

The efficacy of 5% topical tea tree oil gel in mild to moderate acne vulgaris: A randomized, double-blind placebo-controlled study

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ABSTRACT

Background: Finding an effective treatment for acne that is well tolerated by the patients is a challenge. One study has suggested the efficacy of tea tree oil in treatment of the acne vulgaris. **Aim:** To determine the efficacy of tea tree oil in mild to moderate acne vulgaris. **Methods:** This was a randomized double-blind clinical trial performed in 60 patients with mild to moderate acne vulgaris. They were randomly divided into two groups and were treated with tea tree oil gel (n=30) or placebo (n=30). They were followed every 15 days for a period of 45 days. Response to treatment was evaluated by the total acne lesions counting (TLC) and acne severity index (ASI). The data was analyzed statistically using t-test and by SPSS program. **Results:** There were no significant differences regarding demographic characteristics between the two groups. There was a significant difference between tea tree oil gel and placebo in the improvement of the TLC and also regarding improvement of the ASI. In terms of TLC and ASI, tea tree oil gel was 3.55 times and 5.75 times more effective than placebo respectively. Side-effects with both groups were relatively similar and tolerable. **Conclusion:** Topical 5% tea tree oil is an effective treatment for mild to moderate acne vulgaris.

Key Words: Acne vulgaris, Tea tree oil gel, Topical treatment

INTRODUCTION

Acne vulgaris remains one of the commonest diseases to afflict humanity. The analysis of the 1996 census data in the United States of America indicated that the prevalence of acne in the age group 12-24 was 85%.^[1] Even in its mild form, acne can have lingering impacts on mental health (e.g., anxiety and depression), social interactions, self-confidence, self-esteem and employment opportunities.^[2] Antibiotics which suppress *Propionibacterium acnes* are the standard treatment for acne, but are becoming less effective probably because of the emergence of antibiotic-resistant strains.^[3-6] Search for an effective treatment that is well tolerated by patients is a challenge.

Tea tree oil has broad-spectrum antimicrobial^[7] and anti-inflammatory^[8,9] activity *in vitro*. These properties have formed the basis of its use in the treatment of a range of superficial dermatoses such as cuts, insect bites, boils and dermatophytosis.^[7,10] There are study reports suggesting the use of 5% tea tree oil for the treatment of acne vulgaris and showing the efficacy of tea tree oil gel against *Propionibacterium acnes*.^[11] These basic facts prompted us to perform a double-blind placebo-controlled study to determine the efficacy of tea tree oil in the treatment of mild to moderate acne vulgaris.

METHODS

This double-blind clinical trial was performed between

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December 2004 and September 2005 at our out-patient clinics. A total of 60 patients (age range-15 to 25 years) with mild to moderate facial acne vulgaris (defined as the maximum number of comedones as well as papules and pustules less than 20 and 50 respectively and the absence of any nodules, cysts or sinus tracts)^[12] were selected randomly. Ethical Committee clearance was taken before performing this study. Informed consent was also taken from all patients.

We performed this study with 30 patients in each group. Patients were randomized to two groups using random allocation software. Patients in Group A were treated with 5% tea tree oil gel and those in Group B, with placebo (vehicle gel alone). The vehicle gel was composed of the carbomer that had no antiacne activities *per se*. Tea tree oil and placebo gels were in the same color, texture, package size but with different labels. Both the active drug and the placebo were provided by Cinere Company, Iran. Every patient was interviewed separately so that they were not able to compare their drugs with each other. The patients were instructed to apply the drug or placebo twice daily over the affected area for 20 min and then to wash it off with tap water. The treatment was continued for 45 days. Both investigators and the patients were blinded to the type of treatment.

The patients were seen at every 15-day period to evaluate the lesions and any side-effects. To determine the efficacy of treatment on acne severity we used both total lesion count (TLC) and the acne severity index (ASI).

The ASI^[11] was calculated as:

$$\text{ASI} = \text{Papules} + (2 \times \text{pustules}) + (\text{comedones}/4)$$

The TLC count was calculated as:

$$\text{TLC} = \text{Papules} + \text{pustules} + \text{comedones} + \text{nodules}$$

The primary outcome measure was defined as the change in mean TLC and ASI scores at the end of treatment compared to baseline in both the study and control groups. Secondary outcome measures included a change in the mean numbers of comedones, papules and pustules.

A second investigator blinded to the type of treatment was responsible for counting the lesions before and after the treatment. In the first visit, the total number of lesions was considered to be 100% and any decrease in the number of lesions was calculated accordingly and regarded as the percentage of improvement. The mean of these percentages of improvement was calculated in each group of patients and used for statistical analysis. At the end of the study, the data were analyzed by the third investigator using SPSS (release 13) program (student's *t* test) and then the labels were revealed.

RESULTS

Demographic results

The demographic characteristics of the patients are shown in Table 1. There were no significant differences regarding these characteristics between the two groups (*P* value > 0.05), confirming the success of randomization. All the patients completed the study.

Efficacy on TLC

The mean TLC in the 5% tea tree oil gel group reduced from 21.16 before treatment to 11.33 after six weeks of treatment, a reduction of 43.64%. This difference was statistically significant (*P* value = 0.035, 95% confidence interval (CI) of the difference = 7.05-12.6). The mean TLC in the placebo group dropped from 19.53 before treatment to 17.23 after treatment, i.e., by 12.03%. This difference was not statistically significant (*P* value = 0.09, 95% CI of the difference = 1.16-3.43). There was a significant difference between 5% tea tree oil gel and placebo regarding improvement of the TLC (*P* value = 0.000, CI of the difference = 21.24-41.98) [Figure 1]. In terms of the TLC, 5% tea tree oil gel was 3.55 times more effective than placebo.

Efficacy on ASI

The mean ASI in the 5% tea tree oil gel group was 14.18 before treatment and 7.64 after treatment, a reduction of 40.49%. This difference was statistically significant (*P* value = 0.000, CI of the difference = 4.51-8.58). In the placebo group, there was 7.04% reduction of the ASI, from a mean ASI of 12.35 before treatment to 11.56 after treatment. This difference was not statistically significant (*P* value = 0.051, CI of the difference = -5.2-1.5). There was significant difference between 5% tea tree oil gel and placebo regarding improvement of the ASI [Figure 1] (*P* value = 0.000 CI of the difference = 18.64-48.24). In context of ASI, 5% tea-tree oil gel was 5.75 times more effective than placebo.

Efficacy on comedones number (CN)

The mean of CN in the 5% tea tree oil gel group was 12.23 before treatment and 6.46 after treatment; the CN reduced by

Table 1: Demographic characteristics of the patients

Patients characteristics	Tea tree oil-treated group	Placebo-treated group
	n = 30	n = 30
Male	7 (24%)	6 (20%)
Female	23 (76%)	24 (80%)
Age (Mean and SD)	19.3 ± 3.1	19.13 ± 2.64
Total lesion count	21.16 ± 7.73	19.53 ± 8.26
Acne severity index	14.18 ± 6.14	12.35 ± 5.54

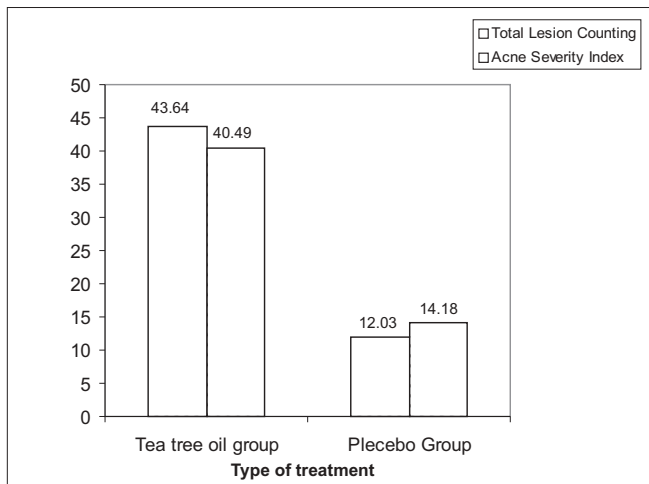


Figure 1: Efficacy of the tree oil gel and placebo in the reduction of the total lesion counting and acne severity index

40.24%. This difference was statistically significant (P value = 0.000, CI of the difference = 3.59-7.94). The efficacy of placebo was 12.13% in reduction of CN (from 12.86 before treatment to 10.80 after treatment). This difference was statistically significant (P value = 0.001 CI of the difference = 0.95-3.1). There was a significant difference between 5% tea tree oil gel and placebo regarding improvement of the CN (P value = 0.000 CI of the difference = 14.33-41.94) [Figure 2].

Efficacy on papules number (PPN)

The 5% tea tree oil gel reduced PPN as much as 46.06% during six weeks of treatment. The mean of PPN in this group was 6.60 before treatment and 3.56 after treatment. This difference was statistically significant (P value = 0.004 CI of the difference = 1.85-4.21). The reduction of PPN in the placebo group was calculated to be 9.70%. The mean of PPN in this group was 4.43 before treatment and 4.00 after treatment. This difference was not statistically significant (P value = 0.056, CI of the difference = -1.2-0.87). There was significant difference between these two groups regarding improvement of the papules number (P value = 0.022; CI of the difference = 3.91-49.33) [Figure 2].

Efficacy on pustules number (PUN)

The 5% tea tree oil gel reduced PUN by as much as 47.45% during six weeks of treatment. The mean of PUN in this group was 2.30 before treatment and 1.23 after treatment. This difference was statistically significant (P value = 0.001, CI of the difference = 0.47-1.65). In the placebo group, there was worsening of the pustular lesions of acne. A reduction of 2.37% in pustules number was noted in the placebo group. The mean of PUN in this group was 2.30 before treatment and 2.36 after treatment. This difference was not statistically significant (P value = 0.45, CI of the difference = -0.46-0.2). There was a

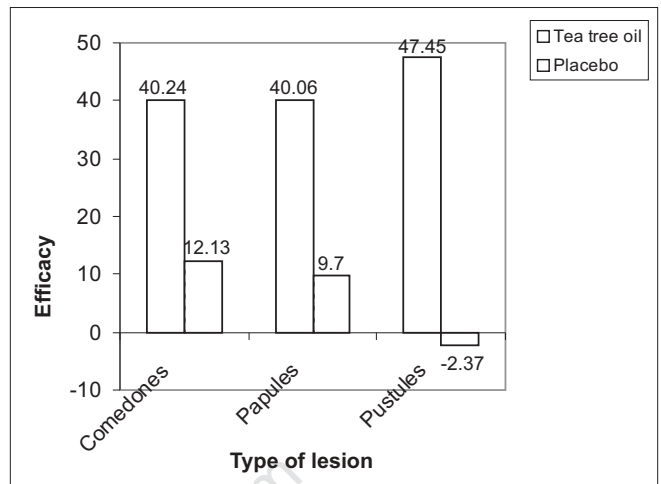


Figure 2: Efficacy of tea tree oil and placebo in the reduction of different types of lesions

significant difference between these two groups regarding improvement of the pustules number (P value = 0.001, CI of the difference = 21.42-78.21) [Figure 2].

Side-effects of treatment

In the 5% tea tree oil-treated group, three out of 30 patients (10%) complained of minimal pruritus. One patient (3.33%) reported a little burning sensation on application of the drug and another (3.33%) had minimal scaling. In the placebo group, two patients (6.66%) complained of minimal pruritus and two patients (6.66%) reported a little burning sensation on application of the drug.

DISCUSSION

The essential oil of *Melaleuca alternifolia*, also known as tea tree oil or *Melaleuca* oil, has been used medicinally in Australia for more than 80 years.^[7] The tree itself has been used therapeutically for even longer, being one of the plants used in traditional medicine by the Bundjalung aborigines of northern *New South Wales*.^[7] Tea tree oil (TTO) is well characterized and contains approximately 100 *terpenes* and their related alcohols.^[13] The physical and chemical properties of commercial TTO are regulated by an international standard.^[14]

TTO (batch 971) was kindly provided by Cinere Company, Tehran, Iran. The levels of the components were determined by gas chromatographic analysis according to the international standard.^[14] Tea tree oil has broad-spectrum antimicrobial^[7] and anti-inflammatory^[8,9,15,16] activity *in vitro*. These properties have formed the basis of its use in the treatment of a range of superficial dermatoses such as cuts, insect bites, boils, acne

and dermatophytic infections.^[7,10] Furthermore, data from clinical studies indicate that superficial infections or conditions caused by bacteria,^[10] fungi^[17] and viruses respond clinically to treatment with tea tree oil.

In a single-blind, randomized clinical trial performed for the evaluation of tea tree oil in acne vulgaris, the efficacy and skin tolerance of 5% tea tree oil gel in the treatment of mild to moderate acne was compared with 5% benzoyl peroxide lotion in 124 patients. The results showed that both 5% tea tree oil and 5% benzoyl peroxide had a significant effect in ameliorating acne by reducing the number of inflamed and noninflamed lesions (open and closed comedones), although the onset of action in case of tea tree oil was slower. Encouragingly, patients treated with tea tree oil experienced fewer side-effects.^[10]

The present study, till now, is the only double-blind study for the evaluation of tea tree oil for mild to moderate acne vulgaris. We found a six-week course of 5% tea tree oil to be effective in reducing both inflammatory and non-inflammatory acne lesions. This effect was possibly due to the anti-inflammatory and antibacterial effects of the tea tree oil.^[15,16] The low and minimal side-effects of this treatment render it as a suitable treatment option for mild to moderate acne vulgaris.

Considering the broad-spectrum antibacterial activity of tea tree oil, we suggest that its efficacy can be evaluated in cases of acne vulgaris resistant to conventional therapies. Since there are no reports of its teratogenicity,^[18] we suggest that its safety should be examined in pregnancy.

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