

Beyond pain: sleep quality impairment in lumbosacral radiculopathy neuropathic pain and sleep in lumbosacral radiculopathy

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Cite this article as: Buturak Ş, Fidancı H. Beyond pain: sleep quality impairment in lumbosacral radiculopathy neuropathic pain and sleep in lumbosacral radiculopathy. *J Orthop Res Rehabil.* 2026;4(4):83-86. doi:10.51271/JORR-0077

Received: 17.07.2026

Accepted: 18.08.2026

Published: 28.10.2026

ABSTRACT

Aims: Lumbosacral radiculopathy is one of the major causes of neuropathic pain, and sleep quality may be impaired secondary to neuropathic pain in these patients. In this study, we aimed to investigate the relationship between neuropathic pain and sleep quality in patients with lumbosacral radiculopathy.

Methods: In this retrospective study, 30 patients with lumbosacral radiculopathy detected on magnetic resonance imaging (MRI) were included. All patients were electrophysiologically evaluated for lumbosacral radiculopathy. The Douleur Neuropathique 4 (DN4) questionnaire was used to assess neuropathic pain, and the Jenkins Sleep Scale was administered to evaluate sleep quality. A DN4 score of 4 or higher indicates neuropathic pain. Patients with a Jenkins Sleep Scale score of ≤ 9 were assigned to the mild sleep impairment group, whereas those with a score >9 were assigned to the moderate-to-severe sleep impairment group.

Results: Thirty patients (12 males, 18 females) diagnosed with lumbosacral radiculopathy based on neuroimaging findings were included in the study. Electrophysiological findings confirmed lumbosacral radiculopathy in 17 patients. Neuropathic pain was present in all patients. Impaired sleep quality was observed in patients with higher neuropathic pain scores. A positive correlation was found between DN4 scores and Jenkins Sleep Scale scores ($p=0.006$, $r=0.487$).

Conclusion: Neuropathic pain associated with lumbosacral radiculopathy may lead to impaired nocturnal sleep quality. The relationship between neuropathic pain and sleep quality may be associated with the severity and duration of neuropathic pain. Further studies with larger sample sizes are needed to clarify this relationship.

Keywords: Lumbosacral radiculopathy, neuropathic pain, sleep quality

INTRODUCTION

The lumbar region is the most commonly affected site of radiculopathy, with the L5-S1 level being the most frequently involved segment.^{1,2} This is mainly because it is the most mobile and weight-bearing segment of the spine. Degenerative changes associated with aging are the most common etiological factors in this region. Lumbosacral radiculopathy develops secondary to nerve root compression caused by conditions such as intervertebral disc herniation, spondylolisthesis, and spinal stenosis.³ Patients with lumbosacral radiculopathy commonly present with complaints such as low back pain radiating to the leg and paresthesia.^{1,4} The condition may develop acutely or chronically. Diagnosis is established through magnetic resonance imaging (MRI) and electrophysiological evaluation.^{5,6}

Neuropathic pain is a subjective complaint that may impair sleep quality.^{7,8} It can develop due to many different causes, and lumbosacral radiculopathy is one of the important causes of neuropathic pain.⁹ The severity and duration of neuropathic pain are important factors affecting sleep quality.¹⁰ Difficulty falling

asleep, difficulty maintaining sleep, frequent awakenings, waking up feeling tired, and daytime sleepiness are indicators of impaired sleep quality.¹¹

In this study, patients diagnosed with lumbosacral radiculopathy based on MRI findings were also evaluated electrophysiologically, and their neuropathic pain was assessed using the DN4 neuropathic pain questionnaire. In addition, nocturnal sleep quality was evaluated using the Jenkins Sleep Scale. Thus, the relationship between neuropathic pain associated with lumbosacral radiculopathy and impaired sleep quality was investigated.

METHODS

This study was approved by the Scientific Researches Ethics Committee of Adana City Training and Research Hospital (Date: 18.12.2025, Decision No: 946). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

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Patients older than 18 years of age who were referred to the Neuroelectrophysiology Clinic of Adana City Training and Research Hospital between April 1, 2025, and September 30, 2025, presenting with clinical complaints and diagnosed with lumbosacral radiculopathy based on neuroimaging findings, were included in this study.

Patients with fibromyalgia, diabetes mellitus, vasculitis, multiple sclerosis, peripheral neuropathy, or a history of spinal cord trauma were excluded from the study. All included patients were evaluated for neuropathic pain using the DN4 Neuropathic Pain Questionnaire. A DN4 score of 4 or higher was accepted as indicative of neuropathic pain.¹² The Jenkins Sleep Scale was administered to all patients to assess sleep quality during the previous month. According to the Jenkins Sleep Scale, scores between 0–9 were considered mild, scores between 10–20 were considered moderate-to-severe impairment in sleep.¹³ Patients presenting with clinical symptoms and MRI findings suggestive of lumbosacral radiculopathy underwent electromyographic (EMG) evaluation. Although MRI findings were consistent with lumbosacral radiculopathy, electrodiagnostic studies may yield normal results in some patients.

Electrophysiological Tests

Electrodiagnostic tests were performed with the Cadwell Sierra Summit electromyography (EMG) unit (Cadwell Laboratories, Kennewick, Washington, USA). Nerve conduction studies were performed using previously suggested methods.^{8,9} The normal values of our laboratory were used for the normal values of the nerve conduction study.^{8,9} Needle EMG study was performed with concentric needle electrodes (length=50 mm, diameter=0.46 mm, Bionen Medical Devices, Florence, Italy). The band filter range for needle EMG was 10 Hz–10 kHz. The sweep speed/sensitivity during rest, during mild muscle contraction, and for interference pattern analysis were 10 ms/100 μ V, 10 ms/500–1000 μ V, and 100 ms/500–1000 μ V, respectively. Needle EMG was applied visually. Positive sharp waves (PSWs) and fibrillation potentials (FPs) were carefully analyzed. If the motor unit action potential (MUAP) amplitude was >3 mV and the MUAP duration >15 ms, this MUAP was considered neurogenic. Tibialis anterior, medial gastrocnemius, vastus lateralis, peroneus longus, gluteus medius and gluteus maximus muscles were examined with needle EMG. Needle EMG findings were considered abnormal when PSWs, FPs, or MUAPs with neurogenic features were detected.

Statistical Analysis

Categorical variables were expressed as frequencies and percentages, whereas numerical variables were presented as mean $\pm$ standard deviation and range. Categorical variables were compared between groups using the Pearson Chi-square test or Fisher's exact test, as appropriate. Numerical variables were compared using the Mann–Whitney U test. Correlations between variables were assessed using Spearman's rank correlation test. The strength of the correlation was interpreted according to the correlation coefficient (r) as follows: $r \geq 0.9$ or $r \leq -0.9$, very strong; $0.7 \leq r < 0.9$ or $-0.9 < r \leq -0.7$, strong; $0.5 \leq r < 0.7$ or $-0.7 < r \leq -0.5$, moderate; $0.3 < r \leq 0.5$ or $-0.5 < r \leq -0.3$, weak; and $-0.3 < r < 0.3$, negligible. A p-value < 0.05 was considered statistically significant.

RESULTS

Thirty patients (12 males and 18 females) were included in the study. The mean age of the patients was 55.6 ± 15.8 years (range, 22–82 years). The mean duration of symptoms was 40.3 ± 25.3 months (range, 3–120 months). The mean DN4 Neuropathic Pain Questionnaire score was 5.7 ± 1.1 (range, 4–8), and the mean Jenkins Sleep Scale score was 11.8 ± 3.0 (range, 6–19). Since only patients with MRI-confirmed lumbosacral radiculopathy and clinically compatible symptoms were enrolled, all patients had a DN4 score of ≥ 4 , consistent with the presence of neuropathic pain.

The Jenkins Sleep Scale score was between 0–9 in 6 patients and between 10–20 in 24 patients. **Table 1** summarizes the associations of Jenkins and DN4 scores with clinical characteristics. A weak positive correlation was observed between Jenkins and DN4 scores ($r=0.487$, $p=0.006$). Needle EMG abnormalities were identified in “17 patients (56.7%)” ($17/30 = 0.5667$). Jenkins scores in patients with and without needle EMG abnormalities are compared in **Table 2**. Patients with abnormal needle EMG findings had significantly higher Jenkins scores than those with normal findings ($p=0.004$). **Figure** illustrates the distribution of patients according to needle EMG findings and sleep quality category. All patients with needle EMG abnormalities had Jenkins scores >9, whereas 7 patients without needle EMG abnormalities also had scores >9 ($p=0.003$).

Table 1. Correlation between Jenkins Sleep Scale score and clinical features

Clinical feature	Jenkins Score	
	p value	r value
Age	0.387	0.163
Disease duration (months)	0.617	0.099
DN4 Score	0.006	0.487
DN4: Douleur Neuropathique 4		

Table 2. Questionnaire scores according to EMG findings

Questionnaire	Needle EMG abnormalities (+)	Needle EMG abnormalities (-)	p value
Jenkins	13.1 ± 2.6 (12.0) (10-19)	10.2 ± 2.9 (10.0) (6-17)	0.004
DN4	6.0 ± 1.1 (6.0) (4-8)	5.3 ± 1.0 (5.0) (4-7)	0.091
DN4: Douleur neuropathique 4, EMG: Electromyography			

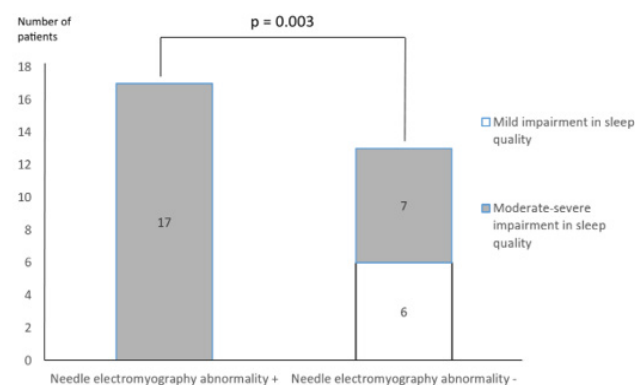


Figure. Distribution of patients according to needle EMG findings and sleep quality.

EMG: Electromyography

DISCUSSION

Neuropathic pain was identified in all patients included in the present study. This finding is consistent with the pathophysiological mechanisms of radiculopathy, in which nerve root involvement and ectopic impulse generation are considered major contributors to neuropathic pain.¹⁴ The presence of neuropathic pain in all patients may be attributable to the study's inclusion criteria. Only individuals with clinical and imaging findings consistent with lumbosacral radiculopathy were enrolled, which may have contributed to the uniformly high prevalence of neuropathic pain observed in the cohort.

Neuropathic pain is associated not only with sensory symptoms but also with impairments in physical functioning, emotional well-being, and quality of life.¹⁵ As pain severity increases in individuals with lumbosacral radiculopathy, limitations in daily activities may become more pronounced and sleep quality may also deteriorate. The positive association observed between neuropathic pain and sleep disturbance in our cohort supports this view and suggests that neuropathic pain may be an important factor contributing to impaired sleep in these patients. The association observed between neuropathic pain and sleep disturbance may reflect a reciprocal relationship, in which greater pain is accompanied by poorer sleep.^{16,17} Accordingly, alleviation of neuropathic pain could contribute to better sleep quality in affected patients. Given the observed association between neuropathic pain and sleep disturbance, a comprehensive clinical assessment should include evaluation of sleep-related symptoms in addition to neuropathic pain and neuromuscular abnormalities. Accordingly, treatment outcomes should be assessed not only in terms of pain relief but also with regard to improvements in sleep quality.¹⁸ Further studies that examine polysomnographic findings, pain duration, depression, and anxiety may help clarify the relationship between neuropathic pain and sleep disturbances in patients with radiculopathy.

Patients with radiculopathy confirmed by needle EMG exhibited higher Jenkins scores than those without electrophysiological abnormalities. Needle EMG abnormalities may reflect more severe nerve root involvement and axonal degeneration, which could contribute to the greater degree of sleep impairment observed in these patients. This observation suggests that sleep disturbance may be related not only to pain severity but also to the extent of neurological damage.¹⁹ Electrophysiological findings may therefore help identify patients at risk of greater functional impairment.

Limitations

Several limitations of this study should be acknowledged. First, the retrospective design and relatively small sample size may limit the statistical power of the analyses and generalizability of the findings. Another limitation of this study is that sleep quality may be influenced by medications used for pain management. Analgesic agents, including neuropathic pain medications, nonsteroidal anti-inflammatory drugs, and other concomitant treatments, may independently affect sleep quality, either positively or negatively. In addition, electrodiagnostic assessment relied

on needle EMG, which reflects motor axonal involvement but does not directly assess pain-related pathways. Future studies may benefit from the inclusion of techniques that provide information on pain pathway function, such as sympathetic skin response testing. Nevertheless, needle EMG remains valuable for identifying axonal degeneration and characterizing the extent of neurological involvement. Larger, prospective, multicenter studies are needed to confirm the relationship between neuropathic pain, sleep quality, and electrophysiological findings in patients with lumbosacral radiculopathy.

CONCLUSION

In this study, neuropathic pain was observed in all patients with lumbosacral radiculopathy, and sleep disturbances were frequently identified. Higher neuropathic pain scores were associated with greater impairment in sleep quality. Patients with radiculopathy findings on needle EMG also tended to have higher Jenkins scores, suggesting a possible link between electrophysiological abnormalities and sleep disturbance. These findings suggest that sleep-related symptoms may represent an important clinical feature of lumbosacral radiculopathy. Further studies with larger cohorts are needed to better clarify the relationships among neuropathic pain, electrophysiological findings, and sleep disturbance in this patient population.

ETHICAL DECLARATIONS

Ethics Committee Approval

This study was approved by the Scientific Researches Ethics Committee of Adana City Training and Research Hospital (Date: 18.12.2025, Decision No: 946).

Informed Consent

This retrospective study used pre-existing anonymized patient data. No additional intervention was performed, and there was no direct patient contact. The study was approved by the Ethics Committee, and the requirement for written informed consent was waived by the ethics committee.

Peer Review Process

This manuscript was subject to external peer review.

Conflict of Interest

The authors declare no conflicts of interest related to this study.

Financial Disclosure

The authors received no financial support for the conduct or publication of this research.

Author Contributions

Concept: HF, SB; Design: HF, SB; Control: HF, SB; Resources: HF, SB; Materials: HF; Data Collection and/or Processing: HF, SB; Analysis and/or Interpretation: HF, SB; Literature Review: SB; Writing The Article: HF, SB; Critical Review: HF, SB.

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