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Effect of Laser Acupuncture in the Treatment of Non-allergic Rhinitis

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Abstract

Non allergic rhinitis is defined by the symptoms of nasal congestion, rhinorrhea, postnasal drainage and sneezing. It has been associated with various pathologic changes, although it can occur in the absence of any inflammation. Therefore, the diagnosis is based on the clinical presentation. The best overall treatment is the evasion of the known trigger with medical treatment as an addition when all other options fail, surgical intervention becomes a feasible therapy. Acupuncture aroused as one of the most popular complementary and alternative treatments of rhinitis with high beneficial effects through clinical trials. It can be used to improve medical effectiveness and compliance. Laser acupuncture is considered as a painless and non-invasive modality of treatment with no risk of infection. The aim of this research is to assess the effectiveness of laser acupuncture in the treatment of non- allergic rhinitis and improving its symptoms. This study included 84 adult patients, 41 male and 43 female diagnosed as non-allergic rhinitis, they were been divided according to the management modality into Group I: 27 adults diagnosed as cases of non-allergic rhinitis and received laser acupuncture therapy in addition to medical treatment. Group II: 29 adults diagnosed as cases of nonallergic rhinitis received laser acupuncture therapy only. Group III: 28 adults diagnosed as cases of non-allergic rhinitis received medications only that act as a control group. According to our results, a significant reduction was noted in serum levels of Interleukin 6 (IL-6) in laser acupuncture groups after 16 weeks of treatment as compared to those who received medical treatment alone. It was found that total nasal symptoms scores (TNSS) decreased significantly in those being treated with laser acupuncture as compared to others receiving medical treatment alone. It was found that TNSS score and IL 6 were positively co-related. In conclusion, the application of laser acupuncture may be used as an alternative or adjunctive treatment for non-allergic rhinitis.

Keywords: Non allergic rhinitis, Laser acupuncture, Interleukin 6 (IL-6), total nasal symptoms scores (TNSS).

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1. Introduction

Non-allergic rhinitis (NAR) is a syndrome resulting from nasal inflammation that encompasses several special diagnoses. It is a common disease for which there are only poor therapeutic treatment choices. This syndrome should be distinguished from allergic rhinitis, a syndrome that immunoglobulin E (IgE) is thought to intermediate. Non-allergic rhinitis may be diagnosed via clinical evaluation or via allergen skin testing or radioallergo sorbent testing [1]. In last few years, intensive studies have been carried out to explain the underlying mechanisms of the effectiveness of acupuncture. Numerous studies have shown that acupuncture regulates immune reactions and inhibits inflammatory reactions in different diseases, including rhinitis [2]. Acupuncture is about the stimulation of acupoints that are present at lines of meridians that correspond to the flow of energy throughout the body. Modern acupuncture has surpassed other methods of stimulating acupoints including applying pressure to the acupoint as well as the use of an electrical current, or utilizing a low intensity laser. Acupuncture evokes the release of β endorphin, which coupled to the release of adrenocorticotrophic hormone (ACTH) provoke the adrenal cortex to release cortisol, offering possible anti-inflammatory effect [3]. Meanwhile, in 2009, a random, placebo-controlled study by Fleckenstein et al.,2009 was published that revealed a significant change in nasal sickness score (NSS, max 27 points) in patients with vasomotor rhinitis treated with acupuncture versus others who had sham laser acupuncture treatment [4]. This study's purpose is to assess the efficacy of laser acupuncture in the

treatment of non- allergic rhinitis and ameliorating its symptoms.

2. Subjects and methods

2.1. Subjects

A prospective comparative study included 84 adults aged from 18- 60 years old from both sexes, diagnosed as non-allergic rhinitis according to BSACI guideline for the diagnosis and management of both allergic and non-allergic rhinitis 2017 [5].

Cases were recruited from Complementary Medicine clinic, Medical Research Centre of Excellence (MRCE), National Research Centre (NRC). Patients were grouped according to type of treatment as follow:

- **Group I:** 27 adults diagnosed as cases of non-allergic rhinitis and received laser acupuncture therapy in addition to medical treatment.
- **Group II:** 29 adults diagnosed as cases of non-allergic rhinitis received laser acupuncture therapy only.
- **Group III:** 28 adults diagnosed as cases of non-allergic rhinitis received medications only in the form of (antihistaminic, nasal decongestant, intranasal corticosteroids).

2.2. Inclusion criteria

- Adults 18-60 years old of both sexes.
- Term of sickness > 12 weeks.
- Negative allergic skin testing

BSACI guideline for the diagnosis and management of both non-allergic and allergic rhinitis.

2.3. Exclusion criteria

- Term of sickness < 12 weeks.
- Previous nasal surgeries.
- Polyposis nasi
- Contraindications regarding laser acupuncture (such as: risk of bleeding, pregnancy).
- Psychological disorders.
- Drug addiction.
- Autoimmune disease and other severe illness.

2.4. Methods

After taking a written consent form signed by the patient enrolled in this study after explaining the benefit and the possible side effects of the laser acupuncture therapy, a precise medical history taking as well as a discrete clinical examination were done for each participant. All patients had been subjected to the following:

2.4.1. Medical history taking with particular emphasis on

- Demographic data (name, sex and age).
- Family history.
- Disease's duration.
- Symptoms' severity (subjective and objective) in addition to medications taken in previous attack.

Symptoms were written down on a five-point scale (FPS) Hauswald et al., 2014 [6]. These points included:

- Nasal mucosa by anterior rhinoscopy.
- Nasal secretion.
- Nasal obstruction.
- Number of sneezing attacks.
- Subjective evaluation of therapeutic effect.

2.4.2. Subjective Symptom Scores

Subjective Symptom Scores were noted retrospectively from the patients as follows: nasal obstruction, congestion in addition to nasal secretion rhinorrhea were assessed using the given scale:

- **0** = symptoms free.
- **1** = slight but noticeable symptoms, not rendering daily activities undoable.
- **2** = moderate symptoms, hardly interfering with daily activities and sleep.
- **3** = severe symptoms, noticeably interfering with daily activities and sleep.
- **4** = symptoms with the greatest severity, drastically interfering with daily activities and sleep.

Following that, sneezing attacks were put together in 3 categories:

- **0** = no sneezing attacks.
- **1** = rare sneezing attacks, (one-two sneezing attacks per day).
- **2** = frequent sneezing attacks with more than three attacks in a day. At last, Subjective Estimation of the Therapeutic Effect was recorded as 1 = improved and 2 = remained as it was or worsened.

Total Nasal Symptom Scores (TNSS) Each symptom (sneezing, congestion, itching, and rhinorrhea) is classified from zero to three by the participants throughout the screening visits. To permit standardization and comparability, all patients were acupunctured at the same acupoints which were picked out in accordance with the guidelines of TCM.

2.4.3. Laser acupuncture

Laser acupuncture was applied bilaterally at the following points:

- The sphenopalatine acupoint (SPA)
- Lung 7 (LU 7)
- Large Intestine 4 (LI4)
- Liver 3 (LR3) Tai Chong

2.4.4. Laboratory investigations

- A 5 CC sample of venous blood will be obtained from each patient. After clotting the blood samples are going to be centrifuged and the serum is going to be separated as well as kept at −8 Celsius degree for batch assessment.
- IL6 will be assessed by ELISA (enzyme-linked immunosorbent assay).
- Re- assessment of these patients was done by the end of 16 weeks from the beginning of Laser acupuncture sessions by:
  - Improvement of the symptoms.
  - Re-evaluating of IL 6.

- Comparing the values between the studied groups.

2.5. Statistical analysis

Data analyzed using MedCalc© version 18.2.1 (MedCalc© Software bvba, Ostend, Belgium). Normally distributed numerical variables had been reported as mean ± SD and inter-group differences were put in comparison using the unpaired t test. Skewed numerical data were put out as median and range. Differences were put in comparison using the Mann-Whitney test.

Nominal variables were written out as number and percentage and differences were put in comparison using the Pearson chi-squared test or Fisher's exact test. Ordinal data were put in comparison using the chi-squared test for trend. Two-sided p-value <0.05 was regarded as statistically significant.

3. Results and discussion

Laser acupuncture is considered as a painless and non-invasive modality of treatment with no risk of infection, so many studies supported its use [7-8]. As regard IL6, our study showed significant reduction in serum levels of IL6 in all studded groups after 16 weeks of treatment, group 1 received medical treatment with laser acupuncture, group 2 received laser acupuncture and group 3 received medical treatment only, ($P < 0.001$, 0.001 and 0.05 respectively) which verified the anti-inflammatory effect of laser acupuncture. In non-allergic rhinitis, the mechanism of the pathophysiological nature of the nasal mucosal inflammation is still unknown. These agree with Kany et al 2019 and Peters et al., (2010), who reported that over-activity of the interleukin 6 pathway due to elevated interleukin 6 and sIL-6 receptor could elevate Th2 inflammation and impair T regulatory cell responses, denoting the persistence of chronic inflammation that is distinctive of chronic rhinitis [9-10]. This is in accordance with Tran et al., (2011), who reported that, when substance P is given to allergic participants, mRNA levels of interleukin 1, interleukin 2, interleukin 3, interleukin 4, interleukin 5, interleukin 6, tumor necrotic factor α, and γ-interferon vs. only an increase of interleukin 6 and interleukin 6 mRNA in non-allergic participants [11]. It has been recorded that low level laser therapy (LLLT) provokes particular cells and tissues utilizing photo energy, which enhances blood circulation, collagen synthesis, cell growth and bone remodeling as well as alleviates pain, edema, and inflammation Avci et al., (2013) [12].

Recently, some pro- inflammatory cytokines were noted as possible mediators of the pathological and clinical events in rhinitis. Among these is interleukin 6 which acts either indirectly or directly by the process of activating leukocytes to illicit nasal and sinus mucosal inflammation. interleukin 6 promotes B-cell differentiation into plasma cells and is a powerful stimulant of acute-phase reactants Spencer et al., (2013) [13]. In our study sneezing score and nasal congestion and obstruction were the most prominent symptoms. There were no statistical significance differences between the three studied groups before treatment. These agree with Zheng et al., (2018) and Hellings et al., (2017) who found that nasal congestion is considered one of most prominent symptoms of both AR and NAR; it is associated with snoring and breathing disorder during sleep, a condition that can affect mental health by associated increase in psychiatric disorders, anxiety up to depression [14-15]. This also in agreement with Ponda et al., (2023) and Avdeeva et al., (2022), who found that nasal obstruction was the most frequent symptom in non-allergic rhinitis [16-17]. On comparing the total nasal symptoms scores (TNSS) between the three study groups, we noted improvement of all the mean values of nasal symptoms scores with potentially significant improvement TNSS in both group 1 receiving medical treatment with laser acupuncture and group 2 received laser acupuncture alone (P=0.001), while mild significant improvement in mean values of total nasal severity symptoms scores TNSS in 3 group receiving medical treatment alone (P=0.05) (Table 3 and Figs. 1-3).

In a study done by Fleckenstein et al., (2009) regarding the effectiveness of acupuncture on the symptoms of vasomotor rhinitis, they found that the mean TNSS was drastically decreased from 9.3 +/- 3.89 to 4.1 +/- 3.20 points ($p < 0.001$), following 4 weeks of acupuncture therapy with difference 5.2 between pre- and post-mean values which denoted the accuracy of our results [4]. It was noted in a different study, Mi et al., (2020), who that there was a gradual improvement in nasal symptom through 6 weeks of therapy either it being with acupuncture alone or in combination with an antihistamine in their randomized, placebo /controlled study [18]. Adam et al., (2018), reported that acupuncture drastically decreased the days of antihistamine intake in those who have Seasonal allergic rhinitis (SAR) in comparison to those who were treated by sham acupuncture and those who took medication only [19]. When the positive effects of acupuncture on symptoms and disease-specific quality of life are taken into consideration, it can be recognized as a crucial, complementary treatment modality for Seasonal allergic rhinitis individuals with the capability to lower side effect of medical therapy. Another study noted that acupuncture at the sphenopalatine ganglion (SPG) attributed to great improvement in nasal patency and ventilation, and enhanced sympathetic nerve excitability Wang et al., (2016) in healthy individuals [20].

Moreover, another study highlighted the acupuncture's effect at the SPG acupoint for the prevention of the development of PAR Mi et al, (2018) [21]. In another recent study done by Wang et al, (2022), which studied the effectiveness of acupuncture at the (SPG) for Seasonal allergic rhinitis (SAR), it was noted that acupuncture at the SPG could potentially improve SAR symptoms and reduce rescue medication [22]. In Egypt, laser acupuncture was performed 3 sessions per week in fifty asthmatic children and it was stated that an improvement in respiratory function tests were observed, beta-mimetic drugs were discontinued, and the dose of intra-nasal corticosteroids was reduced after the one month of treatment period Elseify et al., (2013) [23]. Also, Moustafa et al., (2019), noted the outstanding improvement in the severity score symptoms and great improvement in the inflammatory marker's level in pediatric allergic rhinitis group received laser acupuncture sessions and they concluded that laser acupuncture is a painless, non-invasive, reliable as well as successful modality, which may be utilized as an adjuvant therapy regarding pediatric allergic rhinitis [24]. We found positive significant

correlations between TNSS score and IL 6 (figures 4-6). In agreement with our results, study performed by Li et al., (2022), showed that after the treatment with acupuncture the scores of TNSS, as well as the contents of serum IL-4 and IL-6 were decreased significantly (P<0.05) [25].

Table 1: Demonstrate the parameters of blood elements levels in the three chosen groups.

Parameters	Group 1 (laser + medication) N=27	Group 2 (laser) N=29	Group 3 (medication) N=28	*P* value
Red blood cells (RBCS) (mean +STD)	5.02±0.53	5.10±0.47	5.14±0.43	0.6450
HAEMOGLBIN (mean +STD)	13.01±1.1	13.21±0.96	13.38±0.87	0.3610
White blood cells (WBCS) (mean +STD)	6.80±1.49	6.6 ± 1.17	6.7± 0.90	0.8250
EISONOPHIL (mean +STD)	2.6±1.50	2.3 ± 1.26	2.57 ± 1.19	0.6320
PLATLETS (mean +STD)	259.2 ± 48.62	243.27± 41.16	240.37 ± 30.07	0.1610
Immunoglobulin E (IgE) (median + range)	22.9 (2-142)	24 (3-121)	23 (3-121)	0.9340
Erythrocyte Sedimentation Rate (ESR) (mean +STD)	11±3.2	9±3.0	10±2.9	0.561
Creactive Protein (CRP) (mean +STD)	3±0.9	4±1.1	3±1.0	0.473

ANOVA tests for parametric distribution data p>0.05, and using Kruskal Wallis tests for nonparametric data P>0.5 for IgE levels, denoting asymptotic significant are displayed.

Table 2: Represent the levels of interleukin-6 in all groups.

Parameters	Pre-treatment	Post-treatment	P value
All patients n=85 [median (range)] IL-6 (pg/mL)	9.375 (2-58)	7(1-48)	0.001***
GROUP-1 n=27[median (range)] IL-6 (pg/mL)	10 (3-58)	7(2-48)	0.001***
GROUP-2 n=29[median (range)] IL-6 (pg/mL)	9 (3-48)	5(1.3-30)	0.009**
GROUP-3 n=28 [median (range)] IL-6 (pg/mL)	8 (2-49)	7(1-47)	0.032*

Group1 (treated with laser acupuncture and medications), Group2 (treated with laser only), Group3 (treated with medication only). Significant P<0.05 using the nonparametric Wilcoxon Signed Ranks Test were displayed.

Table 3: The mean TNSS before and post-treatment after 16 weeks of treatment in all studied groups 1, 2 and 3 (group1 patients treated with laser acupuncture and medications, group 2 patients treated with laser acupuncture only and group 3 patients treated with medications only).

Nasal Symptoms	Pre-Treatment Mean Score	Post-Treatment Mean Score	P value
TNSS (group1)	8.81	2.9	<0.0001**
TNSS (group2)	9.1	4.60	<0.0001**
TNSS (group3)	9	5.36	<0.005**

Pre- and post-treatment means of TNSS were put in comparison using the t-test, and the P-value was considered as significant. TNSS: total nasal symptom score.

Table 4: Correlation between IL6 levels after treatment for various groups and the TNSS Score for each group.

Parameters	TNSS in Group 1 (laser + medication) N=27	TNSS in Group 2 (laser) N=28	TNSS in Group 3 (medication) N=29	P value
GROUP-1IL-6 (pg/mL) after treatment	r =0.531*			0.004**
GROUP-2 -IL-6 (pg/mL) after treatment		r=0.489*		0.008**
GROUP-3 - IL-6 (pg/mL) after treatment			r= 0.450*	0.014*

Using spearman's correlation coefficient. P<0.05 for statistically significance. TNSS: total nasal symptom score.

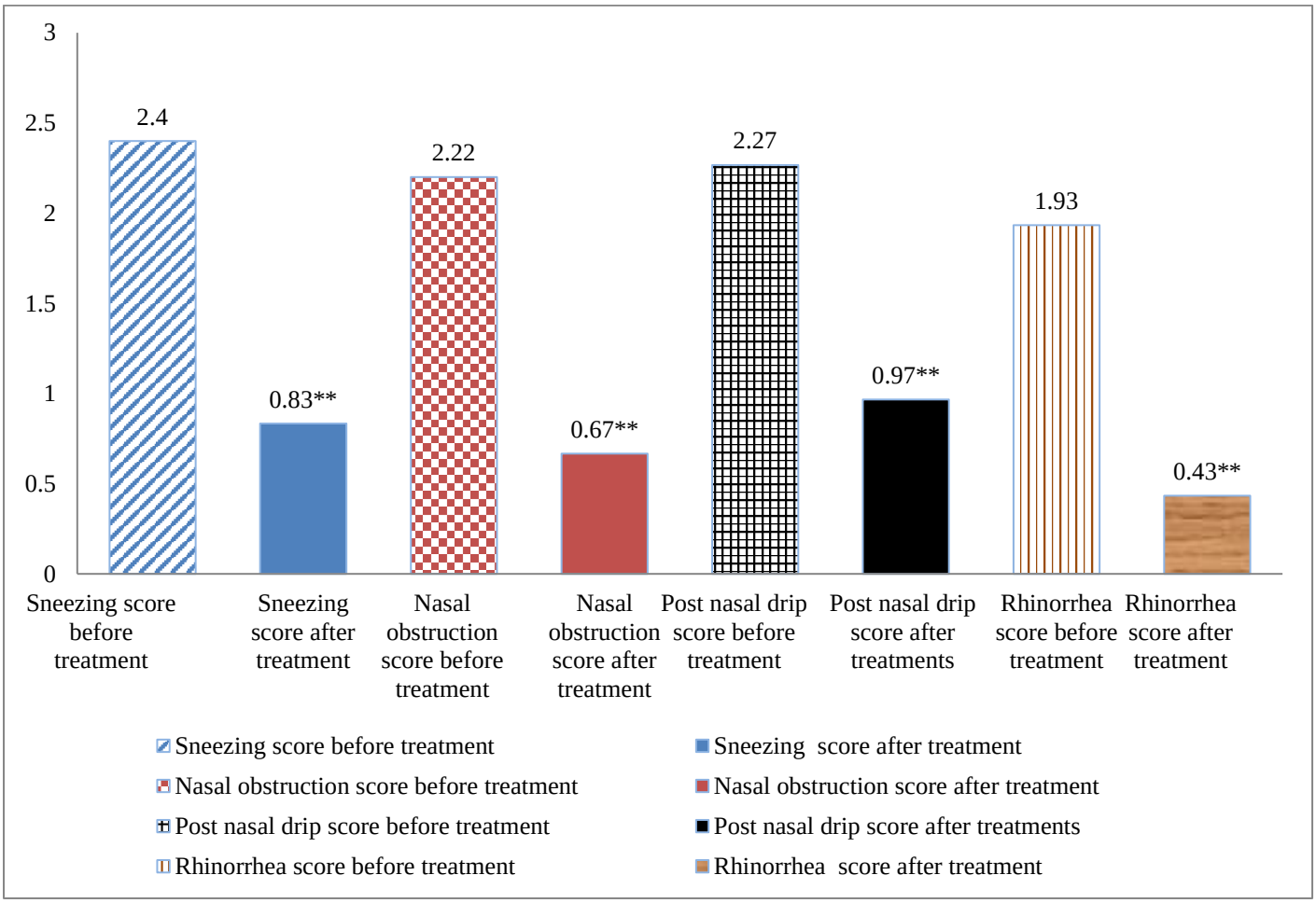

Figure 1: The mean values of pre- and post-treatment scores for each nasal symptom including sneezing, nasal obstruction, postnasal drip, and rhinorrhea in group1.

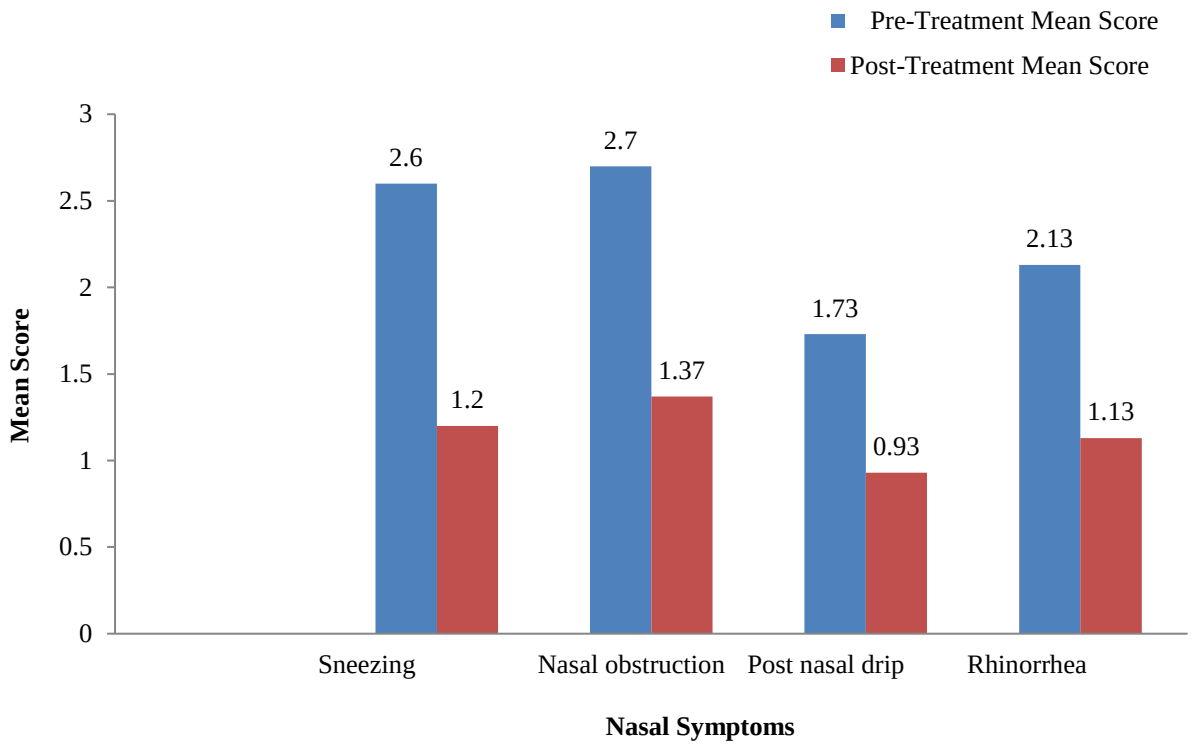

Figure 2: The mean values of pre- and post-treatment scores for each nasal symptom including sneezing, nasal obstruction, postnasal drip, and rhinorrhea in group2 patients (treated with laser acupuncture only).

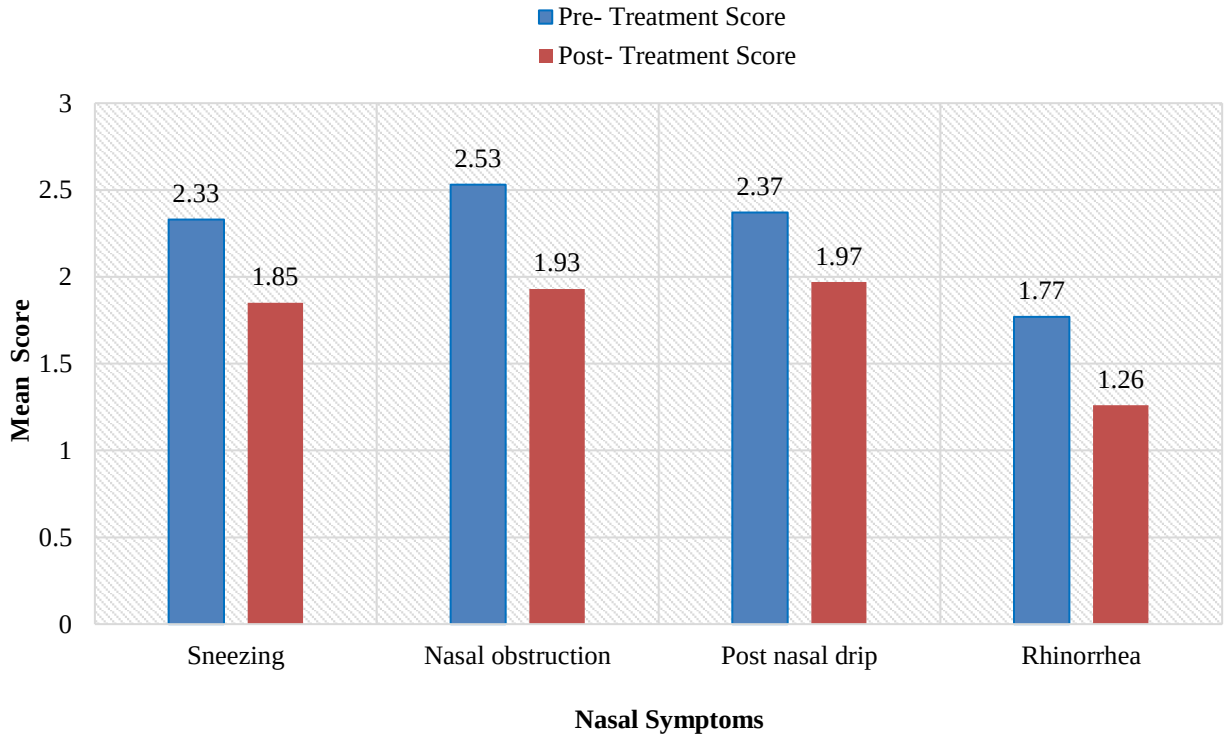

Figure 3: The mean values of pre- and post-treatment scores for each nasal symptom including sneezing, nasal obstruction, postnasal drip, and rhinorrhea in group3 patients (treated with Medication only).

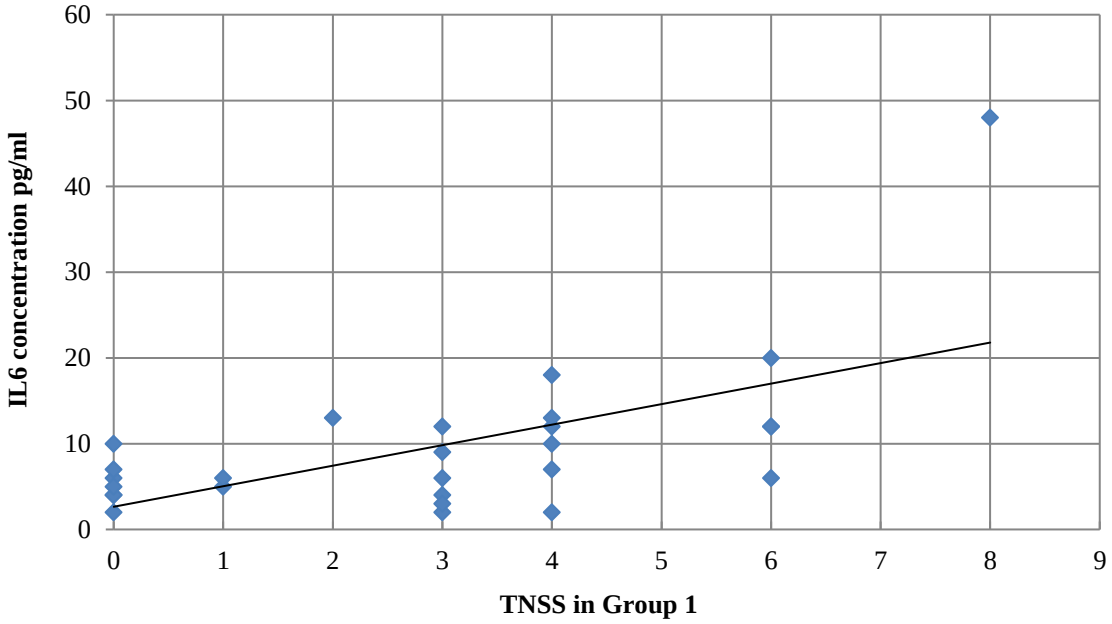

Figure 4: Correlation between IL6 concentration and TNSS in group 1, r = 0.531, P=0.004**

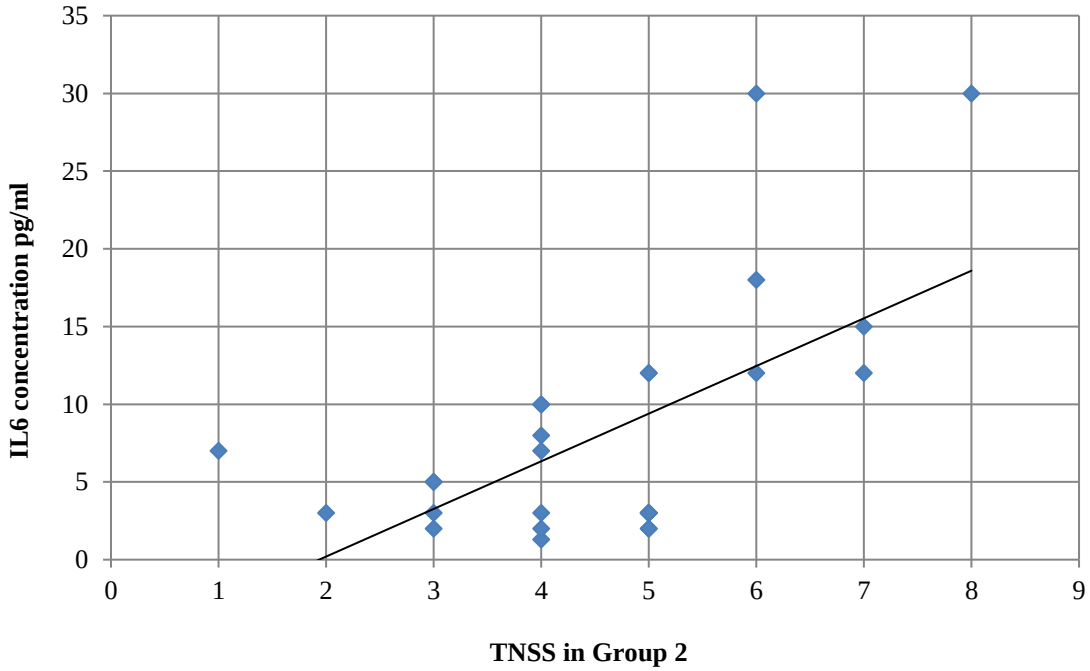

Figure 5: Correlation between IL6 concentration and TNSS in group 2, r = 0.489, P=0.008**

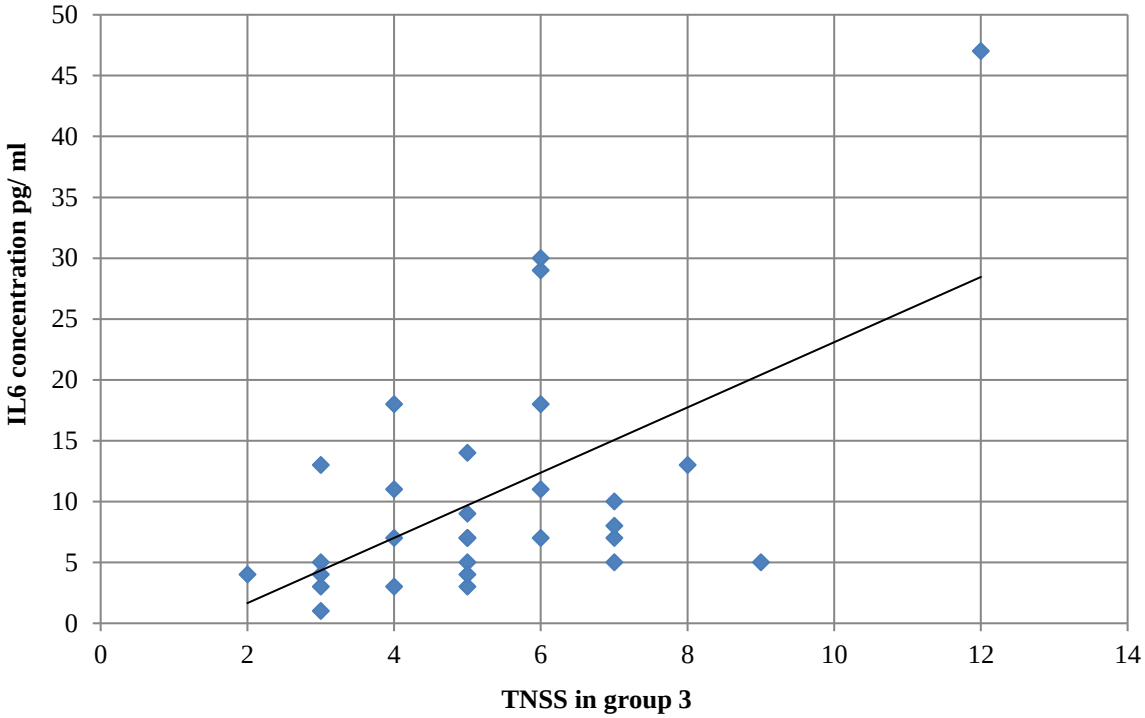

Figure 6: correlation between IL6 concentration and TNSS in group 3, r = 0.450, P=0

4. Conclusions

To summarize, laser acupuncture can be utilized as a substitutive therapy or even as an adjunctive therapy for non-allergic rhinitis.

Recommendations

- More studies should be carried out with a larger sample size with longer follow up to confirm its effectiveness, especially incompliant patient to conventional medical therapy which may achieve better symptom improvement.
- More accurate measurement tools like imaging study in addition to inflammatory biomarkers, should be taken into account and highlighted in the next studies to make the evidence more powerful.

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