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Prevalence of Central Sensitization in Notalgia Paresthetica Patients and its Association with Vertebral Degeneration: A Cross-sectional Study

Derya CIRAKOGLU[1] and Fatma ETGÜ[2]
[1]Department of Physical Medicine and Rehabilitation, Ordu University, Faculty of Medicine, Ordu, and [2]Department of Dermatology, Ordu University, Faculty of Medicine, Ordu, Turkey

Notalgia paresthetica (NP) is a sensory neuropathy characterized by itching and hyperpigmentation, typically around the scapular region. This study aimed to investigate the relationships between clinical findings, radiological features, and central sensitization (CS) in NP patients. This cross-sectional study included 45 NP patients and 45 age- and gender-matched healthy controls. Neuropathic symptoms were assessed using the painDETECT questionnaire (PD-Q), while CS symptoms were evaluated with the Central Sensitization Inventory (CSI). Pain and pruritus severity were evaluated using a Visual Analogue Scale (VAS). Cervical–thoracic vertebral pathologies were examined via 2-view X-rays. Vertebral degeneration was observed in 75.5% of NP patients, which was significantly higher than in controls ($p = 0.001$). CS was present in 48.9% of NP patients, also significantly higher than in the control group ($p = 0.020$). A higher rate of prior fibromyalgia diagnosis, based on CSI-B responses, was found in NP patients ($p = 0.05$). NP patients with CS had significantly higher VAS pain scores ($p < 0.001$), PD-Q scores ($p = 0.005$), and vertebral degeneration rates ($p = 0.001$) compared with those without CS. Additionally, 63.6% of NP patients with CS had lesions in multiple vertebral regions ($p = 0.002$). CS is common in NP patients, especially in those with vertebral degeneration. Multidisciplinary evaluation considering CS status may improve management of NP.

Key words: notalgia paresthetica; spondylosis; central sensitization; neuropathic pain; pruritus; pain.

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Corr: Fatma Etgü, Department of Dermatology, Ordu University, School of Medicine, Nefsi Bucak Street, No. 94/1, 52200, Altınordu/Ordu, Turkey. E-mail: fatmaetgu@gmail.com

SIGNIFICANCE

Notalgia paresthetica is a chronic skin condition that causes persistent itching and skin discoloration, primarily on the back. Our study found that patients with this condition exhibited higher levels of central sensitization compared with healthy controls. Central sensitization was associated with more intense itch and pain, and patients had more widespread spinal degeneration and lesions. Therefore, targeting central sensitization in treatments for these patients could enhance treatment effectiveness and significantly improve their quality of life.

Notalgia paresthetica (NP) is a cutaneous neuropathy that is characterized by itching and hyperpigmentation, mostly localized around the scapula (1, 2). Chronic pruritus is the most frequently encountered symptom and affects the quality of life of patients the most (3). Hyperpigmentation occurs secondarily to the constant scratching of the lesion area by the individual, and it has a post-inflammatory origin. In addition to itching, some patients also report neuropathic complaints such as pain, numbness, tingling, and burning (1, 2, 4).

NP is usually seen in middle-aged women. Despite its prevalence, it is underdiagnosed (1, 4). While NP is not life-threatening, chronic itching negatively affects the quality of life and sleep quality of patients. Its treatment involves oral or topical medical treatments (such as capsaicin, corticosteroids, and anaesthetics), in addition to different methods including physiotherapy, dry needling, exercise, and acupuncture (5). Because it does not have an exact treatment, treatment incompliance may be observed. Moreover, symptoms may regress without treatment and recur later. The reason for the spontaneous disappearance and recurrence of symptoms has not yet been understood (6).

The aetiology of NP is still not exactly known. Nevertheless, it is thought that it occurs via the compression of the cutaneous branches of thoracic spinal nerves, especially for reasons such as spinal pathology or muscle impingement. Another theory is that it occurs via compression of the cutaneous sensory branch of the dorsal scapular nerve due to cervical vertebral pathologies (7). In a recent study, an increased prevalence of fibromyalgia (FM) was shown in NP patients (8). The most significant factor implicated in the aetiology of FM is central sensitization (CS). CS is defined as the excessive response of nociceptive neurons in the central nervous system to normal or subthreshold stimuli (9). The most significant symptom suffered by patients in NP cases is chronic itching. CS also plays an important role in the aetiology of chronic itching, and in these cases the responsiveness of neurons to pruritogens is abnormally high. In light of

all this information, it is seen that CS has an important role in both chronic pain and chronic itching (10).

To the best of our knowledge, there is no study in the literature examining the prevalence of CS in NP patients. In this study, we aimed to investigate the relationship between cervical and thoracic vertebral degeneration, as well as the prevalence of CS as a different aetiology, in NP patients and the clinical findings of these patients.

MATERIALS AND METHODS

Design and participants

This cross-sectional study was carried out between 1 April 2023 and 10 March 2025. NP diagnosis was made by an experienced dermatologist based on clinical findings. The sample of the study consisted of 45 patients diagnosed with NP and 45 age- and sex-matched controls. Patients who had been followed up at the dermatology outpatient clinics with the diagnosis of NP for at least 6 months, had dorsalgia/cervicalgia complaints, did not have neurological deficits, and were at least 18 years old were included in the study. Patients with diabetes mellitus, thyroid, rheumatic, neurological, or psychiatric diseases, those with a history of cervical and/or thoracic surgery, and those with benign or malignant skin lesions other than NP were excluded. The control group consisted of individuals who visited the physical medicine and rehabilitation outpatient clinics with complaints of dorsalgia/cervicalgia, did not have any neurological deficit, and were at least 18 years old. Individuals with diabetes mellitus, thyroid, rheumatic, neurological, or psychiatric diseases and those with a history of cervical and/or thoracic surgery were excluded.

The protocols of the study were carried out in compliance with the principles of the Declaration of Helsinki. Ethical approval to conduct the study was obtained from Ordu University Scientific Research Ethics Committee with the decision dated 2025 and numbered 103.

Clinical examinations

The demographic data of the patients including their sex and age and the localizations of their lesions were recorded. Patients with NP diagnosis and cervicalgia/dorsalgia complaints were examined by a physical medicine and rehabilitation specialist. Patients for whom cervical/thoracic spinal 2-view radiographs were ordered to evaluate vertebral pathologies were included. The vertebral radiographs of the patient and control groups were examined and interpreted by another physical medicine and rehabilitation specialist who was not aware of the group allocations. The presence of 1 or more of the findings of endplate sclerosis, narrowing of the intervertebral disc space, osteophytes, and facet joint degeneration in the cervical and/or thoracic region on X-ray imaging was considered as vertebral degeneration. The neuropathic symptoms of the patients were evaluated using the painDETECT questionnaire (PD-Q), their CS symptoms were evaluated using the Central Sensitization Inventory (CSI), and their pain and itch levels were evaluated using the Visual Analog Scale (VAS).

Visual Analog Scale (VAS-pain): The severity of pain felt by each patient was marked on a 10-cm ruler (0 = no pain at all, 10 = most severe pain imaginable).

Visual Analog Scale (VAS-pruritus): The severity of each patient's itch experienced within the past 24 h was marked on a 10-cm visual analogue scale (0 = no pruritus, 10 = the worst imaginable pruritus (11).

PainDETECT Questionnaire (PD-Q): Neuropathic pain symptoms were evaluated using the Turkish version of PD-Q. PD-Q is a simple questionnaire that is easy to implement and has high levels of sensitivity and specificity. The presence of neuropathic pain is assessed based on PD-Q scores, which vary from –1 to 38. Patients with a total score of 12 or lower are considered not to have a neuropathic component of pain, while those with scores of 13 or higher are considered to potentially have a neuropathic pain component (12).

Central Sensitization Inventory (CSI): CSI was used to evaluate the presence of CS in the patients. Section A of the scale includes 25 items questioning symptoms seen in CS. In the scoring done on a scale of 100, scores of 40 or higher indicate the presence of CS. Section B of the scale questions whether the patient has been diagnosed previously with a disease associated with CS (13).

Statistical analysis

The sample size was calculated using data from a previous study (8). Power analysis determined that this study had a type I error (α) = 0.05, effect size = 0.94, and a total sample size required of 38 with a power of 80%.

All statistical analyses were carried out using the SPSS (22.0; IBM Corp, Armonk, NY, USA) program. The Kolmogorov–Smirnov test was conducted to determine whether the data were normally distributed. Mean and standard deviation values were calculated. Student's *t*-test was used to compare normally distributed data, whereas the Mann–Whitney *U* test was used to compare non-normally distributed data. χ^2 tests were used to compare categorical data (sex). The correlation between 2 variables was evaluated using bivariate correlation analysis, while comparisons among more than 2 groups were performed using one-way ANOVA tests. $P < 0.05$ was considered statistically significant.

RESULTS

The results of the analyses are presented in **Tables I** and **II**. The sample of this study consisted of 90 participants, including 45 NP patients and 45 controls. The sex distributions in the patient and control groups were equal. In

Table I. Comparison of demographic data, VAS, PD-Q, CSI-A, CSI-B and vertebral degeneration rates between patients with notalgia paresthetica and control group

Factor	NP ($n=45$)	Control ($n=45$)	p-value
Age, years, mean±SD	55.82±13.30	51.69±14.07	0.156
Sex, male/female, *n* (%)	11(24.4%)/ 34(75.6%)	11(24.4%)/ 34(75.6%)	1
VAS-pain score, median±IQR (min–max)	5.00±3 (2–10)	5.00±3 (1–9)	0.173
PD-Q score, median±IQR (min–max)	9.00±10 (0–27)	12.00±10 (1–25)	0.094
Neuropathic pain ratio relative to PD-Q (PD-Q≥13)	31.1% (14)	44.4% (20)	0.058
CSI-A score, median±IQR (min–max)	42.00±25 (13–75)	36.00±17 (7–67)	0.037*
CS-A presence (≥ 40)	48.9% (22)	31.1% (14)	0.020*
Fibromyalgia syndrome	26.7% (12)	8.9% (4)	0.05*
Total vertebral degeneration	75.5% (34)	31.1% (14)	0.001*
Cervical degeneration	24.4% (11)	17.8% (8)	0.438
Thoracic degeneration	20.0% (9)	0	NA
Cervical + thoracic degeneration	31.1% (14)	13.3% (6)	0.043*

IQR: interquartile range; VAS: Visual Analogue Scale; PD-Q: painDETECT questionnaire; CSI: Central Sensitization Inventory; NA: non-applicable. *Statistically significant values ($p<0.05$).

each group, there were 11 (24.4%) men and 34 (75.6%) women. In the entire patient group, there was intense itching in the hyperpigmented area. No statistically significant difference was found between the 2 groups in terms of their age, VAS-pain scores, PD-Q scores, and neuropathic pain rates according to PD-Q (respectively, $p=0.156$, $p=0.173$, $p=0.094$, and $p=0.058$). The CSI-A scores of the patient group were significantly higher than those of the control group ($p=0.037$). The presence of CS was also significantly higher in the patient group than in the control group ($p=0.020$). In the comparisons of CS-related symptoms, the rate of FM in the patient group was found to be significantly higher than that in the control group ($p=0.05$). There was no significant difference between the groups in terms of other CS-related symptoms.

The sum of the number of patients with cervical vertebral degeneration only, the number of those with thoracic vertebral degeneration only, and the number of those with both cervical and thoracic vertebral degeneration was taken as the total number of vertebral degeneration cases. The total rate of vertebral degeneration was 75.5% in the patient group and 31.1% in the control group, and the difference between the groups was statistically significant ($p=0.001$). The co-occurrence rate of cervical and thoracic vertebral degeneration was also significantly higher in the patient group than in the control group ($p=0.043$). Detailed results are presented in Table I.

In the comparisons of the patients with CS (CS-A≥40) and those without CS (CS-A<40), it was determined that the mean age of the patients with CS was significantly higher ($p=0.007$). There was no significant difference between the groups in terms of their sex distributions ($p=0.165$). The patients with CS had significantly higher VAS-pruritus score ($p=0.001$), VAS-pain scores ($p<0.001$), and PD-Q scores ($p=0.005$). The total

Table II. Comparison of notalgia paresthetica patients with and without central sensitization in terms of demographic data, VAS, PD-Q score, vertebral degeneration, and lesions

Factor	NP without CS ($n=23$)	NP with CS ($n=22$)	p-value
Age, years, mean±SD	50.74±14.45	61.14±9.71	0.007*
Sex, male/female, *n*	8/15	3/19	0.165
VAS-pruritus score, mean±SD	5.78±1.34	7.36±1.67	0.001*
VAS-pain score, mean±SD (range)	4.50±2 (1–9)	6.00±2 (3–10)	<0.001*
PD-Q score, mean±SD (range)	8.50±10 (0–25)	12.00±8 (0–27)	0.005*
Total vertebral degeneration	56.5% (13)	95.4% (21)	0.001*
Cervical degeneration	21.7% (5)	27.3% (6)	0.738
Thoracic degeneration	26.1% (6)	13.6 % (3)	0.459
Cervical + thoracic degeneration	8.7% (2)	54.5 % (12)	0.001*
Localization of lesion (%), *n*			
Right scapula	39.1% (9)	27.3% (6)	0.399
Left scapula	43.5% (10)	9.1% (2)	0.009*
Bilateral scapula	8.7 % (2)	45.5% (10)	0.002*
Bilateral scapula + lumbar region	4.3% (1)	4.5% (1)	0.974
Bilateral scapula + cervical region	0	4.5 % (1)	NA
Bilateral scapula + cervical + lumbar region	4.3% (1)	9.1 % (2)	0.524
Number of lesions			
Single	82.6% (19)	36.4 % (8)	0.018*
Multiple regions	17.4% (4)	63.6 % (14)	0.002*

IQR: interquartile range; VAS: Visual Analog Scale; PD-Q: pain-DETECT questionnaire; NA: non-applicable. *Statistically significant values ($p<0.05$).

number of patients with vertebral degenerations in the subgroup with CS was significantly higher than that in the subgroup without CS ($p=0.001$). The cooccurrence of cervical and thoracic vertebral degeneration also had a significantly higher rate in the CS subgroup ($p=0.001$). Single lesions were significantly more prevalent in the subgroup without CS ($p=0.018$), while the patients in the subgroup with CS were significantly more likely to have multiple lesions ($p=0.002$). Detailed results are presented in Table II.

The mean VAS-pruritus score in NP patients was 6.56±1.70. The mean VAS-pruritus score was 5.78±1.34 in patients without CS, whereas it was 7.36±1.67 in those with CS. The difference between the groups was statistically significant ($p=0.001$). The VAS-pruritus score correlated significantly with VAS-pain ($p=0.033$) and CS scores ($p<0.001$), whereas no statistically significant correlation was found with PD-Q scores ($p=0.756$). The relationship between VAS-pruritus score and vertebral degeneration was evaluated. No statistically significant difference was found between patients without vertebral degeneration and those with degeneration limited to either the thoracic ($p=0.941$) or cervical ($p=0.877$) regions. In contrast, patients with degeneration in both regions (cervical and thoracic) had significantly higher VAS-pruritus score compared with the other groups ($p=0.001$).

DISCUSSION

The rates of vertebral degeneration and CS were found to be significantly higher in the group of NP patients in comparison with the control group. Within the patient group, the patients with CS had significantly higher PD-Q scores, VAS-pain scores, VAS-pruritus score, and

total vertebral degeneration rates than those without CS. Additionally, the patients with CS were more likely to have more diffuse and multiple lesions.

In agreement with the results of other studies in the literature, in this study, we observed that most NP patients were middle-aged women. The mean age of our patients was 55.82±13.30, and 75.6% of the patients were women. Şenel et al. reported the rate of women in their patient sample as 87.2%, while the mean age of their patients was 47.08±12.28 (2). In the study carried out by Huesmann et al., these values were 75.4% and 56.2±12.7, respectively (14). The unilateral presence rate of lesions in the patients was 60%, which was compatible with the literature (4,15). In addition to this, the patients in our study who had CS were predisposed to having lesions in two or more regions.

While the exact aetiology of NP is unknown, it is thought that it occurs via the injury of the posterior cutaneous branches of spinal nerves for reasons such as cervical and thoracic vertebral degeneration (7,16). In a recent study conducted with 117 NP patients, it was shown that T2–T6 were the most symptomatic dermatomes (2). In a previous cross-sectional study, 45 patients with NP and 35 individuals with dorsalgia complaints were compared, and changes in cervical and thoracic vertebrae were demonstrated in 87% of the NP patients. In the same study, no significant difference was found between the VAS-pain scores of the patient and control groups (4). In our study, the vertebral degeneration rate of the NP patients was 75.5%, which was high. Despite this high rate of vertebral degeneration in the patient group, we did not find a significant difference between the VAS and PD-Q scores of the patient and control groups. The neuropathic symptoms of the patients were similar to those in the control group. Neck/back pain was present in both groups. Although we identified a very high rate of vertebral degeneration in the patient group via cervical and thoracic vertebral imaging, the similar scores of the 2 groups may have been associated with our inability to exclude different pathologies such as herniated disks.

Many studies in the literature have shown NP rates proportional to radiological findings, similar to our results, while a previous study revealed an agreement rate of only 15.7% between the dermatomal localization of NP and radiological findings (14). This suggests that different factors may be encountered in the aetiology of NP. In a recent study, the prevalence of FM was found to be higher in NP patients than in the control group, and these rates were 7.7% and 34.6%, respectively (8). In our study, according to their CS-B results, the rate of those previously diagnosed with FM was 26.7% in the patient group and 8.9% in the control group. It is known that CS is the most frequently studied and associated factor in the aetiology of FM (9, 17). CS is defined as a condition where simple stimuli lead to pain despite no evidence of tissue damage in any part of the body due to dysfunctions in the peripheral or central nervous system (18). Indeed, in the examinations of FM patients, no tissue damage that can cause pain is detected in their bodies. Likewise, in our study, the prevalence of CS in the NP patients was 48.9%, and this rate was significantly higher compared with the control group. Similarly, NP patients do not have a primary cutaneous pathology, and hyperpigmentation occurs secondarily to constant itching (19). This led us to think that NP could be associated with CS. In addition to FM, CS has been studied in degenerative diseases like osteoarthritis and rheumatic diseases like ankylosing spondylitis, and a significant relationship has been demonstrated (20–23). Nonetheless, while we showed the presence of CS in NP cases, it is not known whether CS is primarily involved in the aetiology of NP or is secondary to existing cervical and thoracic vertebral degeneration, and further studies are needed. In fact, in our study, the rate of CS in the NP patients with vertebral degeneration was very high, at 95.4%. Furthermore, our findings revealed that patients with concomitant thoracic and cervical degeneration exhibited significantly higher VAS-pruritus scores than those without vertebral degeneration or with degeneration confined to a single region. In NP cases, nerve compression secondary to vertebral degeneration can lead to the sensitization of unmyelinated C fibres responsible for the transmission of itching signals. This, in turn, can lead to a feeling of itching by causing an excessive response to stimuli. Existing CS may exacerbate itching signals further (24).

In our study, all patients with NP presented with chronic pruritus as the main symptom. The mean VAS-pruritus score was 6.56±1.70, which was consistent with previously reported data in the literature (2). Moreover, the presence of CS was associated with significantly higher VAS-pruritus scores, supporting the notion that CS may be involved in the exacerbation of pruritus severity. Evidence from previous studies has demonstrated that CS contributes to the aetiology of chronic pruritus. CS-related chronic pruritus symptoms emerge in the form of spontaneous itching, hyperknesis, and alloknesis (10). Alloknesis refers to cases of increased sensitization where itching is caused by a stimulus that would normally not cause itching, whereas hyperknesis is a condition where even the smallest stimulus that can cause itching causes excessive itching (25). In a recent study, the relationship between prurigo nodularis, which causes severe chronic itching, and CS was demonstrated. Prurigo nodularis was also found to be closely connected to diseases whose aetiologies include CS, such as fibromyalgia and interstitial cystitis (26).

In our study, VAS-pruritus scores showed a statistically significant correlation with VAS-pain scores. Although these two sensory systems are structurally different, they exhibit remarkable similarities in transmission mechanisms. Pain and pruritus are transmitted to the central nervous system through unmyelinated

and slowly conducting "C" fibres (27). In addition, the same inflammatory mediators activate both nociceptors and pruriceptors (28). Moreover, the use of the same ion channels represents another similarity. Studies have demonstrated that both sensations activate the same brain regions while processing relevant stimuli (27). All these findings support the correlation between pain and pruritus scores.

This is the first study to examine the relationship between NP and CS. However, this study also had some limitations. As in most studies examining NP cases, the number of patients who were included in the sample was limited. Additionally, the radiological examinations were made via 2-view cervical and thoracic X-ray imaging, and it was not possible to identify existing conditions such as disk hernia.

Consequently, CS rates are high in NP patients. These rates increase even further in patients with vertebral degeneration and multiple lesions. We believe that NP patients should be screened for CS. Adding approaches addressing CS to the treatment of NP cases with CS can increase the success of the treatment.

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Data availability statement: Data are available upon reasonable request

The authors have no conflicts of interest to declare.

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