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Characteristics of Low Back Pain due to Superior Cluneal Nerve Entrapment Neuropathy

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Study Design: Retrospective analysis.

Purpose: The present study aimed to investigate the features of low back pain (LBP) due to superior cluneal nerve (SCN) entrapment neuropathy (SCN-EN) using the Roland Morris Disability Questionnaire (RMDQ), and to analyze the differences between LBP due to SCN-EN and lumbar spinal canal stenosis (LSS).

Overview of Literature: The SCN is derived from the cutaneous branches of the dorsal rami of T11–L5 and passes through the thoracolumbar fascia. LBP due to SCN-EN is exacerbated by various types of lumbar movement, and its features remain to be fully elucidated, often resulting in the misdiagnosis of lumbar spine disorder.

Methods: The present study included 35 consecutive patients with SCN-EN treated via nerve blocks or surgical release between April 2016 and August 2017 (SCN-EN group; 16 men, 19 women; mean age, 65.5±17.0 years; age range, 19–89 years). During the same period, 33 patients were surgically treated with LSS (LSS group; 19 men, 14 women; mean age, 65.3±12.0 years; age range, 35–84 years). The characteristics of LBP were then compared between patients with SCN-EN and those with LSS using the RMDQ.

Results: The duration of disease was significantly longer in the SCN-EN group than in the LSS group (26.0 vs. 16.0 months, p=0.012). Median RMDQ scores were significantly higher in the SCN-EN group (13 points; interquartile range, 8–15 points) than in the LSS group (7 points; interquartile range, 4–9 points; p<0.001). For seven items (question number 1, 8, 11, and 20–23), the ratio of positive responses was higher in the SCN-EN group than in the LSS group.

Conclusions: Patients with SCN-EN exhibit significantly higher RMDQ scores and greater levels of disability due to LBP than patients with LSS. The findings further demonstrate that SCN-EN may affect physical and psychological function.

Keywords: Peripheral nerve; Nerve compression syndrome; Low back pain; Spine

Introduction

Low back pain (LBP) is a major health problem that can have a profound effect on an individual's level of functional activity [1]. Approximately two-thirds of adults experience LBP during their lifetime [2]. Although experimental studies have indicated that LBP may originate from various spinal structures, its etiology is non-specific in 85% of patients [2]. The superior cluneal nerve (SCN) is derived from the cutaneous branches of the dorsal rami

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of T11–L5 and passes through the thoracolumbar fascia [3-7]. First described in 1957, SCN entrapment neuropathy (SCN-EN) has been documented as a cause of LBP [3]. According to Kuniya et al. [8], the incidence of SCN-EN in patients with LBP is unexpectedly high (14%). LBP due to SCN-EN is exacerbated by various types of lumbar movement [5,7-9], and its features remain to be fully elucidated, often resulting in the misdiagnosis of lumbar spine disorder.

Several back-specific, self-reported disability scales are available for the assessment of functional outcomes related to LBP [9,10]. The Roland Morris Disability Questionnaire (RMDQ) is widely accepted for the evaluation of pain-related disabilities and health-related quality of life [11,12]. In developing the RMDQ, a back-specific scale was incorporated by selecting 24 items from the Sickness Impact Profile (SIP) and adding the phrase "because of my back." Therefore, various characteristics for evaluating LBP are included. Many surgeons have experience treating lumbar spinal canal stenosis (LSS). To assist spinal surgeons in understanding the characteristics of LBP due to SCN-EN, the present study compared the characteristics of LBP and LSS using the RMDQ.

Materials and Methods

Our study was approved by the institutional ethics committee of Kushiro Rosai Hospital (approval no., 28-3); prior written informed consent was obtained from all patients included in this study

1. Patients

The present study included 35 consecutive patients with SCN-EN treated via nerve blocks or surgical release between April 2016 and August 2017 (SCN-EN group; 16 men, 19 women; mean age, 65.5±17.0 years; age range, 19–89 years). The median duration of disease was 26.0 months (range, 12.0–60.0 months). Among the 35 patients, eight (22.9%) had a history of lumbar surgery for the treatment of LSS, which had occurred a mean of 69.4 months (range, 25–125 months) prior to the study (posterior decompression with and without fusion, n=4 and 4, respectively).

During the same period, 33 patients were surgically treated with LSS (LSS group; 19 men, 14 women; mean age, 65.3±12.0 years; age range, 35–84 years), who were without lumbar disk herniation, vertebral fracture, or severe osteoporosis. The median duration of disease in the LSS group was 16.0 months (range, 6.5–26.5 months). No patient in the LSS group experienced LBP meeting the diagnostic criteria for SCN-EN.

To analyze the characteristics of LBP in patients with SCN-EN and those with LSS, pre-treatment RMDQ scores were compared between the groups. Patients who could not be evaluated using the RMDQ due to dementia were excluded.

For patients with suspected sacroiliac joint (SIJ)-related features, an SIJ block was performed to confirm the presence or absence of SIJ disorder [13]. No patient recruited in the cohort exhibited SIJ pain.

2. Diagnosis and treatment of superior cluneal nerve-entrapment neuropathy

The proposed criteria for a diagnosis of SCN-EN include unilateral or bilateral LBP involving the iliac crest and buttock, a trigger point over the posterior iliac crest 7 cm from the midline (corresponding to the nerve compression zone), and numbness and radiating pain in the SCN region (Tinel-like signs) during compression of the trigger point [5-7,14,15]. For diagnostic purposes, the SCN was blocked by injecting 2 mL of 1% lidocaine at the trigger points in the buttock. Diagnoses of SCN-EN were confirmed when the patients experienced symptoms of relief of >75% and reported 75% reduction in pain within 2 hours following the nerve block [5-7].

In patients with SCN-EN whose pain is not relieved by conservative treatment with repeated SCN blocks, surgical release of the entrapment is performed [5-7]. In the present study, patients remained in the prone position while local anesthesia was administered to the skin. A 6-cm skin incision was then made across the trigger point, located 7–8 cm from the midline of the iliac crest. The subcutaneous soft tissue was carefully dissected and the SCNs were identified. The SCN slants from the caudolateral to rostromedial and penetrates the thoracolumbar fascia around the iliac crest. The orifice of the thoracolumbar fascia was opened with microscissors in a distal-to-rostral direction along the SCN to release the entrapped SCN, and SCN decompression was confirmed by observing posterior bulge of the SCN. The thoracolumbar fascia was then cut until reaching the point at which the SCN was free of kinks. Complete decompression was confirmed by the absence of Tinel-like

signs due to direct SCN compression in the surgical field.

3. Evaluation of outcomes

All statistical analyses were performed using IBM SPSS software ver. 25.0 (IBM Corp., Armonk, NY, USA). Fischer's exact tests were used to compare gender and RMDQ scores between the SCN-EN and LSS groups. Mann–Whitney *U*-tests and Student *t*-tests were used to compare age, duration of disease, and total RMDQ score between the two groups. The level of statistical significance was set at $p<0.05$.

Results

1. Characteristics of patients with superior cluneal nerve-entrapment neuropathy and lumbar spinal canal stenosis

In the SCN-EN group, 25 patients (71.4%) were treated via SCN blocks only, whereas 10 patients (28.6%) required an additional surgical release for SCN entrapment. Among all 35 patients, 21 (60.0%) experienced LBP only, whereas 14 (40.0%) experienced LBP associated with leg symptoms. No patients experienced leg symptoms only. In the LSS group, 30 patients experienced LBP associated with leg numbness or pain, whereas three patients (9.1%) experienced leg symptoms only. The duration of disease was significantly longer in the SCN-EN group than in the LSS group (26.0 versus 16.0 months, respectively; $p=0.012$).

2. Differences in the Roland Morris Disability Questionnaire scores between patients with superior cluneal nerve-entrapment neuropathy and those with lumbar spinal canal stenosis

The median RMDQ scores in the SCN-EN and LSS groups were 13 points (interquartile range, 8–15 points) and 7 points (interquartile range, 4–9 points), respectively. Therefore, the RMDQ scores were significantly higher in the SCN-EN group than in the LSS group ($p<0.001$).

To further examine the association between LBP due to SCN-EN and RMDQ scores, each of the 24 RMDQ items was compared between the SCN-EN and LSS groups (Table 1). For seven items (question number [QN]: 1, 8, 11, 20–23], the ratio of positive responses was higher in the SCN-EN group than in the LSS group: staying at home most of the time (QN1), trying to get other people to do things (QN8), trying not to bend or kneel down (QN11), sitting down for most of the day (QN20), avoiding heavy jobs around the house (QN21), tending to be more irritable and short-tempered with people than usual (QN22), and going upstairs more slowly than usual (QN23). There were no high scores in the LSS group (Table 2).

Table 1. Comparison between SCNEN and LSS in patient demographics

Variable	SCNEN (n=35)	LSS (n=33)	*p*-value
Age (yr)	65.5±17.0	65.3±12.0	NS
Male:female	16:19	19:14	NS
Duration of disease (mo)	26.0 (12.0–60.0)	16.0 (6.5–26.5)	0.012
RMDQ score	13.0 (8.0–15.0)	7.0 (4.0–9.0)	<0.001

Values are presented as mean±standard deviation, number, or median (interquartile range).
SCNEN, superior cluneal nerve entrapment neuropathy; LSS, lumbar spinal canal stenosis; NS, not significant; RMDQ, Roland Morris Disability Questionnaire.

Discussion

In the present study, RMDQ data were compared between patients with SCN-EN and LSS. The results indicated that patients with SCN-EN exhibited longer disease duration and a significantly higher ratio of positive responses to several RMDQ items than those with LSS.

1. Roland Morris Disability Questionnaire scores in the superior cluneal nerve-entrapment neuropathy group

The SCN provides sensory innervation to areas of the posterior iliac crest and buttocks. The SCN originates from the lower thoracic and lumbar spinal nerves, passes through the thoracolumbar fascia, and can be entrapped at the penetrating orifice of the thoracolumbar fascia [4,14]. The anatomic and functional bases for the development of SCN-EN include a rigid fascial edge and stretching of the gluteus maximus muscle and skin over a large area during flexion of the hip joint [6,16,17]. Several reports have suggested that 1.6%–14.0% of all cases of LBP involve SCN-EN [5,8,15]. Various postures and motions can aggravate LBP caused by SCN-EN, resulting in intermittent claudication during walking. Additional studies have indicated that LBP is accompanied by leg symptoms in 47%–53% of

Table 2. Comparison between SCNEN and LSS in each 24 items of the Roland Morris Disability Questionnaire score

No.	Question	SCNEN	LSS	*p*-value
1.	I stay at home most of the time because of my back.	20 (57)	5 (15)	<0.001
2.	I change position frequently to try and get my back comfortable.	24 (69)	17 (52)	NS
3.	I walk more slowly than usual because of my back.	27 (77)	20 (61)	NS
4.	Because of my back I am not doing any of the jobs that I usually do around the house.	13 (37)	5 (15)	NS
5.	Because of my back, I use a handrail to get upstairs.	20 (57)	18 (55)	NS
6.	Because of my back, I lie down to rest more often.	24 (69)	15 (46)	NS
7.	Because of my back, I have to hold on to something to get out of an easy chair.	13 (37)	10 (30)	NS
8.	Because of my back, I try to get other people to do things for me.	13 (37)	1 (3)	0.001
9.	I get dressed more slowly then usual because of my back.	14 (40)	6 (18)	NS
10.	I only stand for short periods of time because of my back.	22 (63)	17 (52)	NS
11.	Because of my back, I try not to bend or kneel down.	21 (60)	11 (33)	0.03
12.	I find it difficult to get out of a chair because of my back.	9 (26)	5 (15)	NS
13.	My back is painful almost all the time.	17 (49)	9 (27)	NS
14.	I find it difficult to turn over in bed because of my back.	17 (49)	12 (36)	NS
15.	My appetite is not very good because of my back pain.	7 (20)	1 (3)	NS
16.	I have trouble putting on my socks (or stockings) because of the pain in my back.	15 (43)	11 (33)	NS
17.	I only walk short distances because of my back.	21 (60)	17 (52)	NS
18.	I sleep less well on my back.	16 (46)	11 (33)	NS
19.	Because of my back pain, I get dressed with help from someone else.	2 (6)	0 (0)	NS
20.	I sit down for most of the day because of my back.	14 (40)	2 (6.1)	0.001
21.	I avoid heavy jobs around the house because of my back.	25 (71)	8 (24)	<0.001
22.	Because of my back pain, I am more irritable and bad tempered with people than usual.	9 (26)	2 (6)	0.046
23.	Because of my back, I go upstairs more slowly than usual.	28 (80)	17 (52)	0.02
24.	I stay in bed most of the time because of my back.	5 (14)	1 (3)	NS

Values are presented as number (%).
SCNEN, superior cluneal nerve entrapment neuropathy; LSS, lumbar spinal canal stenosis; NS, not significant.

all SCN-EN cases [3,8,15,18]. In the present study, 40% of all patients with SCN-EN experienced LBP accompanied by leg symptoms. As these symptoms are similar to those of lumbar disease, a differential diagnosis is necessary.

The RMDQ was developed in 1983 based on the SIP, which evaluates health status based on 136 items encompassing all aspects of physical and mental function [19]. A total of 24 items were selected from the SIP by the original authors as they were specifically associated with physical functions that were likely to be affected by LBP [20]. The RMDQ is short, easy to complete, and readily understood by patients. These characteristics, in addition to evidence of its scientific validity, have led to its widespread use in clinical settings [6,8,21-23]. The present study investigated differences in disability associated with LBP due to SCN-EN and LSS based on RMDQ scores. The findings indicated that median RNDQ scores were significantly higher in the SCN-EN group (13 points; interquartile range, 8–15 points) than in the LSS group (7 points; interquartile range, 4–9 points).

Ermis et al. [24] reported that, although lower mental health scores were obtained on the 36-item Short-Form Health Survey, patients with SCN-EN exhibited no differences in LBP relative to those with lumbar disk herniation. Furthermore, Kuniya et al. [8] reported that the average RMDQ scores were higher in patients with SCN-EN than in those without, even though there were no differences in visual analog scale scores between the groups. These results suggest that higher RMDQ scores reflect the intensity of LBP and its aggravation due to various postures and movements. Such findings also indicate that LBP due to SCN-EN may be affected more markedly by

lumbar movement than other lumbar disorders.

2. Characteristics of low back pain due to superior cluneal nerve-entrapment neuropathy based on the Roland Morris Disability Questionnaire scores

Previous reports have indicated that LBP due to SCN-EN is exacerbated by lumbar movements, including extension, bending, rotating, prolonged standing, sitting, and walking [5,8]. As these symptoms are similar to those of lumbar disorders, there is a potential for misdiagnosis [8,25,26]. Knowledge of the detailed characteristics of LBP due to SCN-EN may assist in reducing the rate of misdiagnosis. In the present study, each of the 24 items of the RMDQ was compared between the SCN-EN and LSS groups. The findings indicated that the ratio of positive responses was significantly higher in the SCN-EN group for seven items, which may represent the characteristics of LBP due to SCN-EN. The RMDQ findings demonstrated that there are differences in the characteristics of LBP between patients with SCN-EN and those with LSS. These results may assist clinicians in suspecting and diagnosing LBP in patients with SCN-EN, although diagnosis using only the RMDQ may be difficult.

Among the seven significant items, QN1, QN11, QN20, QN21, and QN23 reflect the impact of lumbar movement, indicating that rest may decrease LBP due to SCN-EN. Kuniya et al. [8] reported that the characteristic painful limping and limitations in lumbar motion associated with SCN-EN differ from those observed in patients with lumbar disease. Although these characteristics may reflect general LBP, they may also reflect specific attributes of LBP due to SCN-EN.

The rates of positive responses to QN8, QN20, and QN22, which reflect psychological factors associated with LBP, were significantly higher in the SCN-EN group than in the LSS group [21]. Although the rate of positive responses to QN15, which also reflects psychological elements, tended to be higher in the SCN-EN group, this difference was not significant [21]. Ermis et al. [24] reported that SCN-EN may be associated with a higher rate of psychological problems than lumbar disk herniation due to a long history of misdiagnosed or unrecognized cluneal nerve entrapment prior to treatment. In accordance with this hypothesis, the findings of the present study indicated that the duration of disease was significantly longer in the SCN-EN group than in the LSS group. Other items, including QN8 and QN21, which reflect dependent behavior, may reflect several conditions caused by LBP.

3. Limitations

The present study possesses some limitations of note, including the small sample size. In addition, LBP was rated as more severe in the SCN-EN group than in the LSS group. It is possible that patients with more severe pain due to SCN-EN consulted with our hospital, which utilizes an aggressive approach to the treatment of non-specific LBP. LBP in the LSS group of the present study was equivalent to or marginally more severe than that described in previous reports [8,22,23]. Therefore, matching the patient groups based on the severity of LBP may influence these results. Furthermore, the analysis in the present study was retrospective; therefore, it was not possible to evaluate psychosocial factors associated with LBP in either group, despite excluding patients with obvious psychological factors [27]. In addition, it was not possible to investigate leg symptoms accompanying LBP in patients with SCN-EN in detail. Future studies aim to examine differences in leg symptoms between patients with SCN-EN and LSS using a self-administered questionnaire, such as the Zurich Claudication Questionnaire. SCN-EN has been diagnosed in the presence of other lumbar spine disorders, including LSS, lumbar disc herniation, scoliosis, and vertebral fracture [5,6,8]. Although none of the patients with LSS in the present study met the diagnostic criteria for SCN-EN, clinicians should consider the presence of other lumbar disorders when encountering patients with SCN-EN in clinical practice. Facet joint osteoarthritis (OA) has been reported as a source of LBP, eliciting pain that radiates to one or both buttocks in addition to leg symptoms. These symptoms are similar to those of SCN-EN, which may make differential diagnosis difficult. Although a definitive diagnosis of facet joint OA-mediated pain may require facet joint blocks, this was not in the present study. Therefore, for certain patients in the study cohort, LBP may have been associated with facet joint OA, despite all patients in the SCN group meeting the diagnostic criteria for SCN-EN.

Conclusions

In the present study, patients with SCN-EN exhibited significantly higher RMDQ scores and greater levels of

disability due to LBP compared with patients with LSS. These findings further demonstrate that SCN-EN can affect physical and psychological functions. Further studies are required to fully elucidate the specific characteristics of LBP due to SCN-EN.

Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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