one of these patients no clear zinc deficiency could be demonstrated. In both patient's hair and skin changes respond well to treatment with oral zinc (Slonim *et al.*, 1992). The aim of the present work is to evaluate the safety and efficacy of oral zinc sulphate in the treatment of chronic diffuse alopecia of unknown origin.

PATIENTS & METHODS

Study design

This is an open-labeled therapeutic trial conducted at the outpatient Department of Dermatology and Venereology, Baghdad Teaching Hospital, Medical City in the period between January 2002 and March 2003.

Patients' selection

Patients with diffuse hair loss were eligible for enrollment if all known causes of hair loss were excluded.

Medical history

full medical history was taken stressing on the duration, severity, pattern of hair fall, family history of alopecia, drug history especially contraceptive pills, surgical, endocrine, obstetrical and gynecological history, history of anemia, fever, severe blood loss and other relevant factors.

Physical examination

Thorough medical examination was performed emphasizing on the general look of the patient for anemia, low weight, psychological status, scalp examination; pattern and severity of hair loss. Pull test was performed for all patients (this test was performed 5 days after shampooing in 4 fixed areas- for all patients and on each

examination- by gently pulling 50-80 hairs between 2 fingers of one hand and counting the loose hairs with the other hand).

Investigations

The following investigations were performed: Hemoglobin level, serum iron, iron binding capacity, serum proteins, hormonal analysis (testosterone level, luteinizing hormone (LH), follicular stimulating hormone “FSH”, prolactin, and thyroid hormones “T3 and T4”). After excluding all causes of alopecia, patient were enrolled in the therapeutic trial.

Serum zinc estimation

Serum zinc was estimated in all patients both before treatment and post-treatment (2 months after treatment) using atomic absorption method. From each individual a 5-ml sample of venous blood was taken, which was allowed to clot and then centrifuged at 3000 rpm for 15 minutes. The clear serum was transferred to a plastic tube by the disposable syringe and tapped by a plastic stopper. The serum was stored at -20 °C till the time of analysis when they were thawed at room temperature and then tested (Taylor and Bryant, 1981).

Photographic examination

Color photographs for each patient were performed as a baseline and 2 months after treatment. All photographs

were taken using Sony-Digital Still Camera; MVC-FD71. All patients were photographed in the same place with fixed illumination and distance.

Treatment

All patients received oral zinc sulphate in a dose of 10mg /kg /day in three divided doses up to 600mg/day dispensed in gelatin capsules. Follow up the patients were seen after 1 and 2 months of starting therapy to evaluate the response to treatment and to record any side effects.

Evaluation procedures

Patient self-assessment

patient self-assessment of hair growth was determined by means of validated self-administered questionnaire comprising 4 questions, each question included a specific aspects of their hair compared with the start of the study (appearance of hair, growth of hair, slowing down hair loss, and satisfaction about all traits of their hair) (Leyden *et al.*, 1999).

Investigator assessment

Each patient was assessed by means of 7-points scale to answer the following question: “As the investigator, how would you subjectively rate the patients hair at this time point compared to baseline?” this done by aid of photographs which were taken pre- treatment and two months after starting therapy.

The options for the investigators regarding hair condition were as follows (Leyden *et al.*, 1999)

Greatly decreased	-3
Moderately decreased	-2
Slightly decreased	-1
No change	0
Greatly increased	1
Moderately increased	2
Slightly increased	3

Statistical analysis

Data were analyzed by using Statistical Package for Social Sciences (SPSS 21). The significant differences between means were tested by paired t-test, whereas the differences between proportions were tested by chi-square test. Correlation coefficients were estimated to study the associations between continuous variables. P- Values equal or less than 0.05 were considered significant.

RESULTS

Description of the study group

Thirty female patients were included in this study. Their ages ranged between 10 to 30 years with a mean ± SD of 22.2 ± 5.85 years. The duration of the disease ranged between 0.33 - 16 years with a mean ± SD of 3.28 ± 4.26 year (median = 2).

Serum zinc concentration in patients with chronic diffuse alopecia of unknown origin

Serum zinc level in patients with chronic diffuse alopecia of unknown origin before therapy ranged between 71 to 100 µg/dl with a mean ±SD of 85.08 ± 7.78 µg/dl.

Effect of zinc sulphate treatment on serum zinc level in patients with chronic diffuse alopecia of unknown origin

Serum zinc level in patients with chronic diffuse alopecia of unknown origin before therapy ranged between 71 to 100 µg/dl with a mean of 94.6±10.54. After 2 months of treatment with zinc sulphate, the serum zinc level elevated and ranged between 99 to 134 µg/dl with a mean of 115.03 ± 11.87 µg/dl. The difference in serum zinc concentration between pre-treatment levels and after 2 months of therapy with zinc sulphate was highly significant (P = 0.00001).

Pull Test results in patients with chronic diffuse alopecia of unknown origin

The pull test for all patients before therapy ranged between 1 to 10 hairs by pull with a mean of 3.7 ± 2.5 hairs as shown in table (1). Whereas the corresponding estimates of patients after one month of treatment were 1 to 6 and 2.8±1.3 respectively. Results revealed a significant decrease (P=0.0026) in the mean number of hairs by pull test after one month of treatment as compared with the mean of the pretreatment pull test. On the other hand, the pull test after two month of treatment with zinc sulphate ranged between 1 to 8 hairs by pull with a mean of 2.8 ± 2.01 hairs by pull. The difference in pull test results as compared with pretreatment results was significant (P = 0.024). Table (1). The correlation coefficients between serum zinc concentration and each of pre-treatment and post-treatment were not significant (P = 0.506 and 0.523 respectively).

TABLE 1: Pull test results in patients with diffuse alopecia of unknown origin, at baseline, and 1 month and 2 months after treatment with oral zinc sulphate.

Group	No.	Mean	SD	Range	P-Value
Pull test pre-treatment	30	3.7	2.5	1-10	0.0026
Pull test after 1 month	30	2.8	1.3	1-6	
Pull test pre-treatment	30	3.7	2.5	1-10	0.024
Pull test after 2 months	30	2.8	2.01	1-8	

Response of patients with chronic diffuse alopecia of unknown origin to treatment with oral zinc sulphate**Patient self-assessment**

After the second month of treatment, patient self-assessment of hair growth was determined by means of validated self-administered questionnaire comprising 4 questions shown in table (2).

TABLE 2: Patients self-assessment after treatment with oral zinc sulphate.

	Positive		No Change		Negative	
	No.	%	No.	%	No.	%
Hair appearance	-	-	30	100	-	-
Slowing hair fall	10	33.3	2	6.7	18	60
Hair growth	4	13.3	12	40	14	46.7
Satisfaction	2	6.7	-	-	28	93.3

In general, the sum of the two classifications (no change and negative) into one class could be more logical as they reflect the uselessness of treatment and then to test the statistical difference between two groups instead of three as shown in table (3).

TABLE 3: Patients self-assessment after two months of treatment with oral zinc sulphate for two categories

	Positive		No change and negative		Chi-square value	P
	No.	%	No.	%		
Hair appearance	-	-	30	100	-	-
Slowing hair fall	10	33.3	20	66.7	6.67	0.009
Hair growth	4	13.3	26	86.7	32.26	1e-8
Satisfaction	2	6.7	28	93.3	45.06	1e-12

Investigator assessment

The results of the investigator assessment (table 3) showed that all patients were subjectively rated that there was no change in their hair appearance. On the other hand, 66.7% of patients rated there was no change and negative effect for slowing hair fall. The difference between two groups was significant ($P=0.009$). Concerning hair growth, most of patients (86.7%) confirmed the no change and negative effect of treatment which was differed significantly as compared with positive group. Same trend was found in the last criteria as most of patients (93.3%) stated that the effect was negative and the difference was also significant. No side effects were seen or reported by any patients throughout the study period.

DISCUSSION

Chronic diffuse alopecia is an almost evenly distributed loss of hair occurring continuously, but sometimes fluctuating in severity. Although, it is common in both sexes, it was seen more frequently in women over the age of 25 (Dawber *et al.*, 1998). All patients with chronic diffuse alopecia of unknown origin who completed the study were females. This was similar to what has been published in literatures (Mayes, 1988; Dawber *et al.*, 1998). However, this might not be a single factor as women are more eager to seek advice and more concerned with their hair condition (Dawber *et al.*, 1998). It was reported that chronic diffuse alopecia of unknown origin is usually seen in females aged mostly between 30 and 50

years (Dawber *et al.*, 1998). In this study, the age range was between 10 to 30 years with a mean of 22.2 ± 5.85 years. Thus, this condition may occur rather earlier in our patients or again it might be attributed to the fact that younger age groups are more concerned with their look and present more often. All patients included in this study (30 females) were treated with oral zinc sulphate in a dose of 10mg/kg/day in three divided doses up to 600mg/day dispensed in gelatin capsules. They were evaluated after one and two months by means of pull test results, patient self-assessment, and investigator assessment.

The results of pull test showed that the number of hairs by pull decreased significantly after the first month of therapy with zinc sulphate and remained at a significantly lower level than that before treatment. These changes in pull test results were not significantly correlated with the both levels of serum zinc concentration (before and after treatment). This was explained by Babcock *et al.* (1982) who mentioned that; changes in the rate constants for both gastro-intestinal absorption and renal excretion (which can be explained by Michaelis-Menten type saturation mechanism) which are responsible for the changes seen in the kinetic curves following oral zinc loading and also accounted for the observed mean plasma zinc mass increase of only 37% above pre-load levels in face of an 11-fold increase in zinc intake.

Patients self-assessment showed that most of them considered that there was no changes in their hair appearance however ten patients (33.3%) gave positive

results regarding slowing down of hair fall and this support the results of pull test mentioned above. Four patients (13.3%) believed that their hair growth improved when they were on therapy but regarding of overall satisfaction patients; only two patients (6.7%) were convinced by the results and twenty-eight patient (93.3%) were unconvinced. This may be explained by that our patients do not accept half solutions and they want full and long hair, despite of pull test results show statistically significant improvement after two months of treatment.

These results could be attributed to short study period (two months). Hence, to make patients more convinced about the treatment, longer period of follow up (at least six months) is required.

Results of previous studies showed that oral zinc was safe and effective when used for other dermatological purposes and the side effects were mild and transient (nausea, vomiting and mild epigastric pain) (Al-Gurairi *et al.*, 2002). In this study, zinc sulphate treatment was found to be completely devoid of side effects in the treatment dose. This may be related to the fact that the patients might follow strictly the instructions to take the drug after food to decrease the incidence of gastrointestinal side effects, or it may be attributed to that the patients were concerned more with their hair problem despite of the mild side effects of oral zinc.

CONCLUSION

Although, the results of the present study showed a significant effect of using oral zinc sulphate in treatment, but these results did not convinced patients about its validity in treatment. In such case, conduct further studies is very necessary.

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