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Case study

"Clinical Outcomes of Electroacupuncture in the Treatment of Diabetic Peripheral Neuropathy: A Case Series"

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ABSTRACT

This case series evaluates the impact of electroacupuncture on diabetic peripheral neuropathy (DPN) in three patients with long-standing type 2 diabetes. All patients presented at the International Institute of Yoga and Naturopathy Medical Sciences, Chengalpattu, between July and August 2024, with symptoms such as burning sensations, tingling, gait instability, and asymmetric foot discomfort. Clinical assessments revealed impaired protective sensation, elevated vibration perception thresholds, and reduced hot and cold discrimination, consistent with DPN. Glycemic control varied, with HbA1C levels ranging from 7.5% to 8.9%. The intervention involved a 24-day electroacupuncture protocol targeting specific points related to the tibial and sural nerves. Each session lasted 20 minutes, with electrical stimulation alternating between the lateral and medial aspects of the leg. Outcomes indicated significant improvements in protective sensation across all cases, while vibration and heat perception thresholds improved in most patients. However, cold perception thresholds showed mixed results. The findings suggest that electroacupuncture can enhance sensory function and reduce neuropathic symptoms in DPN, potentially lowering the risk of diabetes-related foot complications.This study demonstrates that electroacupuncture is a promising adjunct therapy for DPN management, emphasizing the need for regular monitoring and early intervention to improve patient outcomes.

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Introduction

Diabetes mellitus (DM) is a long-term metabolic condition marked by high blood sugar levels. It can result from inadequate insulin secretion, resistance to the effects of insulin in peripheral tissues, or a combination of both [1]. Diabetic peripheral neuropathy (DPN) is the most common form of neuropathy globally, with its prevalence rising as the duration of diabetes increases. It affects nearly 50% of individuals with diabetes DPN is characterized by symmetric and primarily sensory involvement, beginning in the distal extremities and progressively advancing proximally in a glove-and-stocking pattern.

It leads to significant morbidity and is linked to higher mortality rates [2].In a 2019 study conducted in rural South India, the prevalence of DPN was found to be 39.3%, with 28.9% of males and 10.4% of females affected. Of the 336 participants, 202 (60.1%) were male and 134 (39.9%) were female. Among other key findings, 264 participants (78.6%) had Glycated Hemoglobin (HbA1c) levels greater than 7, 205 (61%) reported experiencing a burning sensation in their feet, 124 (36.9%) had foot numbness, nearly half experienced a pricking sensation, and more than one-third (130) had calluses on their feet [3].

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Persistent hyperglycemia, often due to poorly controlled diabetes, can damage multiple organs and result in chronic complications. These complications can lead to physical or mental disabilities, diminished quality of life, and, in severe cases, death. One of the most frequent complications of diabetes is diabetic foot [4].

Hyperglycemia triggers glucose autooxidation, leading to nerve demyelination and inflammation by stimulating monocytes and endothelial cells. This process activates signaling pathways, including Nuclear Factor kappa B1 (NF-kB), and increases cytokine production (e.g., TNF-α, IL-1β, IL-2, IL-6, IL-18), as well as the release of reactive oxygen species (ROS). These effects contribute to chronic low-grade inflammation, oxidative stress, and neuronal damage [5].

The global rise in diabetes cases, driven by lifestyle changes and aging populations, has led to an increased burden of DPN, highlighting the need for effective management strategies.Pharmacological treatments for DPN, such as anticonvulsants, antidepressants, and opioids, offer pain relief but can cause significant side effects. They often do not stop disease progression and may lead to dependence and reduced quality of life [6].

Non-pharmacological approaches, such as lifestyle changes, physical therapy, and alternative therapies like acupuncture and electroacupuncture, offer complementary management for DPN. Electroacupuncture, which combines electrical stimulation with acupuncture, is noted for potentially improving nerve regeneration, reducing inflammation, and relieving pain by modulating the nervous system. EA treatment also boosts neurotrophin levels in grafts, promoting remyelination and improving functional recovery.

Research indicates that it can stimulate peripheral nerves, enhance blood flow, and boost endogenous opioid release, leading to pain relief and better nerve function [7]. Studies suggest that electroacupuncture

can stimulate peripheral nerves, increase blood flow, and promote the release of endogenous opioids, leading to pain relief and improved nerve function[8].

Integrating pharmacological and non-pharmacological treatments offers a holistic approach to diabetic peripheral neuropathy (DPN), improving outcomes for patients unresponsive to conventional drugs. Electroacupuncture, supported by growing evidence, shows promise as an effective and safe alternative.

The future of DPN management will likely focus on personalized treatment, combining pharmacological and non-pharmacological approaches tailored to each patient's neuropathy profile and treatment response. Ongoing research into electroacupuncture's effects on nerve repair and pain reliefwill help refine protocols, including optimal frequency and duration, and assess long-term benefits[7, 8]. This case series adds to the growing evidence supporting electroacupuncture as a valuable treatment option for DPN.

Case Presentation

All patients were presented with symptoms of diabetic peripheral neuropathy at the International Institute of Yoga and Naturopathy Medical Sciences between July and August 2024. Comprehensive evaluations revealed compromised circulation, impaired sensation, and poor glycemic control (HbA1C 7.5% to 8.9%). This case series highlights the prevalence of diabetic neuropathy and stresses the importance of regular monitoring and early intervention to prevent diabetes-related foot complications across all patients.

Case No 1

A 72-year-old South Asian female, a retired nurse, visited the outpatient department at the International Institute of Yoga and Naturopathy Medical Sciences, Chengalpattu, on August 6, 2024, with the primary concern of a burning sensation in both feet persisting for the past two months. She has a 15-year history of type 2 diabetes mellitus, currently managed with allopathic treatment. Recent laboratory tests indicated poorly controlled diabetes, with a fasting blood sugar of 157 mg/dl, postprandial blood sugar of 256 mg/dl, and an HbA1C of 8.9%. The patient reported no other notable medical or surgical history, and she has no known habits or addictions.

On examination, her vital signs were stable with a blood pressure of 128/82 mmHg, pulse rate of 74 beats per minute, and respiratory rate of 18 breaths per minute. She weighed 82 kg and had a height of 165 cm, resulting in a BMI of 29.97 kg/m^2, classifying her as overweight. Physical examination revealed reduced circulation in the lower limbs. Neurothesiometer (Neuro Touch) evaluation demonstrated significant sensory deficits, including impaired protective sensation, elevated vibration perception thresholds, and diminished hot and cold discrimination. These findings are consistent with peripheral neuropathy secondary to long-standing diabetes and correlate with her reported symptoms of burning sensations in both soles.

The reduced sensory function, combined with decreased blood flow in the lower extremities, indicates an elevated risk for diabetic foot complications, necessitating a comprehensive approach to management and monitoring to prevent further complications.

Case No 2

A 65-year-old South Asian retired Indian railway employee visited the outpatient department of the International Institute of Yoga and Naturopathy Medical Sciences, Chengalpattu, on July 3, 2024, with a one-month history of tingling sensations in both soles and gait instability. He has a 20-year history of type 2 diabetes mellitus, managed with allopathic medication. Recent laboratory tests indicated a fasting blood sugar of 182 mg/dl, postprandial blood sugar of 206 mg/dl, and an HbA1C of 7.5%, suggesting relatively controlled diabetes. The patient denied any other medical or surgical conditions but mentioned a maternal history of diabetes.

He reported no habits or addictions. During the consultation, his vital signs were stable, with a blood pressure of 142/83 mmHg, a pulse rate of 82 beats per minute, and a respiratory rate of 22 cycles per minute. He weighed 70 kg and had a height of 175 cm, resulting in a BMI of 22.86 kg/m^2. He also noted poor appetite and disturbed sleep patterns over the past month. Physical examination revealed reduced peripheral circulation in the lower extremities.

A neurological assessment using a Neurothesiometer (Neuro Touch) demonstrated significant sensory deficits, including impaired protective sensation, elevated vibration perception thresholds, and diminished hot and cold discrimination. These findings are indicative of peripheral neuropathy, a common complication of long-standing diabetes, and correlate with his reported symptoms. The combination of altered sensory function and decreased lower extremity blood flow indicates an elevated risk for diabetic peripheral neuropathy.

Case No 3

On August 26, 2024, a 68-year-old retired engineer visited the International Institute of Yoga and Naturopathy Medical Sciences in Chengalpattu. He presented with asymmetric discomfort in his feet, characterized by a tightness and burning sensation, more pronounced in the right foot. He has been managing type 2 diabetes with conventional medicine for six years. The patient also reported recent sleep disturbances that required pharmaceutical intervention.

Diagnostic tests revealed suboptimal glycemic control, with fasting blood sugar at 167 mg/dl, postprandial blood sugar at 238 mg/dl, and an HbA1C of 7.5%. His vital signs were stable, with a blood pressure of 130/88 mmHg, a pulse rate of 76 beats per minute, and a respiratory rate of 20 breaths per minute. His BMI was 25.76 kg/m^2, based on a weight of 78 kg and a height of 174 cm. Clinical examination indicated compromised peripheral circulation in the lower limbs.

A subsequent neurological evaluation using a Neurothesiometer (Neuro Touch) revealed significant sensory abnormalities, including impaired protective sensation, heightened vibration perception thresholds and reduced thermoreception. These findings, along with the patient's symptoms and compromised circulation, are consistent with diabetic peripheral neuropathy. This condition, associated with suboptimal diabetes management and impaired circulation, suggests an increased risk of diabetes-related foot complications, emphasizing the need for comprehensive management and vigilant monitoring of the patient's condition.

Clinical Findings

In the first case, the significant physical examination findings included reduced peripheral circulation in the lower limbs, indicative of compromised blood flow. The neurological evaluation revealed impaired protective sensation, elevated vibration perception thresholds, and diminished hot and cold discrimination. These clinical findings are suggestive of diabetic peripheral neuropathy, correlating with the patient's burning sensation in both feet and highlighting the increased risk for diabetic foot complications.

In the second case, important clinical findings were reduced peripheral circulation in the lower extremities and significant sensory deficits noted during the neurological evaluation, which included impaired protective sensation, elevated vibration perception thresholds, and diminished hot and cold discrimination. These findings, combined with the patient's history of long-standing diabetes, point to diabetic peripheral neuropathy as the cause of the reported tingling sensations and gait instability.

In the third case, the physical examination revealed compromised peripheral circulation in the lower limbs. Neurological assessment showed significant sensory abnormalities, including impaired protective sensation, heightened vibration perception thresholds, and reduced thermoreception. These findings, along with the asymmetric discomfort and burning sensation more pronounced in the right foot, suggest diabetic peripheral neuropathy with a potential risk for further complications related to diabetes.

Diagnostic Assessment

In the first case, the patient underwent a physical examination (PE), revealing stable vital signs, including a blood pressure of 128/82 mmHg,

a pulse rate of 74 bpm, and a respiratory rate of 18 breaths per minute. Laboratory testing showed poorly controlled diabetes, with fasting blood sugar at 157 mg/dl, postprandial blood sugar at 256 mg/dl, and an HbA1C of 8.9%. The neurothesiometer evaluation indicated significant sensory deficits, including impaired protective sensation and elevated vibration perception thresholds.

Diagnostic challenges such as potential accessibility to follow-up care and monitoring may arise, but no financial or cultural barriers were reported. The diagnosis is diabetic peripheral neuropathy secondary to long-standing diabetes. Other potential diagnoses considered include diabetic foot ulcers due to reduced circulation. The prognosis indicates an increased risk for diabetic foot complications, necessitating careful management and monitoring.

In the second case, the physical examination showed stable vital signs, including blood pressure of 142/83 mmHg and a pulse rate of 82 bpm. Laboratory testing revealed relatively controlled diabetes, with fasting blood sugar at 182 mg/dl, postprandial blood sugar at 206 mg/dl, and an HbA1C of 7.5%. The neurothesiometer assessment indicated significant sensory deficits, correlating with the patient's symptoms.

Diagnostic challenges were not specified, indicating ease of access to testing and treatment. The diagnosis is diabetic peripheral neuropathy. Other diagnoses considered include vascular insufficiency, given the reported gait instability. The prognosis suggests an elevated risk for complications associated with altered sensory function.

In the third case, the patient's physical examination revealed stable vital signs, including blood pressure of 130/88 mmHg. Laboratory testing indicated suboptimal glycemic control, with fasting blood sugar at 167 mg/dl, postprandial blood sugar at 238 mg/dl, and an HbA1C of 7.5%. The neurothesiometer assessment showed significant sensory abnormalities.

Diagnostic challenges are not noted, suggesting no barriers to receiving care. The diagnosis is diabetic peripheral neuropathy. Other considerations include possible complications from peripheral vascular disease. The prognosis indicates an increased risk of diabetes-related foot complications due to compromised circulation and sensory function.

Intervention:

The intervention utilized clinical acupuncture as a therapeutic modality for treating diabetic peripheral neuropathy, specifically targeting the tibial and sural nerves that are often affected by this condition.

The administration of the therapeutic intervention involved electroacupuncture applied to selected acupuncture points: ST36 (Zusanli), UB60 (Kunlun), GB41 (Zulingi), ST44 (Neiting), ST43 (Xiangu), K3 (Taixi), SP6 (Sanyinjiao), and SP9 (Yinlingquan) bilaterally. These points were strategically chosen for their influence on nerve function and blood flow. ST36 is particularly notable for enhancing immune and digestive health and is commonly used in managing complications related to diabetes.

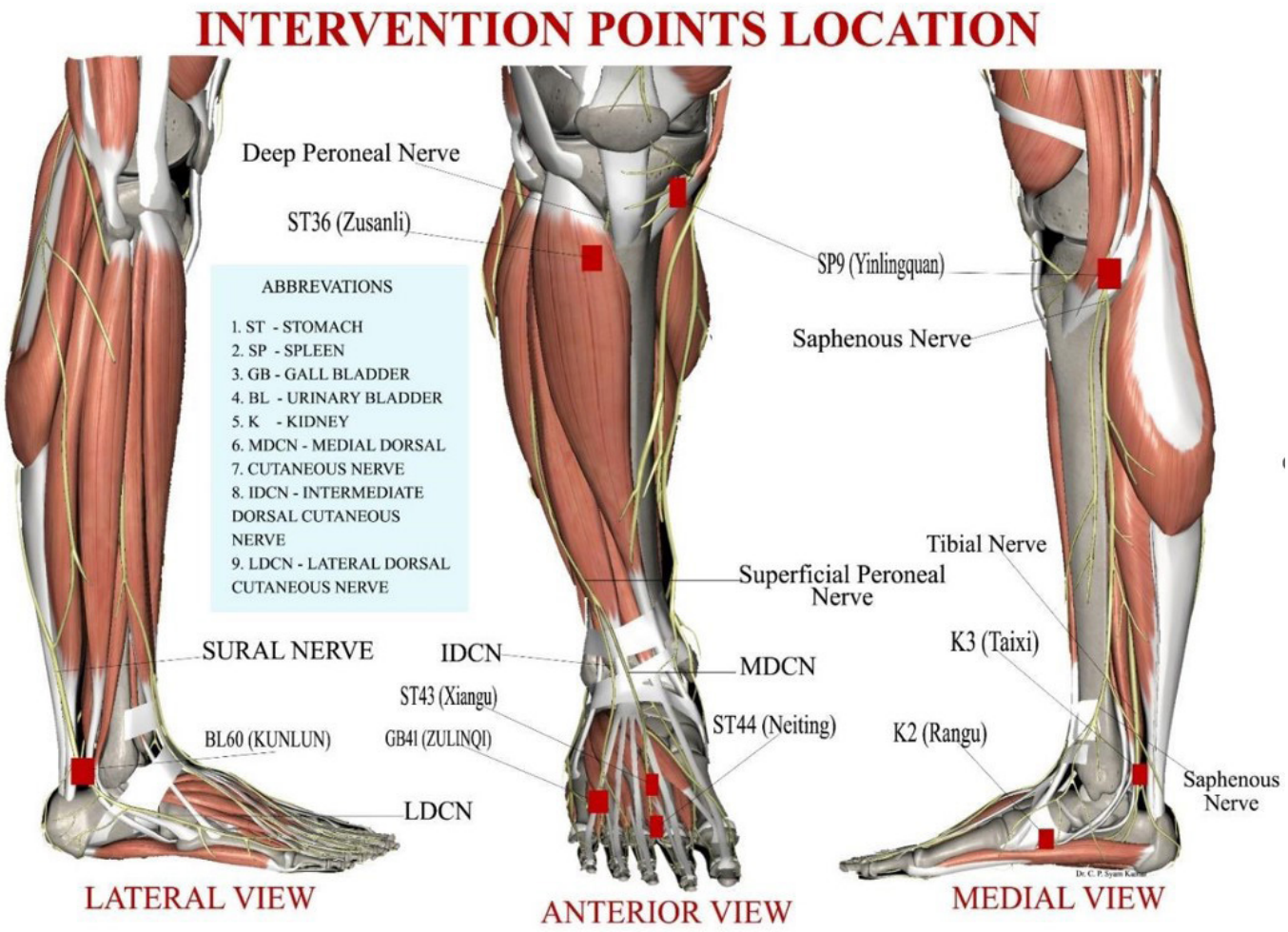
The treatment protocol lasted for 24 days, divided into two phases of 12 days each. In the first phase, electrical stimulation was applied to needles inserted on the lateral aspect of the leg bilaterally, targeting the sural nerve. In the second phase, stimulation was shifted to needles placed on the medial aspect of the leg, focusing on the tibial nerve. Each acupuncture session lasted for 20 minutes, with electrical stimulation frequency set between 1 Hz and 100 Hz. This range allowed for the stimulation of both slow and fast nerve fibers, ensuring comprehensive therapeutic effects for nerve regeneration and symptom relief (Table 1, Figure 1.)

Changes in the therapeutic intervention included the shift in electrical stimulation from the lateral to the medial aspect of the leg after the initial 12 days. This adjustment was made to specifically target the tibial nerve after addressing the sural nerve, maximizing the treatment's efficacy in

Table. 1: Description of Acupuncture Points Used by the Patient.

Needling Point	Location	Depth of Needling	Method of Needling
St – 36 (Zusanli)	Below the knee, 3 cun inferior to the inferolateral angle of the patella, one finger – breadth lateral to the anterior crest of the tibia.	1 – 1.5 cun	Perpendicular
Ub – 60 (Kunlun)	Behind the ankle joint, in the depression between the prominence of the lateral malleolus and the Achilles tendon	0.5 – 1 cun	Perpendicular
Gb – 41 (Zulinqi)	In the depression distal to the junction of the 4th and 5th metatarsal bones, on the lateral side of the tendon of m. extensor digitorum longus.	0.5 – 1 cun	Perpendicular
St – 44 (Neiting)	On the dorsum of the foot, between the second and third toes, 0.5 cun proximal to the margin of the web.	0.5 cun 0.5 – 1 cun	Perpendicular Oblique insertion directed proximally.
St – 43 (Xiangu)	On the dorsum of the foot, between the second and third metatarsal bones, in a depression 1 cun proximal to Neiting	0.5 – 1 cun	Perpendicular or Oblique.
K – 3 (Taixi)	In the depression between the medial malleolus and the Achilles tendon, level with the prominence of the medial malleolus	0.5 – 1 cun	Perpendicular
Sp – 6 (Sanyijiao)	On the medial side of the lower leg, 3 cun superior to the prominence of the medial malleolus, in a depression close to the medial crest of the tibia.	1 – 1.5 cun	Perpendicular or Oblique.
Sp – 9 (Yinlingquan)	On the medial side of the lower leg, in a depression in the angle formed by the medial condyle of the tibia and the posterior border of the tibia.	1 – 1.5 cun	Perpendicular

Figure 1: Detailed visualization of Intervention Point Location



enhancing blood flow and alleviating neuropathic symptoms. Overall, this structured approach aimed to promote the healing of damaged nerves and improve the quality of life for patients suffering from diabetic peripheral neuropathy.

Follow-up and Outcomes: Following the treatment, the evaluation of immediate effects on symptoms and sensory function revealed several key outcomes. Clinician-assessed outcomes demonstrated a steady improvement in Protective Sensation (PS) across all cases. Case 2 exhibited the most significant reduction in PS, decreasing from 23.0 to 9.083, indicating a substantial enhancement in the ability to sense light touch or pressure. Cases 1 and 3 also showed positive changes, with PS decreasing from 14.083 to 8.167 and from 11.833 to 9.67, respectively.

This consistent decline suggests that the intervention likely improved the patients' protective sensations, crucial for preventing injuries.In terms of Important follow-up diagnostic results, Vibration Perception Threshold (VPT) outcomes were mixed. Cases 1 and 3 demonstrated improved sensitivity, with VPT decreasing from 23.167 to 14.667 and from 18.25 to 12.917, respectively. Conversely, Case 2 showed a slight increase in VPT from 7.0 to 9.33, indicating reduced sensitivity. This variance suggests individual differences in the impact of the intervention on vibration perception.

Hot Perception Threshold (HPT) decreased in all cases, with Case 3 showing the largest drop from 45.917 to 38.083. Cases 1 and 2 also experienced smaller reductions, suggesting enhanced heat sensitivity and improved ability to detect hot stimuli. Cold Perception Threshold (CPT) results were mixed, with Cases 1 and 3 seeing increases from 23.917 to 26.67 and from 22.58 to 24.917, respectively, while Case 2 remained stable at 24.16. This could imply either a reduction in cold sensitivity or an improved tolerance to cold stimuli post-intervention.

Intervention adherence and tolerability were assessed through patient feedback and symptom tracking, indicating overall positive acceptance of the treatment protocol. Adverse and unanticipated events were not reported during the intervention, suggesting good tolerability among the patients. The intervention had the most consistent positive effect on Protective Sensation, with all cases improving in this area.

Other parameters exhibited varied responses, indicating individual differences in outcomes. Case 2 had the greatest improvement in PS but mixed results elsewhere, while Case 3 displayed the most consistent changes across all measures, suggesting a more uniform response to the intervention. Notably, standard deviations generally decreased in post-intervention measurements, particularly for PS and VPT, indicating a stabilizing effect on these sensory functions (Table 2)

Discussion:

The analysis of sensory parameters in three cases following an intervention reveals a complex pattern of changes, underscoring the multifaceted nature of sensory processing and the potential for targeted treatments to modulate different aspects of somatosensory function. Notably, improvements in Protective Sensation (PS) were consistent across all cases, highlighting the intervention's likely impact on neural pathways related to light touch and pressure detection.

The monofilament test, a standard tool for assessing cutaneous sensibility, supports these findings, indicating the intervention may have effectively enhanced PS, crucial for preventing injuries (Feng et al., 2009). In contrast, Vibration Perception Threshold (VPT) presented mixed results, with two cases showing improvement and one case experiencing a slight decline. This variability suggests individual differences in response to the intervention, likely due to factors such as baseline sensory function or neurophysiological differences.

Table. 2: Details of Pre-test and post-test assessments of Sensory parameters.

Parameter	Case No. 1		Case No. 2		Case No.3	
	Pre	Post	Pre	Post	Pre	Post
PS	14.083±12.206	8.167±2.623	23.0±11.07	9.083±1.564	11.833±2.51	9.67±1.92
VPT	23.167±4.668	14.667±1.723	7.0±1.595	9.33±0.985	18.25±4.86	12.917±1.44
HPT	44.00±2.486	41.75±1.815	40.58±2.23	39.16±1.03	45.917±1.78	38.083±1.56
CPT	23.917±3.77	26.67±0.78	24.16±1.80	24.16±0.835	22.58±2.27	24.917±1.975
ST	32.83±0.577	31.83±0.39	32.50±0.452	32.00±0.853	34.25±0.452	35.50±0.674

Note: PS = Protective Sensation (Monofilament test), VPT = Vibration Perception Threshold, HPT = Hot Perception Threshold, CPT = Cold Perception Threshold, ST = Skin Temperature.

VPT is critical for proprioception and fine motor control, as it is primarily mediated by rapidly adapting mechanoreceptors (Halonen et al., 1986).The consistent reduction in Hot Perception Threshold (HPT) across all cases points to increased heat sensitivity, possibly due to the modulation of heat-sensitive receptors or central thermal processing pathways.

However, this heightened sensitivity could have both protective and adverse implications, requiring careful management in different environmental conditions.Conversely, the Cold Perception Threshold (CPT) either increased or remained stable, indicating reduced cold sensitivity or improved tolerance. This divergence between hot and cold sensitivity suggests the intervention may affect different thermoreceptor populations or neural pathways distinctly.Overall, the results highlight the potential for interventions to have varying effects across different sensory modalities.

The consistent improvement in PS, combined with more varied outcomes in other sensory parameters, emphasizes the importance of personalized approaches in sensory rehabilitation.Clinically, enhancing protective sensation could be beneficial for individuals with sensory deficits, but the increase in heat sensitivity requires monitoring to ensure safety. The study also raises important questions about the neurophysiological mechanisms underlying these changes, suggesting a need for future research using neuroimaging or electrophysiological methods. Longitudinal studies will be essential to determine the lasting effects of these sensory changes and their impact on functional outcomes. Additionally, exploring how these sensory alterations translate into more complex sensory-motor tasks and overall quality of life will be crucial for advancing therapeutic strategies.

Conclusion

In summary, this analysis demonstrates the complex nature of sensory modulation following an intervention, with promising effects on PS but varied results in other modalities. These findings underscore the importance of individualized approaches in sensory rehabilitation and open new avenues for research into the mechanisms of sensory processing and targeted interventions.

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Declaration of the patient

All patients involved in this study provided informed consent before participation. The study adhered to ethical guidelines as outlined by the International Institute of Yoga and Naturopathy Medical Sciences, Chengalpattu, ensuring confidentiality and the protection of patient data. No identifying information is included in the study, and patient privacy has been strictly maintained throughout the research process.

Source of support

No external financial or material support was provided for this study.

Conflict of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Reference

[1]Goyal R, Singhal M, Jialal I. Type 2 Diabetes. [Updated 2025 Jun 23]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: https://www.ncbi.nlm.nih.gov/books/NBK513253/

[2]Iqbal Z, Azmi S, Yadav R, Ferdousi M, Kumar M, Cuthbertson DJ, Lim J, Malik RA, Alam U. Diabetic Peripheral Neuropathy: Epidemiology, Diagnosis, and Pharmacotherapy. Clin Ther. 2018 Jun;40(6):828-849. doi: 10.1016/j.clinthera.2018.04.001. Epub 2018 Apr 30. PMID: 29709457.

[3]Darivemula S, Nagoor K, Patan SK, Reddy NB, Deepthi CS, Chittooru CS. Prevalence and Its Associated Determinants of Diabetic Peripheral Neuropathy (DPN) in Individuals Having Type-2 Diabetes Mellitus in Rural South India. Indian J Community Med. 2019 Apr-Jun;44(2):88-91. PMID: 31333282; PMCID: PMC6625262.

[4]Perveen, W., Ahsan, H., Rameen Shahzad et al. Prevalence of peripheral neuropathy, amputation, and quality of life in patients with diabetes mellitus. Sci Rep 14, 14430 (2024). https://doi.org/10.1038/s41598-024-65495-2

[5]Pérez Hernández, M.F., Calderón Vallejo, A., Aguilar Castillo, S.d.J. et al. Electroacupuncture efficacy in diabetic polyneuropathy: Study protocol for a double-blinded randomized controlled multicenter clinical trial. BMC Complement Med Ther 24, 90 (2024). https://doi.org/10.1186/s12906-024-04375-8

[6]MATTHEW J. SNYDER, DO, LAWRENCE M. GIBBS, MD, AND TAMMY J. LINDSAY, MD. (2016). Treating Painful Diabetic Peripheral Neuropathy: An Update. American Academy of Family Physicians. https://www.aafp.org/pubs/afp/issues/2016/0801/p227.html

[7]Wang X, Li Q, Han X, Gong M, Yu Z and Xu B (2021) Electroacupuncture Alleviates Diabetic Peripheral Neuropathy by Regulating GlycolipidRelated GLO/AGEs/RAGE Axis. Front. Endocrinol. 12:655591. doi: 10.3389/fendo.2021.655591

[8]Kyung-Min Shin, Seunghoon Lee, Eun Yong Lee, Cheol-Hong Kim, Jung Won Kang, Cham Kyul Lee, Bok-Nam Seo, Ae-Ran Kim, So-Young Jung, Ojin Kwon, Sun-Mi Choi; Electroacupuncture for Painful Diabetic Peripheral Neuropathy: A Multicenter, Randomized, Assessor-Blinded, Controlled Trial. Diabetes Care 1 October 2018; 41 (10): e141–e142. https://doi.org/10.2337/dc18-1254

[9]Peter Deadman & Mazi n Al-Khafaji with Kevin Baker (1998), A Manual of ACUPUNCTURE, reprint September 2001, England, Journal of Chinese Medicine Publications.

[10]Riddhi D, Jebasingh F, Thomas N, Kn M, Sharma S, Saravanan B. NEURO TOUCH: A novel digital device for assessment and screening of peripheral neuropathy. Foot (Edinb). 2022 May;51:101888. doi: 10.1016/j.foot.2021.101888. Epub 2021 Dec 6. PMID: 35255407.

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