

Treatment of Tinea Corporis by Topical 10% Zinc Sulfate Solution

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ABSTRACT:

BACKGROUND:

Tinea corporis is a dermatophyte infection of the glabrous skin. Multiple modalities of therapy have been used in the treatment of tinea corporis including both systemic and topical agents, such as imidazols, triazols, allylamines, ciclopirox and griseofulvin.

OBJECTIVE:

To evaluate the efficacy and safety of topical 10% zinc sulfate solution in the treatment of tinea corporis and tap water as placebo controlled in treatment of tinea corporis.

PATIENTS AND METHODS:

This opened labeled blind-therapeutic trial done in the Department of Dermatology -Baghdad Teaching Hospital, during October 2004 – March 2006. It consisted from 63 patients with tinea corporis, 33 patients treated with 10% zinc sulfate (Group A) and 30 patients received distilled water as the placebo-control group (Group B).

Full history and clinical examinations were done for all patients including all demographic aspects related to the disease.

Every patient was instructed to apply treatment twice daily and to be seen every 3 weeks for 2 months. All patients were assessed clinically and by skin scraping test before, during and after treatment.

RESULTS:

Sixty three patients with tinea corporis met the inclusion criteria and enrolled in this study. Sixty patients completed the study, three patients defaulted from the study in Group A. In Group A 30 patients received topical 10% zinc sulfate solution twice daily for two months, 17 (56.7%) females and 13 (43.3%) male patients. Their ages ranged from 4-64 (27.87 ± 17.68) years, while the duration of the disease ranged from 1-13 (3.7 ± 3.249) weeks. Complete cure response was observed in 13 (43.33%) patients, partial response in 7 (23.34%) patients and no response in 10 (33.33%) patients while in in Group B, 30 patients received distilled water twice daily for two months as placebo-control group, 10 (33.33%) females and 20 (66.67%) male patients. Their ages ranged from 8- 66 (30.67 ± 15.66) years, and the duration of the disease ranged from 1-30 (7.48 ± 6.98) weeks. The clinical response was two (6.67%) patients with partial improvement and 28 (93.33%) patients with no improvement.

No side effects reported apart from mild irritation in the beginning of treatment which resolved soon after continuation of therapy that did not require stopping the treatment.

CONCLUSION:

Topical 10% zinc sulfate solution is a new effective, safe and non costly formulation in the treatment of tinea corporis but it is slow in clearance of the lesions and higher concentrations of zinc sulfate like 20% might increase the effectiveness of the drug and shorten the duration of therapy.

KEYWORDS: tinea corporis. topical zinc sulfate solution.

INTRODUCTION:

Tinea corporis is a common dermatophyte

infection of the glabrous (smooth) skin ⁽¹⁾. It occurs mainly during childhood and puberty. Tinea corporis may be caused by any of the dermatophytes, but it is mainly by *M.canis*, *T.mentogrophytes*, and *T.rubrum*. *M.audouinii* ⁽²⁾. Many modalities had been used in the treatment of dermatophytes infections which include topical antifungal agents like ketoconazole 2% cream, fluconazole, allylamine antimycotics,

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ciclopiroxolamine (1% cream) ⁽¹⁾ and, *Nigella sativa* fixed oil(10%)⁽³⁾.

Systemic antifungal agents like griseofulvin, allylamine antimycotics, itraconazole, fluconazole ketoconazole and ultraviolet and photodynamic therapy ⁽¹⁾. Topical therapy is often indicated when there is single or few patches of tinea corporis ^(1,3).

Zinc is one of the essential trace elements which serve as catalyst for more than 300 metalloenzymes responsible for DNA replication, gene transcription, and RNA and protein synthesis. Zinc is also well known to induce apoptosis and this apoptogenic ability is depend on the ability of the cells to accumulate high levels of intracellular zinc and on the ability of the mitochondria to respond to the direct effect of zinc ⁽⁵⁾. Zinc when absorbed through the skin it is usually concentrated mostly in the epidermis and dermis ⁽⁵⁾.

Zinc sulfate has been used successfully both as topical and systemic therapy in the treatment of many skin diseases like viral warts ⁽⁶⁾, cutaneous leishmaniasis⁽⁷⁾.

Recently it has been shown that zinc sulfate has direct anti-dermatophytes action invitro study ⁽⁸⁾. Also, 15% zinc sulfate solution has been used as an effective therapy against tinea versicolor ⁽⁹⁾.

So, the aim of the present work is to evaluate the efficacy and safety of topical 10% zinc sulfate solution in the treatment of tinea corporis.

PATIENTS AND METHODS:

This is a controlled, single blinded-placebo control trial carried out at the Dermatology and Venereology - Baghdad Teaching Hospital from October 2004- March 2006.

Sixty-three patients with tinea corporis have been divided into two groups:

Group A: Thirty-three patients with tinea corporis started the trial..Thirty patients (17(56.7%) females and 13 (43.3%) males completed the course of the study.

Group B: Thirty patients (10 (33.33%) females and 20 (66.67%) males) with tinea corporis were enrolled in this trial as placebo- control group; there were no default in this placebo-controlled group.

A full history was taken from each patient reporting: name, age, sex, marital status, residence, social status, job, history of the disease itself, including the duration, complaint of the patient (itching or not), family history of the same disease or any other skin diseases, previous history of the same condition, presence of animals contact, drug history (topical and systemic), other systemic diseases such as hypertension, diabetes or others.

All patients were carefully assessed clinically and by skin scraping for fungus were carried out for all patients every 3 weeks for two months. All treated patients had no history of using topical or systemic antifungal drug 2 months before starting the present study. Patients with systemic diseases like diabetes mellitus, or any immune compromised conditions and other severe illnesses were excluded.

Zinc sulfate 10% solution (ZnSO₄ 7H₂O=287.54 from MERK, France) was used twice a day and patients seen every 3 weeks for two months and placebo treatment using distilled water was used in a similar manner to **Group A**.

The nature of this trial was explained and formal consent was taken from each patient before using therapy, after full explanation about the nature of the disease, course, the procedure of treatment, follow up, prognosis and the need for pre and post treatment photographs. Also, the ethical approval was performed by the scientific committee of the Scientific Council of Dermatology & Venereology-Iraqi Board for Medical Specializations.

Examination of the patients and assessment of the disease was performed by:

- Clinical examination of the lesion regarding: site, size, number of the lesions, color and the presence of the erythematous plaque with advancing active border and scaling.
- Laboratory assessment by skin scraping test and mounted in 10-30% of KOH solution.
- Wood's Light examination

Examination of the patients was done every three weeks for each patient. All patients were photographed by a digital camera as a baseline and then every 3 weeks, in the same place with fixed illumination and distance by using a digital camera (Cyber Shoot with optical zoom 5.1).

All patients in **Group A** received 10% zinc sulfate solution, twice daily, while the placebo control group patients received distilled water twice daily. The duration of the treatment was two months.

Preparation and treatment plan:

Zinc sulfate solution 10% (W/V) was prepared by dissolving 10 grams of zinc sulfate crystals (ZnSO₄ 7H₂O=287.54 from MERK, Franc) in 100 ml of distilled water. This source of zinc sulfate crystals is used in all parts of the study. Using the standard cotton tipped applicator; the patient applies the lotion over the lesion twice daily for two months.

Scoring of clinical response is as follow:

I-No response: If there is no response on clinical and mycological examinations.

2-Partial response: If there is partial clinical improvement and with negative or positive skin scraping for the fungus.

3-Complete response: If both clinical and negative skin scraping tests examinations indicate complete improvement.

Statistical analysis was used in all parameters. Chi square used to compare the changes resulted from the treatment. P value of less than 0.05 considered to be significant.

RESULTS:

Group A: Thirty patients only were completed the study, 17 (56.7%) females and 13 (43.3%) males. The ages of the patients ranged between 4-64 (27.87 ± 17.68) years, while the duration of the disease ranged between 1-13 (3.7 ± 3.249) weeks. Positive family history was found in 1 (3.3%) patient.

The remaining three patients: Systemic disease was being found in 2 (6.7%) {Diabetes mellitus in 1 (3.3%) and tuberculosis adenitis in 1 (3.3%) patient} patients which excluded and regarded as default and one patient not completed the treatment for unknown reason.

History of contact with animals was found in 3 (10%) patients. Previous drug therapy (topical treatment) was found in 4 (13.33%) patients. Previous history of tinea corporis was found in 1 (3.3%) patient.

Site distribution was as follow: mainly on anterior trunk 11 (36.67%) patients, upper extremities 10 (33.33%) patients, lower extremities 6 (20%) patients and on the posterior trunk 3 (10%) patients.

Thirteen (43.33%) patients of tinea corporis had been completely improved (both on clinical and skin scraping test examinations), 7 (23.34%) patients have been partially improved; 5 (16.67%) patients with negative skin scraping tests with no scales nor erythema on clinical examination while 2 (6.67%) patients with positive skin scraping tests and loss of border activity, 10 (33.33%) with no improvement, both on skin scraping test and on clinical levels (Table-1,2).

Group B: Thirty patients of tinea corporis received the placebo solution (distilled water), consisted from 10 (33.33%) females and 20 males (66.67%).

The ages of the patients ranged from 8-66 (30.67 ± 15.66) years, and the duration of the disease ranged from 1-30 (7.48 ± 6.98) weeks. Systemic disease was found in 1 (3.3%) patient (Diabetes mellitus).

Site distribution was mainly: on the lower extremities 15 (50%) patients, upper extremities 7 (23.33%) patients, anterior trunk 5 (16.67%) patients and on the posterior trunk in 3 (10%) patients. Two (6.67%) patients with partial improvement (clinically, borders start to fade and remain positive skin scraping test, 28 (93.33%) patients with no improvement and there was no complete improvement (Table-1).

DISCUSSION:

Tinea corporis is common skin disease among children and adult people and usually caused by *T. mentogrophytes* and *T. rubrum*. There are many systemic and topical effective therapies in treating superficial mycoses, like imidazoles, triazoles which inhibit the cytochrome P-450 and interfere with fungal ergosterol synthesis while allylamine antimycotics with fungicidal activity inhibit squalene epoxidase enzyme, griseofulvin which is narrow spectrum antimycotic agent which arrest mitosis at the metaphase stage⁽³⁾.

The present work showed that topical 10% zinc sulfate solution was an effective treatment of tinea corporis in only 43.33% of cases and the duration of therapy was 2 months. So in comparison with other topical antifungal drugs like imidazoles and triazoles⁽³⁾ zinc has slow action. But when compared with tinea versicolor the clearance of rash was more rapid in tinea versicolor with short duration⁽⁹⁾, probably because of using 15% of zinc sulfate solution.

The mechanism of action is not clear but there is in vitro study showed that zinc sulfate has antifungal activity⁽⁸⁾. In addition zinc sulfate has immunomodulating effects and accelerates apoptosis⁽⁵⁾. and topically act as cytotoxic agent⁽⁴⁾. There were no side effects reported after topical therapy of zinc sulfate except irritation of the skin in early course of therapy and this irritation was part from mechanism of action of zinc sulfate.

Table 1: Clinical response among tinea corporis patients during treatment according to clinical examination.

	3 weeks (%)			6 weeks (%)			9 weeks (%)		
	Complete response	Partial response	No response	Complete response	Partial response	No response	Complete response	Partial response	No response
tinea corporis test group (A)			30 (100%)		18 (60%)	12 (40%)	13 (43.33%)	7 (23.34%)	10 (33.33%)
Tinea corporis control group (B)			30 (100%)			30 (100%)	0	2 (6.67%)	28 (93.33%)
χ^2 , d.f. P-Value	Not Valid			Not Valid			16.05, 2, 0.00032		

Table 2: Clinical response among tinea corporis patients during treatment according to skin scraping tests.

	3 weeks (%)		6 weeks (%) (+ve)		9 weeks (%) (+ve)	
	No.	%	No.	%	No.	%
Tinea corporis test group (A)	30	(100%)	30	(100%)	12	(40%)
Tinea corporis control group (B)	30	(100%)	30	(100%)	30	(100%)

χ^2 , 4.68, P-Value = 0.030

CONCLUSION:

Topical 10% zinc sulfate solution was a new effective, safe and non costly formulation in the treatment of tinea corporis but it was slow in clearance of the lesions and higher concentrations of zinc sulfate like 20% might increase the effectiveness of the drug and shorten the duration of therapy. So, further studies are recommended in comparison with standard topical antifungal drug.

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