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ORIGINAL ARTICLE - PERIPHERAL NERVES

# Clinical features of middle cluneal nerve entrapment neuropathy

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## Abstract

**Background** Entrapment of the middle cluneal nerve (MCN), a peripheral nerve in the buttock, can elicit low back pain (LBP). We examined the epidemiology, clinical course, and treatment of MCN entrapment (MCN-EN).

**Methods** Among 383 LBP patients who visited our institute, 105 were admitted for intractable LBP. They were 42 men and 63 women; their average age was 64 years. Based on clinical symptoms, palpation, and the effects of MCN block, we suspected MCN-EN in these 105 patients, 50 of whom are our study subjects. Their treatment outcomes were assessed at the time of discharge and at follow-up visits.

**Results** MCN-EN was diagnosed in 50 of the 383 patients (13.1%) and they were hospitalized. In 43 (11.2%), MCN-EN was associated with other diseases (superior cluneal nerve entrapment, $n = 21$, sacroiliac joint pain, $n = 9$, other, $n = 13$). At the time of discharge, the symptoms of patients with LBP due to MCN-EN were significantly improved by repeat MCN blocks. In 7 of the 383 patients (1.8%), LBP was improved by only MCN blocks; 5 of them had reported leg symptoms in the dorsal part of the thigh. After discharge, 22 of the 50 hospitalized patients required no additional treatments after 2–5 blocks; 19 required only conservative treatment, and 9 underwent microsurgical release of the MCN.

**Conclusions** We confirmed MCN-EN in 50 of 105 patients admitted for intractable LBP. Repeat MCN blocks were effective in 22 patients; 19 required additional conservative treatment, and 9 underwent surgery. Buttock pain radiating to the posterior thigh was an MCN-EN symptom that has been diagnosed as pseudo-sciatica. Before subjecting patients with intractable LBP to surgery, the presence of MCN-EN must be ruled out.

**Keywords** Buttock pain · Low back pain · Middle cluneal nerve · Para-lumbar spine disease · Pseudo-sciatica

## Introduction

The origin of low back pain (LBP) is heterogeneous; its etiology can be complex and its diagnosis difficult [1]. Superior cluneal nerve entrapment (SCN-EN) is a peripheral neuropathy that can elicit LBP. The reported incidence of SCN-EN in patients with LBP ranges from 1.6 to 14% [2, 3]. Specific treatments are SCN-EN blocking and microsurgical release under local anesthesia [2, 4].

The middle cluneal nerve (MCN) is a peripheral nerve in the buttock. It penetrates the gluteus maximus muscle. Among 30 cadaveric hemipelves, 30% of MCNs traversed under the long posterior sacroiliac ligament [5], suggesting that MCN-EN can also elicit LBP. It can be treated by MCN block and by microsurgical release under local anesthesia [6, 7]. MCN decompression surgery obtained good clinical outcomes in patients with LBP due to MCN-EN [6–9]. High-frequency thermal coagulation may be useful for controlling intractable LBP due to MCN-EN [10].

We performed this study to shed needed light on the epidemiology, clinical course, and the outcome of block treatment in patients with LBP due to MCN-EN [6–8, 11, 12].

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## Materials and methods

### Patients

This study was approved by the ethics committee of our hospital. Prior written informed consent for inclusion in this study was obtained from all patients at the time of admission.

Between May 2016 and August 2017, 383 patients consulted us for their LBP. Lumbar magnetic resonance imaging (MRI) and X-ray studies were performed in the outpatient clinic. We excluded from this study 2 patients with LBP due to spinal infection and 12 with lumbar vertebral fracture. Also excluded were 55 with LBP due to lumbar spinal canal stenosis and 20 with lumbar disk herniation based on radiological/neurological findings. Among the remaining 294 patients, we excluded 189 whose LBP was alleviated by oral medication. We admitted 105 patients with tenderness on the back; their intractable LBP affected their activities of daily living (ADL). Four of them were included in our earlier study [12] that focused on non-specific LBP without leg symptoms. Although their sacroiliac joint (SIJ) pain score was high, they were successfully treated by addressing MCN-EN rather than by administering sacroiliac joint blocks.

In the 105 admitted patients, pain was not controlled by oral medications such as nonsteroidal anti-inflammatory drugs, pregabalin, and tramadol. We excluded from this study patients with dementia, malignant tumors, acute fractures or acute trauma, patients who had undergone iliac crest harvest for grafting, and patients whose pain was relieved by conservative treatment. They were 42 men and 63 women; their average age was 64 years (range 16–90 years). LBP was bilateral in 46 patients and unilateral in 59 patients. The diagnosis of LBP due to MCN-EN was based on earlier reports [6, 8].

### Diagnostic criteria

The SCN is defined as the nerve that crosses over the iliac crest at the cranial side of the posterior superior iliac spine (PSIS) and the MCN is the nerve that crosses over the iliac crest on the caudal side of the PSIS. When either the nerve or nerve branches are entrapped near the iliac crest, Tinel-like signs are observed at the entrapment point(s) and patients report pain in the affected area. In the presence of SCN-EN, the Tinel-like sign is elicited cranial to the PSIS, and pain is experienced around the iliac crest and lateral buttock. MCN-EN, on the other hand, produces a Tinel-like sign caudal to the PSIS and pain around the medial buttock. A differential diagnosis requires direct local anesthetic blockage at the site of the Tinel-like sign.

We diagnosed MCN-EN when LBP involved the MCN area and the trigger, i.e., the nerve entrapment point, was 35 mm caudal from the PSIS and slightly lateral from the edge of the iliac crest (Fig. 1), when compression of the trigger point elicited radiating pain, and when local MCN blocks with 2 ml of 1% lidocaine reduced pain in the MCN area by more than 50% within 2 h.

In patients with SCN-EN, LBP involves the iliac crest and lateral buttock. They report numbness and radiating pain in the SCN area (Tinel sign) upon compression of the trigger point. For diagnostic purposes, we blocked the SCN by injecting 2 ml of 1% lidocaine at the trigger point in the buttock. Symptom relief by more than 75% within 2 h after delivery of the nerve block confirmed our diagnosis of SCN-EN.

### Treatment

To treat LBP from MCN-EN, we delivered multiple MCN blocks (2 ml of 1% lidocaine) during hospitalization; oral medication was administered as needed. After discharge from the hospital, the patients were followed on an outpatient basis for a median of 18.4 months. Only patients whose MCN-EN pain was only transiently relieved by MCN blocks and recurred despite 3-month observation therapy were considered candidates for microsurgical release of the MCN [8, 12].

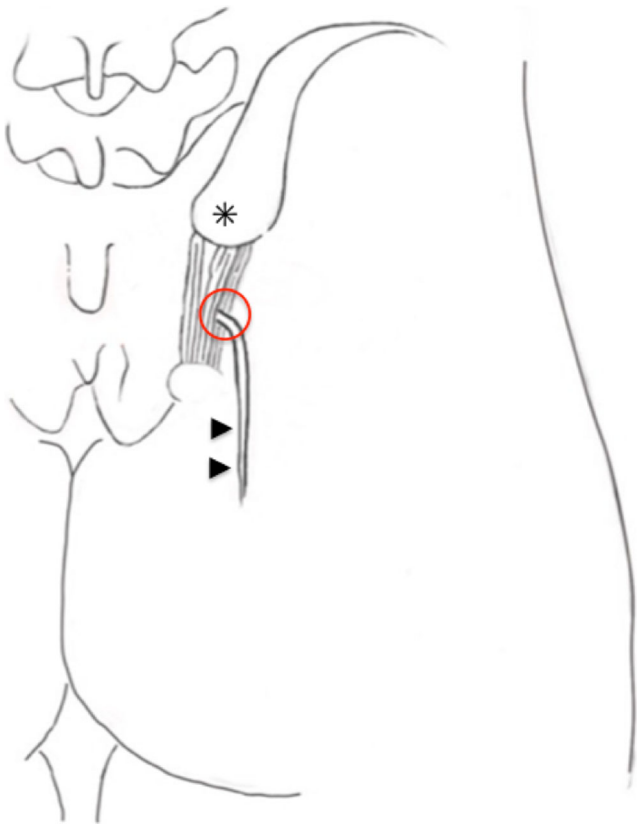

**Fig. 1** The trigger point on the middle cluneal nerve (arrowhead) is located 35 mm caudal from the posterior superior iliac spine (asterisk) at a slightly lateral site

## Evaluation methods

We evaluated the severity of LBP based on the numerical rating scale (NRS), the Japanese Orthopedic Association (JOA) score, and the Roland-Morris Disability Questionnaire (RDQ). The scores recorded at the time of admission and at the last outpatient visit were compared to assess the effectiveness of our treatment. On the NRS, the severity of LBP arising in the MCN area is scored by patient self-assessment from 0 (no pain) to 10 (severe pain). On the JOA score, the scores range from 0 to 29 with 29 indicating the absence of symptoms. The physician rates the degree of subjective symptoms, objective findings, the effect of LBP on the patient's ADL, and bladder and bowel dysfunction. The RDQ reflects the patient's subjective assessment of the impact of LBP on the ADL. The range is from 0 to 24; the higher the score, the more severe is the pain.

## Statistical analysis

All continuous variables (age, length of hospitalization, number of blocks) were expressed as the mean with the range (minimal to maximal), as discrete variables (NRS, JOA, and RDQ) and as the mean with the standard deviation (SD). Prism 8.42 (GraphPad Software, Inc, La Jolla, CA) was used for subsequent statistical evaluations. To quantify the NRS, JOA, and RDQ data, we performed the 2-tailed Wilcoxon matched-pairs signed-rank test. The significance level was set at $p < 0.05$.

# Results

## Incidence of LBP due to MCN-EN

Among the 105 admitted LBP patients, 85 (81%) reported pain in the MCN area; MCN blocks were effective in 50 of the 85 patients (59%) and resulted in a diagnosis of MCN-EN (bilateral $n = 19$, unilateral $n = 31$) (Fig. 2). Four of the 50 patients, including one who underwent surgery, were part of an earlier study [12]. The average patient age (18 males, 32 females) was 67.0 years (range 16–87 years) (Table 1). During their hospitalization lasting an average of 13.8 days (range 4–23 days), they underwent a median of 2 blocks (range 1–5).

As shown in Table 2, in 43 patients, MCN entrapment was associated with or contributed to other diseases. Nerve root blocks controlled leg pain due to radiculopathy in 5 patients. Comparison of pre-treatment and discharge scores showed that the NRS fell from 7.6 ± 1.5 to 1.9 ± 1.5, the RDQ score from 9.9 ± 5.0 to 2.2 ± 2.7, and the JOA score rose from 15.6 ± 5.5 to 22.5 ± 5.1 (all $p < 0.05$) (Fig. 3).

In 3 males and 4 females with a diagnosis of MCN-EN alone (pure MCN entrapment) (bilateral $n = 2$, unilateral $n = 5$), LBP abatement required MCN blocks only; their average age was 72.3 years (range 52–84 years). Of these 7 patients, 5 reported leg symptoms, i.e., pain and/or numbness in the dorsal part of the thigh continuing from the area affected by the MCN.

**Table 1** Characteristics at the time of admission of 50 low back pain patients with middle cluneal nerve entrapment

| | |
|---|---|
| Average age (years, range) | 67.0 (16–87) |
| Female/male | 32/18 |
| Average NRS (range) | 7.6 (5–10) |
| Average JOA (range) | 15.6 (5–27) |
| Average RDQ (range) | 9.9 (2–21) |
| Unilateral/bilateral | 31/19 |

*NRS*, numerical rating scale; *JOA*, Japanese Orthopedic Association score; *RDQ*, Roland-Morris Disability Questionnaire score

## Clinical course of our 50 LBP patients treated for MCN-EN

The median post-discharge follow-up term was 18.4 months (range 1–34 months). Of the 50 patients, 22 (including 4 with pure MCN-EN) required no additional treatment after receiving a median of 2 blocks (range 1–5) during their hospitalization. Their average NRS fell from 7.8 ± 1.4 before treatment to 2.0 ± 1.7 at the time of discharge; it was 1.1 ± 1.4 at the last follow-up. Of the other 28 patients who required additional treatment; 8 (including one patient with pure MCN-EN) received oral medication; 11 (including one patient with pure MCN-EN) underwent repeat nerve blocks. The average NRS of these 19 patients fell from 7.0 ± 1.5 before treatment to 1.8 ± 1.5 at the time of discharge; at the last follow-up, it was 3.1 ± 2.4. The other 9 patients (including one patient with pure MCN-EN), 2 of whom presented with bilateral entrapment, were treated by the microsurgical release of the MCN. A single branch was addressed on 7 and 2 branches on 4 sides (including 2 patients with unilateral MCN-EN alone). The NRS of these 9 patients changed from 8.2 ± 1.5 before treatment to 1.7 ± 1.0 after nerve block therapy. However, it rose to 7.8 ± 1.2 during follow-up; after surgical treatment, it was 1.0 ± 0.7 at the last follow-up visit.

# Discussion

Our findings suggest that before subjecting patients with intractable LBP to surgery, a differential diagnosis must be obtained and the presence of MCN-EN must be assessed.

However, as coexisting diseases in patients with LBP due to MCN-EN have been reported [6–8], it must not be assumed that lower limb symptoms are solely ascribable to MCN-EN.

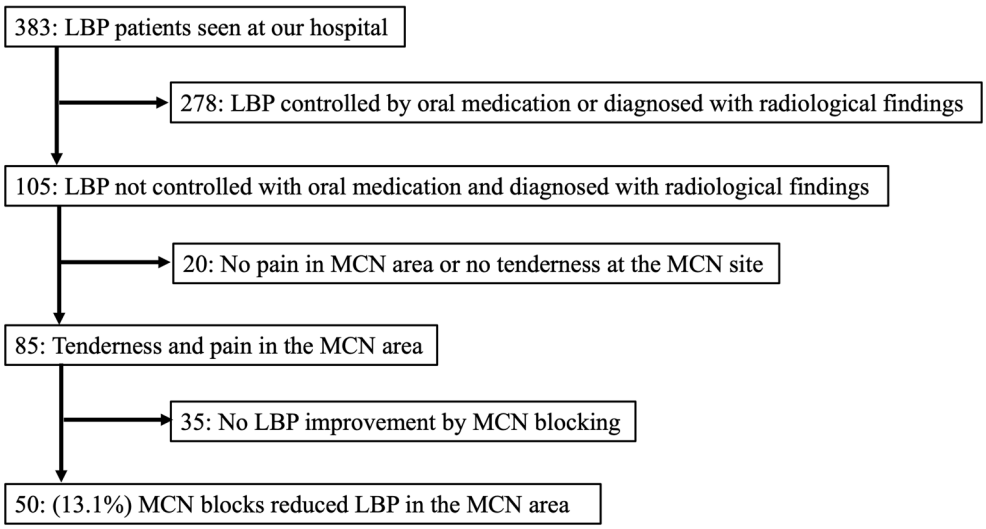


**Fig. 2** Flowchart for diagnosing middle cluneal nerve entrapment. LBP, low back pain; MCN, middle cluneal nerve

LBP: low back pain, MCN: middle cluneal nerve

In 43 of our patients with MCN-EN, there was an association with SIJ pain or a contribution by other diseases such as SCN-EN and radiculopathy.

Like the MCN, the SCN is a peripheral nerve in the buttock. Others [2, 13–15] reported patients with SCN-EN who suffered leg symptoms radiating to the posterior thigh. This has been described as pseudo-sciatica [15, 16]. Of our 7 patients with pure MCN-EN, 5 experienced buttock pain radiating to the posterior thigh; their leg and buttock symptoms were improved by MCN blocks alone.

MCN blocks to treat MCN-EN are minimally invasive and can be effective [8, 11]. SCN-EN, a peripheral nerve entrapment neuropathy similar to MCN-EN, was successfully treated by SCN block in 34–100% of patients reported earlier [2, 3, 17, 18]. Kuniya et al. [2] who followed LBP patients with SCN disorder for 3 weeks post-SCN block therapy reported that 68% of their patients experienced pain relief of more than 50%. However, the success rate of MCN blocks in patients with MCN-EN remained unclear. We found that 22 of our 50 hospitalized LBP patients with MCN-EN responded to a median of 2 blocks (range 2–5). Their status was evaluated in the outpatient clinic after discharge and they did not require additional MCN blocks. However, for symptom improvement, the other 28 needed additional treatment with oral medication, repeat MCN blocks, or microsurgical MCN release which had been reported as effective [6–8, 11]. Matsumoto et al. [7] reported 11 patients with intractable LBP due to MCN-EN; 9 presented with lower limb symptoms. After microsurgical MCN release, all 11 reported significant symptom amelioration with no surgery-related complications. We also found that in our operated patients, the procedure was effective and we encountered no peri- or post-treatment complications.

In our series, 4 of 11 sides featured multiple branches. A cadaver study had revealed that 11% of MCNs harbored 2 branches [5]. Among the patients operated by Matsumoto et al. [7], of 13 sides, 2 had more than 2 branches; one side bore 2 and one side 3 branches. They warned that when the presence of multiple MCN branches is not detected during surgery, the treatment outcome can be poor.

**Table 2** List of coexisting diseases in 50 low back pain patients with middle cluneal nerve entrapment

| | *n* |
|---|---|
| Superior cluneal nerve entrapment | 21 |
| Sacroiliac joint pain | 9 |
| Radiculopathy | 5 |
| Others (several diseases or others) | 8 |
| None | 7 |

## Study limitations

Our retrospective, the single-center study has some limitations. We had no controls, the number of patients was small and included only hospitalized patients, our diagnosis was based on the effect of blocking, and the post-treatment follow-up period was short. For an accurate assessment of the treatment outcomes, our patients are undergoing long-term follow-up to evaluate post-treatment recurrence rates.

At this point, our findings are preliminary and cannot be extrapolated to other patients with LBP due to MCN-EN. However, as little is known on the epidemiology of MCN-EN, they may lead to a better understanding of the disease. Also, the placebo effect and regression to the mean must be

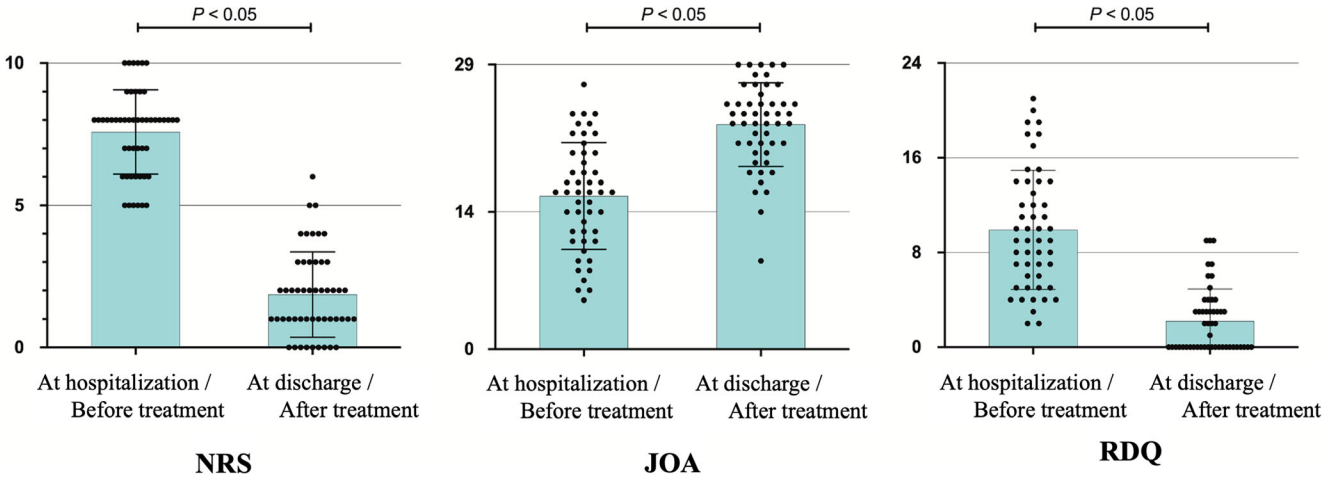


**Fig. 3** To evaluate the clinical outcomes in 50 patients treated for intractable low back pain due to middle cluneal nerve entrapment, we compared the numerical rating scale (NRS), the Japanese Orthopedic Association score (JOA), and the Roland-Morris Disability Questionnaire (RDQ) score recorded at the time of admission and discharge. Boxes and error bars express the mean value and standard deviation; individual data points are plotted

considered. The result of MCN blockage is the best clue for a diagnosis of MCN-EN. However, as the injection of the blocking agent per se may yield a false-positive finding [19–21], we may have overestimated the incidence of MCN-EN. Therefore, our retrospectively acquired findings must be confirmed by prospective studies using placebos and comparative studies on the natural clinical course of patients whose disease is neither surgically nor medically addressed may be needed because the needle injection per se may have contributed to the relief from intractable pain reported by our patients.

## Conclusion

Among 383 patients with intractable LBP, 50 (13.1%) benefited from MCN-EN treatment. Among these 50 patients, 7 presented with MCN-EN only; in 43, MCN-EN was associated with other diseases. The symptom of MCN-EN was buttock pain radiating to the posterior thigh and similar to an entity known as pseudo-sciatica. Before subjecting patients with intractable LBP to surgery, a differential diagnosis must be obtained and the presence of MCN-EN must be assessed.

### Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflicts of interest.

**Ethical approval** All procedures were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Our study was approved by the institutional ethics committee of Kushiro Rosai Hospital.

**Informed consent** Informed consent was obtained from all patients included in this study.

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