Superior Cluneal Nerve Entrapment: A Retrospective Study of This Rare and Underdiagnosed Cause of Chronic Low Back and Leg Pain

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Abstract

Aim: Superior cluneal nerve entrapment (SCNE) is a rare, peripherally mediated cause of chronic radicular low back and leg pain that is underdiagnosed, leading most patients to be evaluated as having nonspecific low back pain.

Methods: The files of 18 patients diagnosed with SCNE and treated with a superior cluneal nerve (SCN) block were examined. Records pertaining to interventional procedures performed on these patients, pain levels before the procedure (Numeric Rating Scale [NRS]-1) and Douleur Neuropathique 4 [DN4]-1), two weeks after the procedure (NRS-2 and DN4-2), and three months after the procedure (NRS-3 and DN4-3), as well as neuropathic pain symptoms, were used for this study.

Results: Evaluation of NRS values showed a significant difference between NRS-1 and NRS-2 (p=0.000162) and between NRS-1 and NRS-3 (p=0.000186). The mean NRS score was 8.94 before interventional treatment and decreased to 2 three months afterward. Evaluation of DN4 values showed a significant difference between DN4-1 and DN4-2 (p=0.000399) and between DN4-1 and DN4-3 (p=0.001). The mean DN4 score was 2.77 before interventional treatment and decreased to 0.5 following the SCN block.

Conclusions: This study demonstrates that SCNE should be considered in patients with chronic low back and leg pain, especially in cases where clinical findings cannot be fully explained by imaging. The hypothesis that widespread recognition of SCNE may reduce unnecessary spinal surgeries remains speculative and should be investigated using prospective controlled studies.

Keywords: *Superior cluneal nerve; back pain; chronic pain*

1. Introduction

Low back pain is one of the leading causes of activity limitation and work absenteeism worldwide. Since it imposes a substantial economic burden, treatment is essential. A systematic review estimated the annual incidence of first-episode low back pain to range between 6.3% and 15.3%, while the annual incidence of any low back pain episode is estimated to range between 1.5% and 36% [1]. An increase in chronic low back pain has been observed. In a study by Freburger et al.[2], the prevalence of chronic low back pain in North Carolina rose from 3.9% in 1992 to 10.2% in 2006. More than 37% of patients with chronic low back pain experience neuropathic pain symptoms, and radicular pain is commonly observed in these patients[3].

Low back pain is classified as specific or nonspecific based on etiology. Specific low back pain is defined as symptoms caused by an identifiable pathophysiological mechanism such as nucleus pulposus herniation, infection, osteoporosis, rheumatoid arthritis, fracture, or tumor. In nonspecific low back pain, a definitive cause cannot be determined, and the origin of the pain remains unclear.

Approximately 90% of all patients with low back pain have nonspecific low back pain, a diagnosis largely based on ruling out specific pathology[4]. Despite advances in imaging and interventional pain management techniques, the cause sometimes remains elusive.

Among the structures capable of causing low back or leg pain, the intervertebral discs, lumbar facet joints, and sacroiliac joint have received the most attention. The role of peripheral nerve entrapment as a cause of pain has been overshadowed by spinal sources but has increasingly attracted attention in recent years. Superior cluneal nerve entrapment (SCNE) is a rare, peripherally mediated cause of chronic radicular low back and leg pain that is underdiagnosed, leading most patients to be mistakenly considered as having nonspecific low back pain[5].

This study aimed to draw attention to SCNE, a frequently overlooked cause of chronic low back and leg pain, to investigate its etiology and to prevent unnecessary surgeries.

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2. Materials and Methods

2.1. Patients and Study Setting

Between January 1, 2024, and August 31, 2025, approximately 12,000 patients with low back and leg pain presented to the Algology Clinic of Mersin City Training and Research Hospital. All patients were initially evaluated in the physical medicine and rehabilitation or neurology clinics, where a 10-day course of nonsteroidal anti-inflammatory drugs was prescribed. Patients who did not improve were referred for physiotherapy, and those who failed conservative treatment were subsequently referred to the algology clinic for interventional management.

Routine examinations were performed in the algology clinic. Laboratory results, lumbar magnetic resonance imaging, and pelvic radiographs were evaluated. Interventional treatments deemed appropriate based on the findings were administered. The patients were scheduled for routine follow-ups on day 15 and at months 1, 3, and 6 after interventional treatment. Pain levels were assessed using the Numeric Rating Scale (NRS) and neuropathic pain using Douleur Neuropathique 4 (DN4) questions, and the findings were recorded.

Ethical approval numbered 2025/1204 was obtained from Mersin University for this study. A retrospective review of 12,000 patient files was undertaken. The files of 18 patients diagnosed with SCNE and treated with a superior cluneal nerve (SCN) block were examined. Records pertaining to interventional procedures performed on these patients, pa[1]in levels before the procedure (NRS-1) and DN4-1, two weeks after the procedure (NRS-2 and DN4-2), and three months after the procedure (NRS-3 and DN4-3), as well as neuropathic pain symptoms, were used for this study.

All patients received medial branch blocks of the facet joints based on palpatory lumbar paravertebral tenderness, and 7 patients additionally underwent transforaminal injection. In the case of persistence of pain, the medial branch block was repeated. Patients meeting the following two physical examination criteria were diagnosed with SCNE and received a nerve block: 1) maximal tenderness located on the posterior iliac crest approximately 6–7 cm lateral to the midline and 2) pain triggered upon palpation of this point.

2.2. Interventional Treatment Procedure

Eighteen patients with suspected SCNE underwent ultrasound-guided nerve block using a 90-mm 21G Quincke-type spinal needle. A high-frequency linear probe was placed longitudinally over the posterior superior iliac spine (Figure 1). The probe was advanced cranially until the iliac crest was visualized. A hyperechoic oval structure between the iliac crest and thoracolumbar fascia was identified as the medial branch of the SCNs. Using a longitudinal in-plane approach, 8 mg of dexamethasone and 3 cc of bupivacaine were administered to this area (Figure 2). No complications occurred.

2.3. Statistical Analysis

Normality and variance were tested for each variable using the one-sample Kolmogorov-Smirnov test. Quantitative data were presented as mean and standard deviation and qualitative data as frequency and percentage. Intra-group comparisons were performed using the Wilcoxon signed-rank test. Analyses were conducted using the Statistical Package for Social Sciences (SPSS Inc., Chicago, IL), version 20.0. Statistical significance was set at $p < 0.05$.

3. Results

Of the 18 patients evaluated in this study, 7 were male and 11 (61%) were female. The mean age was 57.27 ± 18.96 years, ranging from 19 to 91 years. Table 1 presents the demographic data of the patients. Only 1 patient had a body mass index (BMI) between 20 and 25, while 12 patients had a BMI between 25 and 30, 2 patients between 30 and 35, and 3 patients above 35. Eleven of the 18 patients had lumbar disc pathology: 2 had a history of lumbar surgery, 1 had listhesis, 2 had lumbar disc herniation, and 6 had lumbar stenosis. Six patients had only low back and hip pain, whereas 12 patients had radicular pain radiating to the leg accompanying low back pain. Prolonged sitting and prolonged standing triggered pain in all patients. Standing up from a seated position was painful in 14 patients, lumbar flexion in 9 patients, and prone positioning in 2 patients. Pain was bilateral in 2 patients.

Evaluation of NRS values showed a significant difference between NRS-1 and NRS-2 ($p = 0.000162$) and between NRS-1 and NRS-3 ($p = 0.000186$). No significant difference was found between NRS-2 and NRS-3 ($p = 0.681$). The mean NRS score was 8.94 before interventional treatment and decreased to 2 after three months. Evaluation of DN4 values showed a significant difference between DN4-1 and DN4-2 ($p = 0.000399$) and between DN4-1 and DN4-3 ($p = 0.001$). No significant difference was found between DN4-2 and DN4-3 ($p = 0.705$). The mean DN4 score was 2.77 before interventional treatment and decreased to 0.5 following the SCN block (Table 2).

Table 1

Demographic data of the patients

	Mean ± SD	95% CI	IQR n (%)
Age	57.27 ± 18.96	47.84–66.70	44.25–68.25
BMI	29.79 ± 4.88	27.36–32.22	26.92–30.3
Pain duration	15 ± 17.83	6.13–23.86	4.75–18
		n (%)	
Sex (F/M)		11 (61.1)/7 (38.9)	
Pain location (R/L)		13 (72.2)/5 (27.8)	
DM		2 (11.1)	
Coxarthrosis		6 (33.3)	
LDH		11 (61.1)	

SD, standard deviation; CI, confidence interval; IQR, interquartile range; F, female; M, male; BMI, body mass index; R, right; L, left; DM, diabetes mellitus; LDH, lumbar disc hernia.

Table 2

Pain and neuropathic pain levels of the patients according to measurement times

	Mean ± SD	95% CI	IQR	Median
NRS-1	8.94 ± 1.05	8.41–9.46	8–10	9
NRS-2	2.16 ± 1.5	1.41–2.91	0.75–3	2
NRS-3	2 ± 1.97	1.02–2.97	0–4	2
DN4-1	2.77 ± 1.62	1.96–3.58	2–4	2.5
DN4-2	0.55 ± 0.61	0.24–0.86	0–1	0.5
DN4-3	0.5 ± 0.85	0.07–0.92	0–1	—

SD, standard deviation; CI, confidence interval; IQR, interquartile range; NRS, Numeric Rating Scale; DN4, Douleur Neuropathique 4;
NRS-1 and DN4-1: before the procedure, NRS-2 and DN4-2: two weeks after the procedure, NRS-3 and DN4-3: three months after the procedure
Post hoc comparison for NRS:
NRS-1 vs. NRS-2: p = 0.000162; NRS-1 vs. NRS-3: p = 0.000186*; NRS-2 vs. NRS-3: p = 0.681*
Post hoc comparison for DN4:
DN4-1 vs. DN4-2: p = 0.000399; DN4-1 vs. DN4-3: p = 0.001*; DN4-2 vs. DN4-3: p = 0.705*
**p < 0.05; Wilcoxon signed-rank test*

4. Discussion

The SCN typically arises from the lateral branches of the posterior rami of T11–L4[6]. These branches pass through the lumbar portion of the erector spinae muscle, pierce the posterior layer of the thoracolumbar fascia, descend subcutaneously, cross the iliac crest as 1–3 nerves, and innervate the skin and all subcutaneous tissues of the upper gluteal region[7]. The SCNs may be classified into medial, intermediate, and lateral branches[8]. It is a purely sensory nerve. The most medial of the SCNs passes intermittently through an osteofibrous tunnel over the iliac crest. This landmark has previously been used for blind nerve block techniques targeting the medial SCN[9].

SCN entrapment was first described by Strong and Davila in 1957[10]. The nerve may become entrapped as it passes through the osteofibrous tunnel. It may cause groin pain and/or leg symptoms in 57% of patients and is therefore frequently misdiagnosed as other lumbar spinal disorders[11]. In our study, 2 patients with a history of lumbar surgery and 2 diagnosed with lumbar disc herniation exhibited radicular pain on the side opposite their spinal pathology. SCNE should be considered, particularly in cases where magnetic resonance imaging findings and patient symptoms do not correspond laterally.

Descriptions of SCN anatomy contain deficiencies and inconsistencies. Many descriptions and diagrams depict three SCN branches crossing the iliac crest and classify them as medial, intermediate, and lateral branches[8,12]. In contrast, a cadaver study by Konno et al.[13] showed that 8 of 23 sides (35%) had more than three branches crossing the iliac crest. Earlier anatomical studies found that the medial branch of the SCN contained cutaneous branches of the dorsal rami of the upper three lumbar nerves[8,14]. Maigne et al.[6] reported that SCNs originated from T11 to L3 nerve roots and that the lateral dorsal rami of L4 and L5 did not have cutaneous branches. Engel and Bogduk[15] examined lumbar dorsal rami and found that the lateral branches of L1–L3 became cutaneous after piercing the thoracolumbar fascia, whereas the L4 lateral branch remained entirely intramuscular and no lateral branch arose from L5. In contrast, Konno et al.[13] identified SCNs arising from T12–L5 nerve roots and noted that the lateral branches of L4 and L5 predominantly passed through an osteofibrous tunnel within the fascia above the iliac crest. This evidence explains how SCN entrapment can lead to sciatica-like radicular pain. In our study, 7 patients with radicular pain and imaging findings consistent with their symptoms initially underwent transforaminal injection. Persistence of pain following transforaminal injection prompted reevaluation, leading to a diagnosis of SCNE. This is critical for preventing unnecessary surgeries.

Medical treatment, nerve block, and surgical treatment are recommended for SCN entrapment[16]. Ermis et al.[17] successfully treated SCNE in a series of 25 cases using nerve blocks alone. They performed one block in 20 cases, two blocks in 3 cases, and three blocks in 2 cases. In another study, Kuniya et al.[18] reported that 68% of their patients experienced more than 50% pain relief after 1–3 SCN blocks. In our study, 5 patients experienced increased pain after approximately six months and underwent a second block.

Women constitute 55–63% of all patients with SCNE; however, the roles of body habitus, spinal alignment, and childbirth have not been reported. Similarly, 61% of our patients were women. Although the average onset age ranges between 55 and 68 years, SCNE has also been reported in younger individuals such as soldiers and athletes[18,19]. Our youngest patient, aged 19 years, was a professional athlete.

Vertebral fractures increase susceptibility to SCNE[18]. The mechanism is considered to involve irritation of the SCN by unstable facet joints or stretching of the nerve due to spinal kyphosis. Although none of our patients had vertebral fractures, 6 had ipsilateral coxarthrosis. In addition, similar to coxarthrosis, BMI has not previously been identified as a risk factor in the literature. The case presented by Chauhan et al. [20] describes SCNE developing after postlaminectomy. Although not identified as a risk factor, the patient had a BMI of 32 kg/m2 and ipsilateral coxarthrosis. In our study, nearly all patients except 1 had elevated BMI. Prospective studies with larger patient numbers are needed to determine the risk factors for SCNE.

5. Conclusion

SCNE clinically resembles other causes of low back and leg pain. Although considered rare, it is estimated that 14% of patients with low back pain may meet SCNE criteria[18]. This study demonstrates that SCNE should be considered in patients with chronic low back and leg pain, especially in cases where clinical findings cannot be fully explained by imaging. The short-term efficacy of SCN block observed in this study is consistent with previous literature. However, the presence of significant concomitant spinal pathologies in most patients represents a major confounding factor. The retrospective design, absence of a control group, small sample size, and short follow-up period limit the ability to draw causal conclusions. Additionally, baseline DN4 scores were relatively low, suggesting that neuropathic features were mild in some patients. This may indicate that SCNE can present without prominent neuropathic characteristics.

The hypothesis that widespread recognition of SCNE may reduce unnecessary spinal surgeries remains speculative and should be investigated using prospective controlled studies.

Statement of ethics

Ethical approval numbered 2025/1204 was obtained from Mer¬sin University for this study. The study was conducted in accordance with the Declaration of Helsinki and local regulatory requirements.

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No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by both authors.

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Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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