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Effect of Transcutaneous Electrical Nerve Stimulation on Patients with Palmar Hyperhidrosis: A Randomized Controlled Trial

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Abstract

Background: Hyperhidrosis is a severe worldwide health concern that may be caused by sympathetic hyperactivity, it seriously lowers the quality of life of patients by interfering with their everyday social and professional activities.

Aim of Study: This study aimed to assess the impact of transcutaneous electrical nerve stimulation (TENS) on the severity of hyperhidrosis and the quality of life in patients with primary palmar hyperhidrosis.

Design: Single-blinded, randomized controlled trial conducted before and after the test.

Setting: Outpatient physiotherapy clinic xxxxx.

Population: Fifty-six patients from both genders aged from 18 to 30 years old and suffered from bilateral primary palmar hyperhidrosis.

Material and Methods: The participants were divided into two equal groups, A and B, at random. For two weeks of treatment, 10 sessions, five times a week, of transcutaneous electrical nerve stimulation (TENS) and relaxation breathing exercises were administered to study group (A) and for two weeks, the control group (B) received five times a week for ten treatment sessions, during which time they were only taught relaxation breathing exercises. The starch-iodine test was used to evaluate the patients' progress both before and after treatment to measure hyperhidrosis severity by colorimetric measurement and dermatology life quality index (DLQI) to measure the quality of dermatology life. It was started in June 2023 and was finished in May 2024.

Results: After treatment, a comparison between the study group and the control group revealed that the study group had significantly lower DLQI scores (p=0.0001) and a statistically significant decrease in iodine starch (p=0.0001) than the control group.

Conclusion: For patients with primary palmar hyperhidrosis, transcutaneous electrical nerve stimulation (TENS) is thought to be a useful technique for lessening the intensity of their sweating and enhancing their quality of life. Clinical Rehabilitation Impact It is thought that TENS may be a beneficial technique to incorporate into patients' rehabilitation regimens with primary palmar hyperhidrosis.

Key Words: *Transcutaneous Electrical Nerve Stimulation (TENS) – Primary Palmar Hyperhidrosis – Quality of dermatology life.*

Introduction

HYPERHIDROSIS (HH) is an excessive sweating that exceeds physiological demand. It has been linked to a complicated autonomic nerve system dysfunction and neural abnormalities in the central or peripheral nervous systems **[1].**

Which could account for the dysfunction in sweating as well as undiagnosed changes in the control of cutaneous blood flow **[2].**

The primary sweat glands in the human body, also known as merocrine glands, are present in al-

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Abbreviations:

BMI : Body mass index.
DBR : Deep breathing relaxation.
DLQI : Dermatology life quality index.
GI : Gastrointestinal.
HH : Hyperhidrosis.
MTI : Modern university for technology and information.
PPH : Primary palmar hyperhidrosis.
SNS : Sympathetic nerve system.
TENS : Transcutaneous electrical nerve stimulation.

most every skin type. The density of these glands is highest in the palm and soles, followed by the head, but it is significantly lower in the torso and the extremities, They are comparatively rare in other mammals, mostly found on hairless surfaces like the pads of the feet and When they are at their most developed in humans, their density can reach 200–400/cm^ of skin surface [3].

The sweat pore serves as the eccrine gland's opening. Columnar or cuboidal epithelial cells arranged in two concentric layers form the coiled portion [4].

In order to provide cooling through water evaporation of sweat secreted by the glands on the skin and emotionally induced sweating (pain, stress, anxiety, and fear), eccrine glands play an important role in thermoregulation. Salt concentration rises due to evaporation, which results in white sediment in otherwise colorless eccrine secretions, sweat odors originate from bacterial activity on the secretions of the apocrine sweat glands, which are a distinct type of sweat gland present in human skin. Only the sympathetic nervous system provides innervation to eccrine glands [5]. Hyperhidrosis may manifest as either a primary or secondary illness, the majority of instances of primary hyperhidrosis (PHH) are symmetric, bilateral, and focal. Usually starting in childhood or around puberty, symptoms manifest. It mostly affects the face, scalp, palms, soles, and axillae. Primary hyperhidrosis has been reported to affect both genders at a rate of 0.6% to 2.8% [6].

It has been found that the prevalence of primary hyperhidrosis estimated as 4.8% of American population or 15.8 million people from both genders [7].

Sweating is an essential physiological function. On the other hand, excessive perspiration, or hyperhidrosis, can seriously distress an individual [8,9].

The causes of generalized hyperhidrosis, which affects the entire body, include infections, endocrine disorders and changes (hyperthyroidism, hyperpituitarism, diabetes, menopause and pregnancy, pheochromocytoma, carcinoid syndrome, acromegaly), neurological disorders (like parkinsonism) [8], malignancies like myeloproliferative syndromes, Hodgkin's disease), medication (like antidepressants), intoxication, and withdrawal of alcohol or other substances [9]. The development of primary focal hyperhidrosis occurs "idiopathically" in otherwise healthy individuals. Puberty is primarily when it starts. Roughly 3% of people are suffering overall [9].

Neural abnormalities in the central or peripheral nervous systems cause secondary focal hyperhidrosis. Neuropathies, such as diabetic neuropathy, are examples of peripheral causes [1]. In actuality, patients with PHH exhibit sympathetic over-function, exhibiting stronger sympathetic skin responses and reduced reflex responding with valsalva technique, bradycardia. Acetylcholine is a neurotransmitter that the sympathetic nervous system uses to activate muscarinic M3 postganglionic receptors in order to innervate eccrine sweat glands [10].

A recent study found that PPH had anxiety and depression rates that were up to 60.0% and 49.6%, respectively, higher than those of the general population [11].

Transcutaneous electrical nerve stimulation (TENS) is one of the non-pharmacological treatment modalities that can be used therapeutically to enhance the sympatho-vagal balance and reduce sympathetic excitation [12,13].

It is useful in lowering sympathetic activity in both cardiovascular disease patients and healthy individuals. In individuals in good health, sympathetic activity declines [14]. When administered on the paravertebral ganglion region in hypertensive patients, low-frequency TENS reduces sympathetic nervous system activity and increases parasympathetic nervous system activity, while high-frequency TENS increases diastolic blood pressure [12].

The impact of transcutaneous nerve stimulation on the severity of hyperhidrosis is a topic of controversy. There have been reports of successful use of transcutaneous nerve stimulation to treat reflex sympathetic dystrophy [12].

Transcutaneous nerve stimulation has also been shown not to affect certain autonomic variables (cutaneous temperature, pulse rate, blood pressure, pupil size, or skin impedance), according to contradictory clinical reports. Since sympathetic hyperactivity is the primary cause of hyperhidrosis, do Amaral Sartori et al., [12] used TENS to lower sympathetic activity.

For the management of primary hyperhidrosis, several therapies have been suggested. Topical therapy, anticholinergic, iontophoresis, botulinum toxin, and surgery are available treatments for hyperhidrosis. Because aluminum salt is believed to obstruct the distal eccrine sweat gland duct, the most popular treatment for mild to moderate hyperhidrosis of the palms and axillae is 20%–25% aluminum chloride in ethanol. Skin irritation often limits its continued use [6].

Accordingto our knowledge, a research on how transcutaneous electrical nerve stimulation affects the degree of hyperhidrosis in individuals with primary palmar hyperhidrosis has not been done. So, we conducted this study to look at how transcutaneous electrical nerve stimulation affects patients with primary palmar hyperhidrosis in terms of quality of life and the severity of their hyperhidrosis to help in the rehabilitation of those patients.

Material and Methods

This study aimed to determine how transcutaneous electrical nerve stimulation affected the degree of hyperhidrosis and the patients' quality of life in those who had primary palmar hyperhidrosis. Designed as Single-blinded, randomized controlled trial conducted before and after the test and setting was outpatient physiotherapy clinic xxxxx. It was started in June 2023 and was finished in May 2024.

Randomization:

Using the computer-generated randomization block, two groups of participants were randomly selected. Four and eight block sizes were used to prevent bias and guarantee group balance.

To ensure the confidentiality of the allocation, the randomization codes were stored in opaque sealed envelopes bearing sequential numbers. The treatment was given by the blinded researcher following their opening of the sealed, opaque envelope.

A randomized procedure was employed by the researcher, who was visually impaired and did not participate in the data collection process.

Researcher who was blinded, gathered the data without knowing the allocation step. They was blinded then analyzed and interpreted the data. The research trial's flow chart is shown in Fig. (1).

Out of the sixty enrolled participants, four were eliminated due to their refusal to finish. Two groups of twenty-eight patients each were randomly assigned to 56 participants.

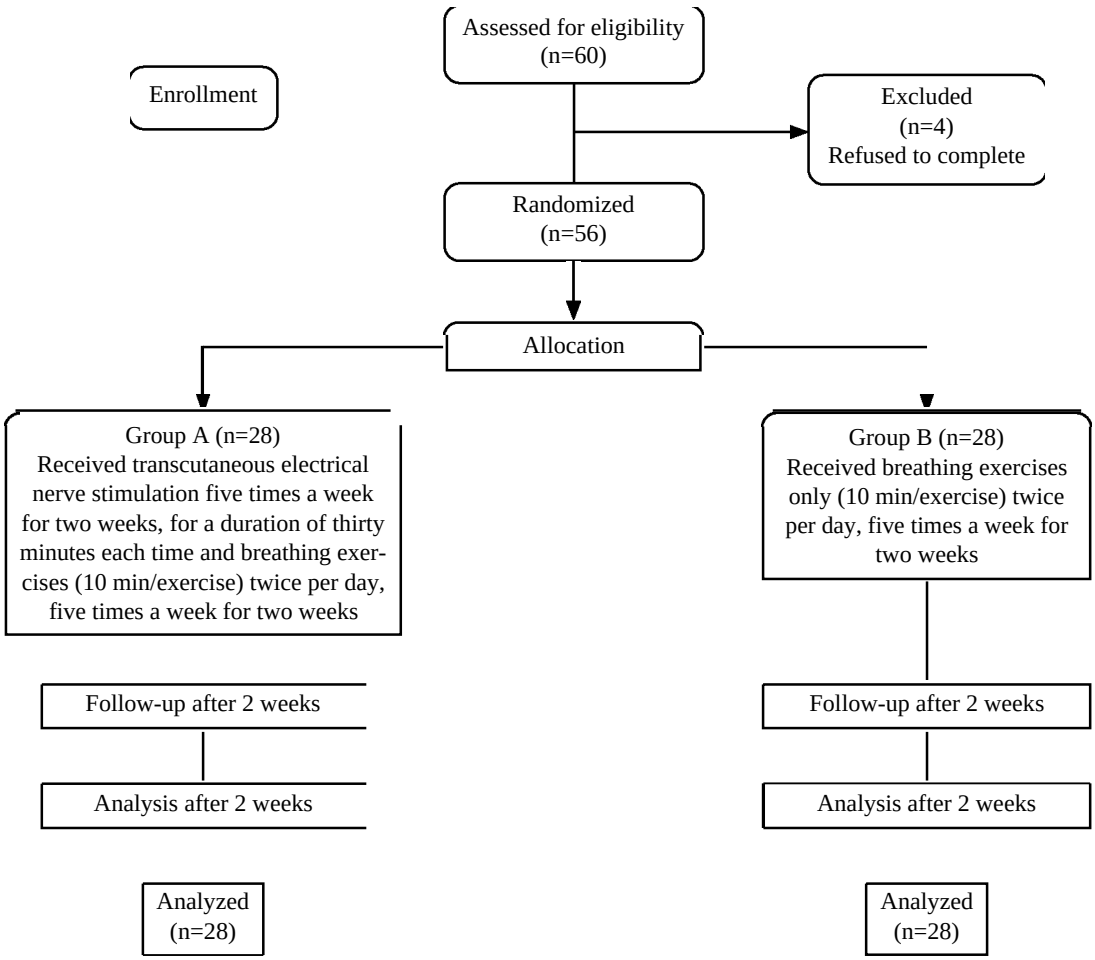

Fig. (1): Consort flow chart for this research.

Participants:

Prospective parallel randomized controlled trial with single-blinding (assessor) between the pre- and post-tests. This study involved 56 patients of both sexes, ranging in age from 18-30 years old, from June 2023 to May 2024 in the physiotherapy clinic xxxxx. A unique ethical number was assigned by Cairo University, Faculty of Physical Therapy, Research Ethics Committee (P.T.REC/xxxxx) to this study. An additional unique figure comes from the Clinical Trials Registry, or the Registry for short ID: NCT xxxxx.

Participants in this study were limited to those who satisfied the criteria for primary palmar hyperhidrosis, which included the inclusion criteria **[12,13,15]:**

- Subjects with The age range covered 18–30 years old.
- Subjects originated in both sexes.
- The body mass index of the subjects varied from 18.5 to 24.9 Kg/m^2.
- Participants experienced bilateral primary palmar hyperhidrosis.
- Subjects who did not receive treatment one month ago.

Patients who were rejected from the study if they were under the exclusion criteria **[14,16,17]:**

- Subjects outside the target range.
- Individuals carrying metal implants, like pacemakers.
- Individuals who were nursing or pregnant.
- Participants with ischemic heart disease or arrhythmias in the past.
- Individuals with any other illnesses that might contribute to secondary hyperhidrosis.
- Post traumatic patients.
- Patients who had chemotherapy or radiotherapy.

Outcome measures:

The study's results were measured both prior to the start of the treatment program and ten study sessions later. Measures of outcome were severity of hyperhidrosis by starch-iodine test via colorimetric measurement, the dermatology life quality index's (DLQI) measure of life quality.

Instrumentations and Tools:

Tools for assessment:

Starch-iodine test:

This test was used to evaluate colorimetric measurement of patients **[20].** When more specialized diagnostic testing is needed or in hospitals with limited technical resources, the starch-iodine test is a valid and reliable alternative. Even for patients who are aware of what to anticipate, the starch-iodine test is a simple procedure to administer and interpret **[20].**

The life quality index (DLQI) for dermatology:

In order to gauge the extent to which the skin condition has impacted the patient's life over the past week, the questionnaire was given to the patients **[21].** An easy-to-use, validated self-administered survey is the Dermatology Life Quality Index (DLQI). This series of questions addresses symptoms and feelings, daily activities, leisure, work and school, interpersonal relationships, and treatment. Based on their experiences during the previous week, patients respond. Their responses are scored on a range of 0 to 3. Increased scores signify a more substantial effect on the patient's standard of living. The overall result can be between 0 and 30 **[21].**

Tools for treatment:

TENS stands for Electrical Nerve Stimulation through Transcutaneous Apparatus TENS was applied using gymnauniphy N.V. Pasweg 6A, 3740 Bilzen, Belgium, SN 69968.

Fig. (2): Transcutaneous Electrical Nerve Stimulation unit.

Procedures:

All subjects were informed by the nature of the study, its possible risks read and signed a consent form. All personal data, past medical history were collected before the commencement of the study. Prior to and following the ten sessions of the treatment program, patients underwent assessments.

Assessment of severity of palmar hyperhidrosis:

Via the colorimetric measurement by starch-iodine test.

After washing and drying both hands, the subjects were instructed to spray starch powder and apply a 2% iodine solution to their palms Fig. (3). The degree of sweating determined how the starch-iodine test result was graded [22]. Values were presented as number (%) or mean ± standard deviation using the Intensity Visual Scale. Test using starch and iodine: Grade 1 is no reaction, Grade 2 is mild discoloration, Grade 3 is moderate discoloration, and grade 4 is severe discoloration.

Fig. (3): Assessment of severity of palmar hyperhidrosis by Starch-iodine test.

Evaluation of one's own life quality:

Patients filled out a dermatology life quality index (DLQI) to indicate how much their skin condition has affected their quality of life over the last week. Without requiring a thorough explanation, patients were asked to complete it. Typically, it takes one or two minutes to complete [21].

Ranking:

The following was the scoring system for each question:

- Really, very much third place.
- Scores for: A lot (2 points) A little (1 point) Not at all (0 points) Not relevant (0 points).
- Question 7: I was unable to work or study. 3 points.
- Each question's score was added up to determine the DLQI, which has a minimum of 0 and a maximum of 30. A higher score indicates a greater impairment to one's quality of life.

Interventions:

Study group received (TENS) and breathing exercise for relaxation, control group received breathing exercises for relaxation only. Frequency of sessions for both groups was ten sessions, or five times a week for two weeks, was required.

Group (A): This group received TENS and breathing exercises.

The disk electrodes of TENS (10mm in diameter) it was applied bilaterally, to the dorsal (anode) and volar (cathode) sides of the hand. Between the first and second metacarpal bones, there is a positive lead on the web, and the negative lead over the hand's ulnar edge. This placement stimulates the radial and ulnar nerves, which supply all of the sympathetic fibers to the hand and digits [21].

The subjects were informed that they would experience a "tapping sensation" and that the current would be delivered at a sensory level intensity, adjusting every five minutes based on each subject's tolerance threshold. However, there would be no reported pain or motor contraction [12].

The subjects were placed in a calm, semi-darkened room with air conditioning and a regulated 21°–24°C temperature range while they lay supine. Every subject's skin temperature was higher than 31.5°C. During the procedure, the subjects were told not to close their eyes, talk, cough, sigh, laugh, or move their heads. They were also told not to go to sleep. The low frequency of the band fast filters was set to 4 Hz [12].

Between 0.5 and 1mV was the sensitivity. The skin was stimulated with a TENS unit gymnauniphy N.V. Pasweg 6A, 3740 Bilzen, Belgium, for 0.1ms at a 30mA intensity, SN 69968. To prevent habituation, five stimuli totaling one electrical pulse were given at random intervals of 20–25 seconds [15].

After that, patients were given diaphragmatic breathing exercises technique [23]. Participants in that technique must contract their diaphragm while inhaling and exhaling slowly [24]. Patients were instructed to take regular and gentle breaths in. For some, counting steadily from 1 to 5. Patients might initially be unable to reach 5. If he/she found this helpful, then let it flow out gently and count from 1 to 5 once more. The patient was allowed to breathe

as deeply into his/her belly as feels comfortable for at least five minutes without pushing it [25].

Group (B): This group received breathing exercises as mentioned before in group (A) only (10 min / exercise) For a period of two weeks, twice daily and five times weekly [25,26].

Sample size:

The G*POWER statistical program (version 3.1.9.2; Franz Faul, Universitat Kiel, Germany) is used to calculate sample size. Expecting large difference between groupsbased on the results reported by do Amaral Sartori et al. [12], and found that 56 participants, 28 in each of two equal groups made up of men and women, were needed for the study's sample size. $\alpha = 0.05$, power = 80%, and effect size = 0.8 are used in the calculation.

Examining statistics:

The homogeneity of variance and normalcy assumption tests were applied to the data. After removing outliers found by box and whisker plots, the data was found to be normally distributed ($p>0.05$) using the Shapiro-Wilk test for normality of data. Furthermore, no significant difference ($p>0.05$) was found using Levene's test to assess the homogeneity of variance. These results all made parametric and non-parametric analysis possible. The data are analyzed parametrically and have a normal distribution.

The statistical SPSS Package application version 25 for Windows was used to perform the statistical analysis (SPSS, Inc., Chicago, IL). Gender categorical data are expressed as number and percentage, while age, weight, height, BMI, iodine starch, and DLQI scores are expressed numerically as mean and standard deviation. Iodine starch and DLQI scores were compared before and after treatment in Group A and Group B using a paired *t*-test. Age, weight, height, BMI, iodine starch, and DLQI scores were compared between Group A and Group B before and after treatment using an independent (unpaired) *t*-test. The gender variable was compared between Group A and Group B using the Chi-square test. At the significance level ($p<0.05$), all statistical analyses were deemed significant and accepted.

Results

The present investigation comprised 56 patients with primary palmar hyperhidrosis, comprising 18 female participants and 38 male participants. Random assignment was used to divide the patients into two equal groups, each with 28 subjects. Table (1) shows that there were no significant differences ($p>0.05$) in the patients' age ($p=0.160$), weight ($P=0.985$), height ($p=0.656$), BMI ($p=0.480$), gender ($p=0.567$), or BMI ($p=0.480$) between Group A and Group B.

Table (1): General features of the patient.

Items	Groups		*p*-value
	Group A (n=28)	Group B (n=28)	
Age (year)	21.82±1.70	20.68±1.74	0.160
Weight (kg)	73.14±8.35	73.11±5.15	0.985
Height (cm)	170.25±7.36	169.50±4.92	0.656
BMI (kg/m^2)	25.16±1.63	25.42±1.10	0.480
Gender	18 (64.30%) :	20 (71.40%) :	0.567
(Males : Females)	10 (35.70%)	8 (28.60%)	

The independent *t*-test is used to compare numerical data, which are expressed as mean ± standard deviation and include age, weight, height, and BMI. Chi-square test is used to compare gender-related categorical data, which are expressed as numbers or percentages.

p-value: Probability value.

$p>0.05$: Non-significant.

Groups A and B had significantly ($p<0.05$) lower iodine starch levels after treatment than before ($p=0.0001$) and $p=0.001$, respectively, according to pairwise comparison tests (time effect) for the iodine starch and DLQI scores variables. Furthermore, within Groups (A) ($p=0.0001$) and (B) ($p=0.001$), the time effect had significantly ($p<0.05$) reduced DLQI scores after treatment compared to before treatment. Following treatment, patients in Group (A) experienced significantly lower iodine starch and DLQI scores than those in Group (B).

Before treatment, there were no significant differences ($p>0.05$) between Group (A) and Group (B) for DLQI scores ($p=0.220$) and iodine starch ($p=0.830$) between the two groups, according to pairwise comparison tests (group effect) for these variables (Table 2). However, following treatment, there were notable variations ($p<0.05$) in the DLQI scores ($p=0.001$) and iodine starch ($p=0.0001$) between Groups A and B. Furthermore, patients with primary palmar hyperhidrosis in group (A) have benefited more from this substantial post-treatment decrease in iodine starch and DLQI scores than do patients in group (B).

Table (2): Comparison of the DLQI scores and iodine starch variables within and between groups.

Variables	Items	Groups		Change	*p*-value
		Group A (n=28)	Group B (n=28)		
Iodine starch	Before-treatment	214.64±23.59	215.68±17.55	1.04	0.830
	After-treatment	194.93±27.04	203.46±17.99	8.53	0.0001*
	MD (Change)	19.71	12.22		
	95% CI	15.04 – 24.38	4.72 – 29.16		
	Improvement %	9.18%	5.67%		
	p-value	0.0001*	0.001*		
DLQI scores	Before-treatment	18.07 ±3.97	19.43±4.74	1.36	0.220
	After-treatment	14.11 ±4.34	17.82±4.63	3.71	0.001*
	Change	3.96	1.61		
	95% CI	2.76 – 5.16	1.85 – 5.07		
	Improvement %	21.91%	8.29%		
	p-value	0.0001*	0.001*		

In data, the mean ± standard deviation (SD) is used.
MD: Mean difference.
CI: Confidence interval.
p-value: Probability value.
* Significant ($p<0.05$).

Discussion

The non-pharmacological treatment modality known as transcutaneous electrical nerve stimulation (TENS) is described that may be used therapeutically to improve the sympatho-vagal balance and lessen sympathetic excitation under various clinical circumstances **[13]**. Hyperhidrosis (HH) has been linked to a complicated autonomic nerve system dysfunction, which could account for the dysfunction in sweating as well as undiagnosed changes in the control of cutaneous blood flow **[2]**. Sympathetic over-function, exhibiting stronger sympathetic skin responses and reduced reflex responding with the Valsalva maneuver, bradycardia **[10]**. An imbalance in the sympathetic and parasympathetic nervous systems has been closely linked to a number of illnesses; one of them is primary palmar hyperhidrosis **[10]**. Causes of primary hyperhidrosis are many and summarized in sympathetic hyperactivity **[17]**. The purpose of this research was to determine how TENS affected patients with primary palmar hyperhidrosis in terms of both quality of life and hyperhidrosis severity.

The study's findings demonstrated that group A and group B's outcomes differed statistically significantly. Group A who received transcutaneous electrical nerve stimulation and breathing exercises demonstrated greater improvement in the quality of life related to dermatology and a greater reduction in the severity of hyperhidrosis compared to group B, which underwent two weeks of treatment with 10 sessions, five times a week, and breathing exercises only (p=0.0001).

The effect of deep breathing exercises may be the reason for group (B)'s improvement, causingincrease in lung ventilation and blood oxygen level. Also, deep breathing exercises can potentially activate the vagus nerve leading to lowering sympathetic activity **[24]**.

The possible explanation of more improvement in Group (A) maybe due to the combined effect of TENS and deep breathing exercises.

It's thought that, TENS can improve the sympatho-vagal balance and lessen sympathetic excitation n in patients with sympathetic disorders **[14]**.

TENS is a convenient and accessible treatment option for individuals seeking relief from the challenges of primary palmar hyperhidrosis. With fewer side effects compared to surgical interventions or medications, TENS offers a safer alternative. Its ability to reduce sweating while positively impacting mental and emotional health makes it a valuable tool in managing this condition effectively.

The findings of this investigation matched up with studies like the study conducted by do Amaral Sartori et al. **[12]**, who looked into how transcutaneous electrical nerve stimulation affected hypertensive patients' autonomic nervous systems. The study showed that in hypertensive patients, high-frequency TENS raises diastolic blood pres-

sure and applying low-frequency TENS to the paravertebral ganglion region causes an increase in parasympathetic nervous system activity and a decrease in sympathetic nervous system activity.

Also, another study agreed with these results as Sallam et al., *[13]*, who looked into how transcutaneous electrical nerve stimulation affected the upper gastrointestinal (GI) symptoms in scleroderma patients, According to their findings, using TENS dramatically improved physical functioning, diminished gastric discomfort and rectified the sympathetic nervous system.

In the same line, another research was conducted by Okuyucu et al., *[15]*, who looked into how transcutaneous nerve stimulation affected the sympathetic nervous system (SNS) by measuring the sympathetic skin response and discovered that, in contrast to a fake TENS control group, TENS inhibits SNS responses that are elicited. Along these same lines, Stein, Dal Lago, conducted another study *[14]*, who investigated how different frequencies of transcutaneous electrical nerve stimulation affected the variability of heart rate in individuals in good health. They concluded that Transcutaneous Electrical Nerve Stimulation (TENS) is a potential therapeutic strategy that can be used in various clinical settings to improve the sympatho-vagal balance and lessen sympathetic excess. There is a frequency-dependent modulation of both parasympathetic and sympathetic activity by TENS.

Moreover, Deuchars et al., *[16]*, examined the mechanisms underlying sympathetic nervous system activity and how transcutaneous vagus nerve stimulation is used to modulate it, and shown thatincreased parasympathetic activity and decreased sympathetic activity have been shown with non-invasive stimulation of the tragus of the ear. Additionally, a correlation between the extent of this effect and the subjects' baseline cardiovascular parameters has been shown. It is possible that the effects are caused by activation of the vagus nerve's afferent branch and additional sensory nerves nearby. This implies that tragus stimulation may function as a therapeutic modality for conditions affecting the heart's autonomic activity.

In addition, Clancy et al., *[27]*, were concerned on healthy individuals, non-invasive vagus nerve stimulation and they founded that TENS has the ability to decrease sympathetic nerve outflow, which is advantageous in diseases like heart failure that are marked by increased sympathetic nerve activity.

Conversely,a study carried out by John and colleagues *[18]*, who investigated how experimental pain and the sympathetic nervous system response were affected by transcutaneous electrical nerve stimulation (SNS). They came to the conclusion that TENS did not affect the shock stimuli's pain intensity ratings, and that neither the 20-minute TENS treatment period nor the shock anticipation periods saw any differences in the three TENS conditions' capacity to influence SNS responses.

Another study disagreed with our results conducted by Lazarou et al., *[19]*, who investigated the impact of transcutaneous electrical nerve stimulation intensity on blood pressure and pain threshold in healthy individuals. They found that over a 30-minute period following stimulation, In comparison to the low-intensity, placebo, and control groups at both measurement sites, the high-intensity group showed a statistically significant increase in pressure pain threshold. Blood pressure was not significantly affected by TENS, irrespective of its intensity. It appears that TENS intensity has no effect on resting blood pressure.

Limitation:

There are certain limitations to the current study even though it offers objective data with statistically significant differences. Study has a brief duration, the sample size was small, and the study's generalizability is restricted to a single clinic. So, to find out how TENS affects patients with primary palmar hyperhidrosis over the long term, more researches are needed to be done.

Conclusion:

This study findings reported improvement in severity of sweating and quality of life in patients with primary palmar hyperhidrosis in both groups with more improvement in the group who received TENS and breathing exercises.

Transcutaneous Electrical Nerve Stimulation (TENS) has been shown to effectively reduce the intensity of sweating in individuals with primary palmar hyperhidrosis.

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تأثير التحفيز الكهربائى للعصب عبر الجلد على مرضى فرط التعرق لليدين

الخلفيـة: مـرض فـرط التعـرق لليديـن هـو مشـكلة صحيـة خطيـرة علـى مسـتوى العالـم قـد تكـون ناتجـة عـن النشـاط المفـرط للجهـاز العصبـى السـيمبثاوى، ويؤثـر بشـكل كبيـر علـى جـودة حيـاة المرضـى مـن خـلال التأثيـر علـى أنشـطتهم الاجتماعيـة والمهنيـة اليوميـة.

الهـدف: كان الغـرض مـن هـذه الدراسـة هـو تحديـد كيـف تؤثـر التحفيـز الكهربائـى العصبـى عبـر الجلـد علـى درجـة التعـرق المفـرط وجـودة حيـاة المرضـى الذيـن يعانـون مـن التعـرق المفـرط الأساسـى فـى راحـة اليـد.

التصميم : دراسة تجريبية عشوائية أحادية التعمية أُجريت قبل وبعد الاختبار.

الإعداد: عيادة العلاج الطبيعى للمرضى الخارجيين بالجامعة الحديثة للتكنولوجيا والمعلومات.

العينـه: سـتة وخمسـون مريضـاً مـن كلا الجنسـين تتـراوح أعمارهـم بـين ١٨ و٣٠ عامـاً، وكانـوا يعانـون مـن التعـرق المفـرط الأساسـى الثنائـى فـى راحـة اليـد.

الطـرق : تم تقسـيم المشـاركين عشـوائيًا إلـى مجموعتـين متسـاويتين. المجموعـة (أ) (مجموعـة الدراسـة): تلقـت لمـدة أسـبوعين مـن العـلاج عشـر جلسـات مـن التحفيـز الكهربائـى العصبـى عبـر الجلـد (TENS) وتمارين التنفـس الاسـترخائى، خمـس مـرات فـى الأسـبوع. المجموعـة (ب) (مجموعـة التحكـم): فقـد تلقـت لمـدة أسـبوعين مـن العـلاج أيضـاً خمـس مـرات فـى الأسـبوع لعشـر جلسـات علاجيـة، ولكـن خـلال هـذه الفتـرة تم تعليمهـم فقـط تمارين التنفـس الاسـترخائى. تم اسـتخدام اختبـار النشـاء واليـود لتقييـم تقـدم المرضـى قبـل وبعـد العـلاج لقيـاس شـدة التعـرق المفـرط مـن خـلال القيـاس اللونـى، وكذلـك تم اسـتخدام مؤشـر جـودة حيـاة الجلـد (DLQI) لقيـاس جـودة حيـاة الجلـد.

النتائـج: بعـد العـلاج، أظهـرت المقارنـة بـين المجموعـة الدراسـة والمجموعـة التحكـم أن المجموعـة الدراسـة سـجلت درجـات DLQI أقـل بشـكل ملحـوظ (p=١,٠٠٠) وانخفاضـاً ذا دلالـة إحصائيـة فـي اختبـار النشـاء واليـود (p=١,٠٠٠) مقارنـة بالمجموعـة التحكـم.

الاسـتنتاج: بالنسـبة للمرضـى الذيـن يعانـون مـن التعـرق المفـرط الأساسـى فـى راحـة اليـد، يُعتقـد أن التحفيـز الكهربائـى العصبـى عبـر الجلـد (TENS) هـو تقنيـة مفيـدة لتقليـل شـدة التعـرق وتحسـين جـودة حياتهـم.

تأثيـر إعـادة التأهيـل السـريرى : يُعتقـد أن جهـاز التحفيـز الكهربائـى للأعصـاب عبـر الجلـد (TENS) قـد يكـون تقنيـة مفيـدة يمكـن إدراجهـا فـى برامـج إعـادة التأهيـل للمرضـى الذيـن يعانـون مـن فـرط التعـرق الأولـى فـى راحـة اليـد.

الخصائص العامة للمرضى:

المجموعة (أ): تم تضمين ثمانية وعشرين من الذكور والإناث يعانون من فرط التعرق الأولى فى راحة اليد فى هذه المجموعة. كان متوسط العمر يتراوح من ١٨ إلى ٣٠ عامًا والوزن يتراوح من ١٨,٥إلى ٢٤,٩ كجم/م^2، ويعانون من مرض فرط التعرق الأولى فى كلتا اليدين، وقد تلقوا التحفيز الكهربائى للأعصاب عبر الجلد TENS مع تمارين التنفس للاسترخاء. تم تطبيق جهاز TENS لمدة ٣٠ دقيقة فى كل مرة، خمس مرات فى الأسبوع، لمدة أسبوعين، وتمارين التنفس العميق الاسترخاء مرتين يوميًا (١٠ دقائق/التمرين) لمدة أسبوعين.

المجموعة (ب): تم تضمين ثمانية وعشرين من الذكور والإناث يعانون من فرط التعرق الأولى فى راحة اليد فى هذه المجموعة. كان متوسط العمر يتراوح من ١٨ إلى ٣٠ عامًا والوزن يتراوح من ١٨,٥ إلى ٢٤,٩ كجم/م^2، ويعانون من مرض فرط التعرق الأولى فى كلتا اليدين، وقد تلقوا تمارين التنفس للاسترخاء فقط مرتين يوميًا (١٠ دقائق/التمرين) لمدة أسبوعين.

الخلاصة: تم الاستنتاج أن جهاز التحفيز الكهربائى للأعصاب عبر الجلد (TENS) فعال فى تقليل شدة التعرق وتحسين جودة الحياة لدى المرضى الذين يعانون من فرط التعرق الأولى فى راحة اليد.

توصيات البحث: أظهرت نتائج الدراسة الحالية ضرورة النظر فى التوصيات التالية:

- يجب إجراء البحث على عينة أكبر.
- هناك حاجة إلى دراسات إضافية لمتابعة المرضى بعد فترة طويلة من العلاج.
- قد تساعد هذه النتائج أخصائى العلاج الطبيعى فى إعداد برنامج إعادة التأهيل للمرضى الذين يعانون من فرط التعرق الأولى فى راحة اليد.