Clinical Trial Protocol
Iranian Registry of Clinical Trials

22 Nov 2026

Investigation of the effects of Cold Atmospheric Plasma in the treatment of patients with refractory dermatophytosis: A triple-blinded randomized clinical trial

Protocol summary

Study aim
The main objective of this study is to investigate the effectiveness of CAP in the treatment of terbinafine-resistant dermatophytosis in a triple-blind clinical trial.

Design
This study is a triple-blind, randomized, placebo-controlled clinical trial. The target population includes patients with dermatophytosis of the groin and body that are resistant to terbinafine and itraconazole. The sample includes 50 patients who were divided into two groups: the intervention group that received combined CAP therapy with itraconazole and the control group that received itraconazole alone. Randomization and blinding were performed to reduce bias and increase the accuracy of the results.

Settings and conduct
This study will be conducted at two locations: Mazandaran University of Medical Sciences and Sadaf Clinic.

Participants/Inclusion and exclusion criteria
Inclusion criteria: patients with treatment-resistant dermatophytosis; dermatophytosis of the groin, perianal area, and body; age over 12 years (both sexes). Exclusion criteria: steroid use within the last 4 weeks; uncontrolled diabetes and immunodeficiency diseases; pregnancy or lactation, and involvement of more than 10% of the body.

Intervention groups
Initially, demographic information about the patients will be recorded through medical records. The severity of the symptoms will be measured using two standard indices: VAS (itching and inflammation) and DeASI (severity and extent of dermatophyte infestation). Fungal samples will be taken at three different times: before starting treatment, at week 4 and at week 12. These samples will be examined in the laboratory to determine whether the infection is still active or if a healing process has occurred.

Main outcome variables
Response to treatment - Duration of treatment - Side effects - Rate of improvement

General information

Reason for update

Acronym
CAP

IRCT registration information
IRCT registration number: **IRCT20250712066462N1**
Registration date: **2025-09-11, 1404/06/20**
Registration timing: **registered_while_recruiting**

Last update: **2025-09-11, 1404/06/20**
Update count: **0**

Registration date
2025-09-11, 1404/06/20

Registrant information

Name
Tahereh Shokohi

Name of organization / entity

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Iran (Islamic Republic of)

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Recruitment status
Recruitment complete

Funding source

Expected recruitment start date
2025-08-23, 1404/06/01

Expected recruitment end date
2025-12-21, 1404/09/30

Actual recruitment start date
empty
Actual recruitment end date
empty
Trial completion date
empty

Scientific title
Investigation of the effects of Cold Atmospheric Plasma in the treatment of patients with refractory dermatophytosis: A triple-blinded randomized clinical trial

Public title
Investigation of the effects of Cold Atmospheric Plasma in the treatment of patients with dermatophytosis
Purpose
Treatment
Inclusion/Exclusion criteria
Inclusion criteria:
Patients with resistant dermatophytosis Patients over 12 years of age (both sexes) Suffering from mild to moderate dermatophytosis (body and groin alopecia) Failure to respond to standard treatments within 4 to 6 weeks
Exclusion criteria:
Patients with dermatophytosis who respond to conventional antifungal treatments. Including pregnant and lactating women and children under 12 years of age. Patients with extensive involvement of more than 10% of the body Patients with uncontrolled diabetes Immunosuppressed individuals Patients taking steroids in the last 4 weeks
Age
From **12 years** old
Gender
Both

Phase
3
Groups that have been masked

- Participant
- Care provider
- Investigator
- Outcome assessor
- Data analyser
- Data and Safety Monitoring Board

Sample size
Target sample size: **52**
Randomization (investigator's opinion)
Randomized
Randomization description
In order for our study to be completely scientific and unbiased, we use the block randomization method. That is, patients are randomly divided into two groups after the doctor and laboratory approval and signing a written consent form. This ensures that the distribution of people in the intervention and control groups is fair and the results of the study are not affected by side factors. How are patients placed in groups? The block randomization method is used, which means that patients are placed in blocks of four and then assigned to one of two groups. The intervention group (CPT) includes patients who receive cold atmospheric plasma (CAP) along with itraconazole. The control group (SWT) will receive itraconazole alone. This allocation is done randomly and the patients' information is recorded in the Master Sheet.
Blinding (investigator's opinion)
Triple blinded
Blinding description
When entering the study, patients receive a specific number that is placed in an opaque envelope, so that even the doctor will not know the type of grouping until the moment the treatment starts. Why is blinding important? To ensure that the results are more accurate and unbiased, the study is designed as a triple-blind. This means that neither the patient, nor the evaluator, nor the laboratory specialist know the type of treatment. The treating doctor assigns the patients to the groups using random codes (via the randomizer.org website). How are the conditions of the groups kept equal? All patients receive the drug itraconazole, but the main difference is that in the intervention group, cold atmospheric plasma (CAP) is also added to the treatment. In order to ensure that the conditions of the two groups are similar, an inactive CAP device (placebo) is also used in the control group, meaning that the patient will not notice any difference in the treatment method. This method helps to accurately assess the true effect of cold plasma and ensure that any changes in patients' condition are due to CAP and not other factors.
Placebo
Used
Assignment
Parallel
Other design features

Secondary Ids

empty

Ethics committees

1

Ethics committee
Name of ethics committee
Ethics Committee of Mazandaran University of Medical Sciences
Street address
Moalem Sq. Research deputy of Mazandaran University of Medical Sciences
City
Sari
Province
Mazandaran
Postal code
4817844718
Approval date
2025-07-16, 1404/04/25
Ethics committee reference number
IR.MAZUMS.REC.1404.150

Health conditions studied

1

Description of health condition studied
Tinea cruris
ICD-10 code
B35.6
ICD-10 code description
Dermatophytosis of groin and perianal area

2

Description of health condition studied
Tinea corporis
ICD-10 code
B35.4
ICD-10 code description
Dermatophytosis of body

Primary outcomes

1

Description
Mycological Cure: This variable is designed to measure the effectiveness of the intervention in eliminating the fungal agent of the disease. Laboratory cure is achieved when both mycological criteria, namely direct microscopic observation with potassium hydroxide (KOH) and the result of fungal culture on dextrose agar containing chloramphenicol and cyclohexamide, are negative. The negativity of both tests indicates complete elimination of dermatophytes from the lesion site and is considered as successful laboratory treatment. This is a qualitative variable and the results are reported as "positive" or "negative". This outcome is considered one of the main outcomes of the study and the sample size was also determined based on it.
Timepoint
Measurements of microscopic and fungal culture results will be performed at the beginning of the study (before treatment begins) and four weeks after the end of treatment.
Method of measurement
To measure this variable, a sample of the affected area is taken and examined in a medical mycology laboratory. First, microscopic examination is performed using a potassium hydroxide (KOH) solution, and then fungal culture is performed in SDA medium containing chloramphenicol and cyclohexamide. Interpretation of the results is performed by a person blinded to the intervention grouping, and the results are reported qualitatively (positive or negative).

2

Description
Clinical Cure based on clinical scoring,This primary outcome variable is designed to clinically assess the effectiveness of the intervention. Clinical improvement is measured by a Visual Analogue Scale (VAS) including a scale of 0 to 10 for the severity of itching, burning, and scaling, as well as the Dermatophytosis Severity and Involvement Index (DeASI). These assessments are performed by a dermatologist (blinded to the type of intervention) at two time points. A significant reduction in scores from baseline is considered clinical improvement. This variable is quantitative and plays an important role in the analysis of treatment effectiveness.
Timepoint
Assessment of the severity of skin lesions and clinical symptoms will be performed at the beginning of the study (before the start of treatment) and four weeks after the start of the therapeutic intervention.
Method of measurement
This variable is measured using a numerical scale from zero to ten (Visual Analogue Scale) for symptoms of itching, inflammation and scaling and the DeASI index for a composite assessment of the severity and extent of skin lesions. These measurements are performed by a dermatologist who is unaware of the type of intervention and are recorded on standard forms. The change in scores from baseline will be analyzed and recorded.

Secondary outcomes

1

Description
Relapse Rate: This variable is designed to assess the stability of the treatment effect and the likelihood of symptoms returning after the end of treatment. Relapse is defined as the patient experiencing a recurrence of clinical symptoms (e.g., itching, inflammation, skin lesions) during follow-up after achieving complete clinical and microbiological recovery, along with positive results in mycological examination (direct observation and/or positive culture). The measurement of this variable indicates the ability of the intervention to prevent relapse and is recorded qualitatively (relapsed/not relapsed).
Timepoint
Six weeks after the end of treatment
Method of measurement
At the follow-up visit 6 weeks after treatment, the patient is examined for recurrence of clinical symptoms (by a physician blinded to the intervention) and a sample is taken from the area of the suspected lesion. The sample is subjected to microscopic examination with potassium hydroxide solution and fungal culture. If both clinical and laboratory examinations are positive again, the disease recurrence is confirmed and recorded.

Intervention groups

1

Description
Intervention group: In addition to receiving standard topical antifungal treatment, patients in this group will be treated with Cold Atmospheric Plasma. Cold plasma is produced by a Helium-based Atmospheric Pressure Plasma Jet device manufactured by [insert company

name], using pure helium gas, and is irradiated directly onto the surface of the fungal lesion. Plasma application parameters include: Operating frequency: 13 kHz Output voltage: 6 kV Nozzle-to-skin distance: 10 mm Duration of each session: 3 minutes for each lesion Number of treatment sessions: 3 times a week for 4 consecutive weeks (12 sessions in total) All irradiation sessions are performed by a trained operator and under the supervision of a dermatologist. In addition to this treatment, patients will apply the topical antifungal drug clotrimazole 1% (manufactured by [company name]) to the lesion twice daily according to standard instructions. Patients will be evaluated for clinical and mycological improvement before starting treatment and at the end of the fourth week.

Category

Treatment - Drugs

2

Description

Control group: Patients in this group will only receive standard topical antifungal treatment and will not receive any atmospheric cold plasma irradiation. Standard treatment includes the use of Clotrimazole 1% topical ointment manufactured by [insert company name] Pharmaceutical Company. How to use the drug: Apply a sufficient amount of the drug to the skin lesion. The drug is used twice a day (morning and evening). Duration of use: For 4 consecutive weeks. All patients will be continuously followed up to ensure that they follow the drug instructions correctly and do not use additional treatments during the study. At the end of the fourth week, clinical and laboratory evaluations will be performed to assess improvement.

Category

Treatment - Drugs

Recruitment centers

1

Recruitment center

Name of recruitment center
Sadaf Clinic
Full name of responsible person
Tahereh Shokouhi
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Sponsors / Funding sources

1

Sponsor

Name of organization / entity
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Phone
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Email
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Grant name
Grant code / Reference number
Is the source of funding the same sponsor organization/entity?
No
Title of funding source
Deputy of research and technologyMazandaran University of Medical Sciences
Proportion provided by this source
100
Public or private sector
Public
Domestic or foreign origin
Domestic
Category of foreign source of funding
empty
Country of origin
Type of organization providing the funding
Academic

Person responsible for general inquiries

Contact

Name of organization / entity
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Full name of responsible person
Tahereh Shokouhi
Position
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Latest degree
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Other areas of specialty/work
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Sharing plan

Deidentified Individual Participant Data Set (IPD)
Yes - There is a plan to make this available
Study Protocol
Yes - There is a plan to make this available
Statistical Analysis Plan
Yes - There is a plan to make this available
Informed Consent Form
Yes - There is a plan to make this available
Clinical Study Report
No - There is not a plan to make this available
Analytic Code
No - There is not a plan to make this available
Data Dictionary
No - There is not a plan to make this available
Title and more details about the data/document
All patient information listed in the questionnaire will be shared.
When the data will become available and for how long
Will be available upon request.
To whom data/document is available
This data will only be available to researchers working in academic and scientific institutions.
Under which criteria data/document could be used
Information that has not been analyzed by us will be available for use with intellectual property rights preserved.
From where data/document is obtainable
shokohi.tahereh@gmail.com
What processes are involved for a request to access data/document
After sending the message by the applicant, the information will be sent via email within two weeks.
Comments