



# Middle cluneal nerve entrapment mimics sacroiliac joint pain

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## Abstract

**Background** Sacroiliac joint (SIJ)-related pain is associated with low back- and buttock pain and the SIJ score is diagnostically useful because it helps to differentiate between SIJ-related pain and pain due to other factors such as lumbar disc herniation and lumbar spinal canal stenosis. Middle cluneal nerve (MCN) entrapment (MCN-E) can produce pain involving the lower back and buttocks. Therefore, the origin of the pain must be identified. We successfully treated patients with a high SIJ score whose pain was attributable to MCN-E.

**Methods** Between August 2016 and June 2017, we treated 40 patients with non-specific low back pain. Among them, 18 (45%) presented with a positive SIJ score. Although SIJ treatment was unsuccessful in 4 of these patients, they responded to MCN-E treatment.

**Results** All 4 patients reported tenderness at the site of the sacrotuberous ligament (STL); 3 were positive for the one-finger test and experienced pain while sitting in a chair. The effect of SIJ block was inadequate in the 4 patients. As they reported severe pain at the trigger point in the area of the MCN, we performed MCN blockage. It resulted in pain control. However, in 1 patient, the effect of MCN block was transient and required MCN neurolysis. At the last visit, our patients' symptoms were significantly improved; their average numerical rating scale score fell from 8.3 to 1.0, their Roland-Morris Disability Questionnaire score fell from 12.8 to 0.3, and their average Japanese Orthopaedic Association score rose from 12.5 to 19.5.

**Conclusions** In patients with suspected SIJ-related pain, the presence of MCN-E must be considered when the effect of SIJ block is unsatisfactory.

**Keywords** Low back pain · Middle cluneal nerve · Entrapment neuropathy · Sacroiliac joint-related pain · Mimic

## Introduction

As sacroiliac joint (SIJ)-related pain eliciting low back- and buttock pain cannot be diagnosed by radiological studies [4, 12, 18–20, 22], the effect of SIJ blockage is important for its diagnosis [3, 10, 13, 21]. Kurosawa et al. [10] reported that their SIJ score is useful for diagnosing SIJ-related pain. As lumbar disc herniation (LDH) and lumbar spinal canal stenosis (LSS) can also produce low back- and buttock pain, the SIJ score is useful for differentiating among pain origins.

The middle cluneal nerve (MCN) is a pure sensory nerve that runs from S1 to S4 [9, 15]. Its entrapment between the posterior-superior and the inferior spine elicits buttock pain [1, 7, 8, 14]. As the SIJ score may be positive for SIJ-related pain in patients with MCN entrapment (MCN-E), successful treatment requires a differential diagnosis.

We encountered patients in whom, based on a high SIJ score, SIJ pain was suspected. They failed to respond satisfactorily to SIJ block because their pain was due to MCN-E. We report their successful treatment.

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## Patients and methods

### Scoring and treatment of SIJ pain

To diagnose SIJ-related pain, we used the SIJ pain score of Kurosawa et al. [10]. It consists of six items, the highest score is 9 (Table 1); a score of 4 is considered positive for SIJ-related pain.

**Table 1** Scoring system of Kurosawa et al. [10] for sacroiliac joint pain

		Case 1	2	3	4
1. One-finger test	3 points	3	0	3	3
2. Groin pain	2	0	2	0	0
3. Pain while sitting on a chair	1	0	1	1	1
4. Sacroiliac joint shear test	1	0	1	0	0
5. Tenderness of PSIS	1	0	0	0	0
6. Tenderness of STL	1	1	1	1	1
Total score	9	4	5	5	5

PSIS posterior superior iliac spine, STL sacrotuberous ligament

We address SIJ-related pain by observation therapy, oral medications (pregabalin, tramadol), and peri-articular SIJ blockage [10, 17].

## Patients

Our study was approved by the institutional ethics committee of Kushirosai Hospital; prior written informed consent was obtained from all patients included in this study.

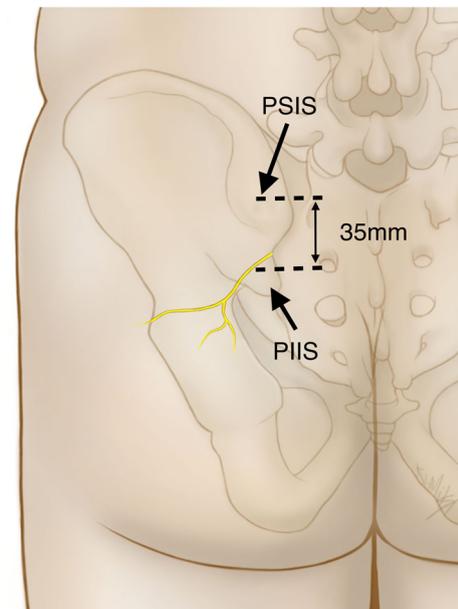
Between August 2016 and June 2017, 40 patients with non-specific low back pain (LBP) were admitted to our department. Of these, 18 had an SIJ score of 4 or higher; their pain was considered to be SIJ-related. Another 10 experienced symptom abatement by SIJ treatment. The effect of SIJ block was inadequate in 4 patients and they underwent successful MCN-E. Their age ranged from 61 to 87 years (average 71.3 years), and 2 were males. The affected side was unilateral (left) in 1 patient and bilateral in 3 patients, and 2 had previously undergone lumbar spine surgery.

## Diagnosis and treatment of MCN-E

The MCN-E diagnosis was based on clinical symptoms [7, 8, 14]. LBP involves the buttocks and worsens with lumbar movements. The trigger point is located 35 mm caudal to the posterior superior iliac spine (PSIS) slightly lateral at the edge of the iliac crest (Fig. 1). When MCN-E is suspected, we perform MCN blockage at the trigger point using 2 ml of 1% lidocaine, carefully avoiding reaching the SIJ (Fig. 2). When more than 50% symptom relief is obtained within 2 h, we diagnose MCN-E.

Besides observation therapy and the administration of oral medications such as pregabalin and tramadol, we perform several MCN blocks in the course of at least 3 months as a specific treatment for MCN-E. In patients who report pain recurrence after the analgesic effect of MCN blockage wore off, we consider surgery.

For the surgical treatment of MCN-E, the senior author (T.I.) performed microscopic MCN neurolysis with the patient in the prone position and under local anesthesia. The gluteus

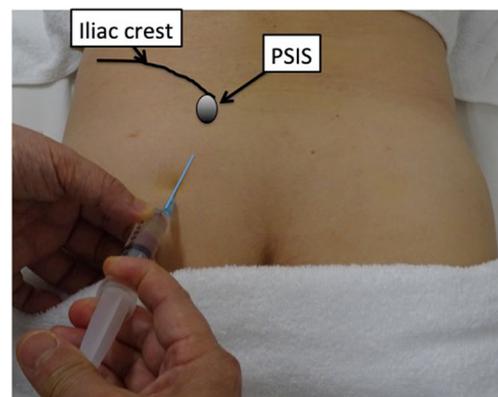


**Fig. 1** The middle cluneal nerve runs and can be entrapped between the posterior-superior and the inferior spine. The trigger point is located 35 mm caudal to the posterior superior iliac spine (PSIS) slightly lateral at the edge of the iliac crest

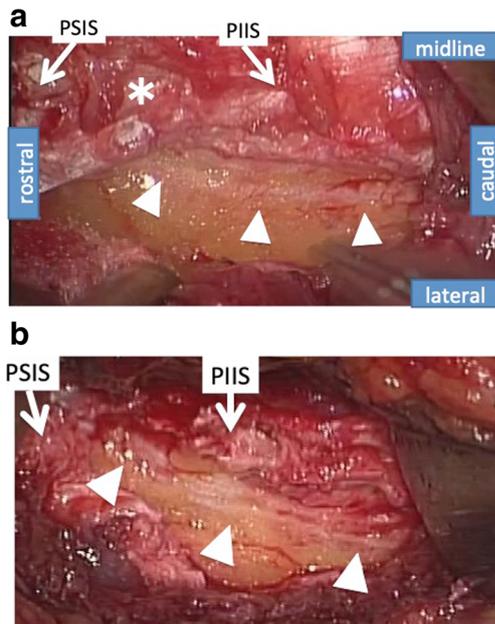
maximus muscle was split by a 7-cm linear incision across the trigger point from the PSIS to the caudal side; the distal portion of the MCN was identified after opening the fascia (Fig. 3a). The MCN penetrating the long posterior sacroiliac ligament (LPSL) between the PSIS and the posterior inferior iliac spine (PIIS) was cut sharply to release and decompress the MCN in a distal to rostral direction along the MCN to reduce MCN tension (Fig. 3b).

## Evaluation of clinical outcomes

The severity of LBP was evaluated on the numerical rating scale (NRS), the Japanese Orthopaedic Association (JOA), and the Roland-Morris Disability Questionnaire (RDQ) scores [5, 6]. For statistical analysis, we used the paired *t* test and



**Fig. 2** Middle cluneal nerve blockage at the trigger point. PSIS, posterior superior iliac spine



**Fig. 3** **a** Microscopic middle cluneal nerve (MCN) neurolysis is performed with the patient in the prone position and under local anesthesia. The distal portion of the MCN (arrow head) is identified after opening the fascia. PSIS, posterior superior iliac spine; PIIS, posterior inferior iliac spine; \*, long posterior sacroiliac ligament (LPSL). **b** The MCN penetrating the LPSL between the PSIS and PIIS is cut sharply to release and decompress the MCN in a distal to rostral direction along the MCN to reduce MCN tension

Statmate III software (ATMS Co., Ltd.). Differences of  $p < 0.05$  were considered statistically significant.

## Results

Our patients' symptoms were exacerbated by walking, by prolonged sitting and standing, in the supine position, and in the half-rising posture. All 4 patients reported sacrotuberous ligament (STL) tenderness, 3 experienced pain at the one-finger test and while sitting on a chair (Table 2).

The effect of initial SIJ blockage was insufficient in the 4 patients; their NRS score fell from an average of 8.3 (range 6–

10) to 7.3 (5–10). As they reported severe trigger point pain in the area of the MCN, they subsequently underwent MCN blockage. In 3 patients, it resulted in pain control while in 1 patient, its effect was transient and we performed MCN neurolysis.

At the last visit, our patients' symptoms were improved significantly; their average NRS score fell from 8.3 to 1.0, their RDQ score fell from 12.8 to 0.3, and their average JOA score rose from 12.5 to 19.5.

## Discussion

### MCN-E

The MCN consists of pure sensory branches from the dorsal rami of S-1 to S-4; it passes under the LPSL between the PSIS and PIIS, and runs over the iliac crest to the buttocks [9, 15]. Its entrapment around the iliac crest can produce buttock pain and its clinical course and etiology remain unclear [1, 7–9, 14, 15]. The symptoms are exacerbated by lumbar movements, by prolonged standing and sitting, by lumbar flexion, by rolling, and especially by walking [1, 7, 8, 14] and are similar to those of patients with lumbar disease.

The diagnosis of LBP due to MCN-E is based on clinical symptoms; pain relief by MCN block is of diagnostic importance [1, 7, 8, 14].

### SIJ-related pain

SIJ-related pain is one cause of LBP and joint dysfunction plays a major role. Repeated movements and accidental minor subluxation of the SIJ may result in SIJ dysfunction, damage SIJ-related structures including the posterior ligament, thereby eliciting SIJ-related pain [17] that cannot be diagnosed by radiological studies. Fluoroscopy-guided SIJ blockage is the gold standard for diagnosing SIJ pain [10, 13, 21].

Although SIJ pain may be associated with lumbar disorders such as LDH and LSS, and may occur after lumbar fusion

**Table 2** Patient data

Case	Age/sex	Site	L-surg	SIJ block	MCN block	MCN-E surg	NRS A → B → C	JOA A → C	RDQ A → C
1	75/M	bil	+	+	+	–	8 → 6 → 1	9 → 25	17 → 0
2	87/M	bil	+	+	+	–	10 → 10 → 1	11 → 18	14 → 0
3	62/F	bil	–	+	+	–	6 → 5 → 2	14 → 27	11 → 0
4	61/F	lt	–	+	+	+	9 → 8 → 0	16 → 26	9 → 1

A, before treatment; B, after SIJ block; C, last visit

M male, F female, bil bilateral, lt left, SIJ sacroiliac joint, MCN middle cluneal nerve, MCN-E middle cluneal nerve entrapment, NRS numerical rating scale, JOA Japanese Orthopaedic Association score, RDQ Roland-Morris Disability Questionnaire, L-surg lumbar spine surgery, MCN-E surg MCN-E surgery

surgery [2, 10, 11, 13], it is difficult to distinguish SIJ-related pain from pain related to lumbar disorders. Although the SIJ pain score created by Kurosawa et al. [10] helps to distinguish between SIJ-related pain and pain associated with LDH and LSS, its usefulness for the differentiation from other diseases has not been established. We encountered 4 LBP patients in whom the SIJ score suggested the SIJ as the pain origin. However, SIJ treatment was not successful, while MCN-E treatment was successful. Our findings suggest that patients with MCN-E may present with high SIJ scores.

Murakami et al. [16] reported that SIJ block was effective in 85% of patients with pain at or around the PSIS. In 8 of their 13 patients in whom SIJ blockage was ineffective, no definite lesions were detected. We suspect that their pain was due to MCN-E.

The MCN can be compressed in the narrow space between the iliac bone and the LPSL around the SIJ. As MCN-E elicits pain at similar sites, it can be misdiagnosed as SIJ-related pain [1, 8, 14] because in some patients with MCN-E, the one-finger test may be positive. However, the one-finger test may be positive for the PSIS or an area within 2 cm of the PSIS; the site where the MCN-E is compressed is slightly lower [10, 16]. Symptoms attributable to MCN-E are exacerbated by sitting; in 3 of our 4 patients, this was the case. The anatomical closeness of the SIJ and the MCN, and the similarity of symptoms can render a differential diagnosis difficult because they also affect the SIJ score. All 4 of our patients with MCN-E reported STL tenderness; in 3 patients, the score obtained with the one-finger test was 3 and 3 patients suffered pain while sitting on a chair. Based on our observations, we suggest that patients with MCN-E may be positive for some of the items on the Kurosawa SIJ score.

### Study limitations

The study population was small and ours was a retrospective, single-center study. We cannot deny a role played by time factors and placebo effects. Our findings must be confirmed by prospective studies of MCN-E patients with positive SIJ scores. We performed peri- but not intra-articular blockage for SIJ-related pain although Murakami et al. [16] reported that among 72 patients in whom SIJ blockage was useful, 14 who did not respond to peri-articular injection required intra-articular injection for pain alleviation.

### Conclusion

In patients with suspected SIJ-related pain who fail to respond to SIJ blockage, the presence of MCN-E must be considered.

### Compliance with ethical standards

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

**Ethical approval** All procedures performed in this study 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.

**Informed consent** Informed consent was obtained from all individual participants included in the study.

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### References

1. Aota Y (2016) Entrapment of middle cluneal nerves as an unknown cause of low back pain. *World J Orthop* 7:167–170
2. Bernard TN, Kirkaldy-Wills WH (1985) Recognizing specific characteristics of nonspecific low back pain. *Clin Orthop Relat Res* 217: 266–280
3. Borowsky CD, Fagen G (2008) Sources of sacroiliac region pain: insights gained from a study comparing standard intra-articular injection with a technique combining intra- and peri-articular injection. *Arch Phys Med Rehabil* 89:2048–2056
4. Cusi M, Van der Wall H, Saunders J, Wong L, Pearson M, Fogelman I (2013) Sacroiliac steroid injections do not predict ablation relief - not a surprise. *Pain Med* 14(1):163–164
5. Fujiwara A, Kobayashi N, Saiki K, Kitagawa T, Tamai K, Saotome K (2003) Association of the Japanese Orthopaedic Association score with the Oswestry Disability Index, Roland-Morris Disability Questionnaire, and Short-Form 36. *Spine* 28:1601–1607
6. Hjernstad MJ, Fayers PM, Haugen DF, Caraceni A, Hanks GW, Loge JH, Fainsinger R, Kaasa S (2011) Studies comparing Numerical Rating Scales, Verbal Rating Scales, and Visual Analogue Scales for assessment of pain intensity in adults: a systematic literature review. *J Pain Symptom Manag* 41:1073–1093
7. Isu T, Kim K, Morimoto D, Iwamoto N (2018) Superior and middle cluneal nerve entrapment as a cause of the low back pain - clinical review. *Neurospine* 15(1):25–32
8. Kim K, Isu T, Matsumoto J, Yamazaki K, Isobe M (2018) Low back pain due to middle cluneal nerve entrapment neuropathy. *Eur Spine J* 27:309–313
9. Konno T, Aota Y, Saito T, Qu N, Hayashi S, Kawata S, Itoh M (2017) Anatomical study of middle cluneal nerve entrapment. *J Pain Res* 10:1431–1435
10. Kurosawa D, Murakami E, Ozawa H, Koga H, Isu T, Chiba Y, Abe E, Unoki E, Musha Y, Ito K, Katoh S, Yamaguchi T (2017) A diagnostic scoring system for sacroiliac joint pain originating from the posterior ligament. *Pain Med* 18(2):228–238
11. Liliang PC, Lu K, Liang CL, Tsai YD, Wang KW, Chen HJ (2011) Sacroiliac joint pain after lumbar and lumbosacral fusion: findings using dual sacroiliac joint blocks. *Pain Med* 12:565–570
12. Luukkainen RK, Wennerstrand PV, Kautiainen HH, Sanila MT, Asikainen EL (2002) Efficacy of periarticular corticosteroid treatment of the sacroiliac joint in non-spondyloarthropathic patients with chronic low back pain in the region of the sacroiliac joint. *Clin Exp Rheumatol* 20:52–54
13. Maigne JY, Planchon CA (2005) Sacroiliac joint pain after lumbar fusion. A study with anesthetic blocks. *Eur Spine J* 14:654–658

14. Matsumoto J, Isu T, Kim K, Iwamoto N, Morimoto D, Isobe M (2018) Surgical treatment of middle cluneal nerve entrapment neuropathy - technical note. *J Neurosurg Spine* 29:208–213
15. McGrath MC, Zhang M (2005) Lateral branches of dorsal sacral nerve plexus and the long posterior sacroiliac ligament. *Surg Radiol Anat* 27:327–330
16. Murakami E, Kurosawa D, Aizawa T (2018) Treatment strategy for sacroiliac joint-related pain at or around the posterior superior iliac spine. *Clin Neurol Neurosurg* 165:43–46
17. Murakami E, Tanaka Y, Aizawa T, Ishizuka M, Kokubun S (2007) Effect of periarticular and intraarticular lidocaine injections for sacroiliac joint pain: prospective comparative study. *J Orthop Sci* 12(3):274–280
18. Sakamoto N, Yamashita T, Takebayashi T, Sekine M, Ishii S (2001) An electrophysiologic study of mechanoreceptors in the sacroiliac joint and adjacent tissues. *Spine*. 26:E468–E471
19. Schomacher M, Kunhardt O, Koeppen D, Moskopp D, Kienapfel H, Kroppenstedt S, Carbraja M (2015) Transient sacroiliac joint-related pain is a common problem following lumbar decompressive surgery without instrumentation. *Clin Neurol Neurosurg* 139:81–85
20. Standring S (2008) *Gray's anatomy. The anatomical basis of medicine and surgery*, 38th edn. Churchill Livingstone, Edinburgh
21. Vanelderen P, Szadek K, Cohen SP, De Witte J, Lataster A, Patijn J, Mekhail N, van Kleef M, Van Zundert J (2010) Sacroiliac joint pain. *Pain Pract* 10(5):470–478
22. Vleeming A, Pool-Goudzwaard AL, Hammudoghlu D, Stoeckart R, Snijders CJ, Mens JM (1996) The function of the long dorsal sacroiliac ligament: its implication for understanding low back pain. *Spine* 21(5):556–562