



Undiagnosed Peripheral Nerve Disease in Patients with Failed Lumbar Disc Surgery

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Study Design: Retrospective study (level of evidence=3).

Purpose: We examine the relationship between residual symptoms after discectomy for lumbar disc herniation and peripheral nerve (PN) neuropathy.

Overview of Literature: Patients may report persistent or recurrent symptoms after lumbar disc herniation surgery; others fail to respond to a variety of treatments. Some PN neuropathies elicit symptoms similar to those of lumbar spine disease.

Methods: We retrospectively analyzed data for 13 patients treated for persistent (n=2) or recurrent (n=11) low back pain (LBP) and/or leg pain after primary lumbar discectomy.

Results: Lumbar re-operation was required for four patients (three with recurrent lumbar disc herniation and one with lumbar canal stenosis). Superior cluneal nerve (SCN) entrapment neuropathy (EN) was noted in 12 patients; SCN block improved the symptoms for eight of these patients. In total, nine patients underwent PN surgery (SCN-EN, n=4; peroneal nerve EN, n=3; tarsal tunnel syndrome, n=1). Their symptoms improved significantly.

Conclusions: Concomitant PN disease should be considered for patients with failed back surgery syndrome manifesting as persistent or recurrent LBP.

Keywords: Low back pain; Peripheral nerve; Lumbosacral region; Intervertebral disc disease; Nerve compression syndrome

Introduction

Lumbar degenerative disease is often treated by lumbar surgery, with lumbar discectomy, which is a commonly used surgical procedure to address lumbar disc herniation (LDH). However, some patients who have been operated report persistent or recurrent symptoms. This is known as failed back surgery syndrome (FBSS), and it has been attributed to recurrent disc herniation, epidural fibrosis

or hematoma, inadequate decompression of coexisting segmental stenosis, segmental instability, dural tear, and/or psychosocial factors [1-6].

Some peripheral neuropathies elicit symptoms similar to those of lumbar spine disease [7]. For example, superior cluneal nerve (SCN) entrapment neuropathy (SCN-EN), a causative factor in low back pain (LBP) that is induced and exacerbated by lumbar movement, can be misdiagnosed as a lumbar spine disorder [8-12]. Similarly,

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common peroneal nerve (CPN) entrapment neuropathy (CPN-EN) elicits leg symptoms similar to those of lumbar disease; therefore, a differential diagnosis is important [7,13-16]. Peripheral nerve (PN) diseases following lumbar discectomy can potentially be overlooked. Therefore, in this study, we examined the relationship between residual or persistent symptoms following primary discectomy for LDH and concomitant PN disease.

Materials and Methods

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

1. Patients

This retrospective study included 13 patients with persistent (n=2) or recurrent (n=11) LBP and/or leg pain, whose LDH had been treated by primary discectomy between April 2013 and May 2015. They included eight men and five women, with a mean age of 58.2 years (range, 33–78 years). All had undergone primary lumbar discectomy for LDH, five at our institution and eight elsewhere. None presented with trauma around the knee, malignancy, active infection, Parkinson's disease, dementia, or psychological issues. The LDH level was L4/5 in 11 patients and L5/S1 in the other two. The mean interval between symptom exacerbation and presentation at our department was 12 months (range, 1–60 months); the mean postoperative follow-up period was 26.4 months (range, 9–39 months) (Table 1). Acetaminophen, non-steroidal anti-inflammatory drugs, and/or tramadol failed to control their pain; none were given codeine or morphine.

2. Criteria for the diagnosis of superior cluneal nerve-entrapment neuropathy

We carefully assessed the patients to confirm that SCN entrapment played a role in their LBP using established diagnostic criteria [11,12,17]. LBP was considered to be the result of SCN-EN if there was unilateral pain involving the iliac crest and buttocks, there was a trigger point over the posterior iliac crest located 7 cm from the midline (corresponding to the nerve compression zone), and the patient experienced numbness and radiating pain in

the SCN area when the trigger point was compressed. Most patients experienced symptom relief within 2 hours of the administration of a local nerve block (2 mL of 1% lidocaine injected at the trigger point in the buttock); however, some reported the recurrence of pain after the analgesic effect of the injection wore off. SCN was blocked with a minimal amount of local analgesic to avoid misdiagnosis of the origin of the patient's pain.

3. Criteria for the diagnosis of common peroneal nerve-entrapment neuropathy

The diagnosis of CPN-EN was based on symptoms including numbness and/or pain from the lower leg to the dorsum of the foot, which appeared when the patient walked or stood and resulted in intermittent claudication [13,15,16]. All patients were positive for Tinel's sign at the CPN around the neck of the fibula.

4. Criteria for the diagnosis of tarsal tunnel syndrome

Tarsal tunnel syndrome (TTS) results from entrapment of the posterior tibial nerve in the tarsal tunnel on the medial malleolus. Its diagnosis is based on symptoms such as numbness and/or pain in the sole of the foot, without heel involvement, which appear when the patient walks or stands for a prolonged time [7,18,19]. All the patients with TTS were positive for Tinel's sign at the tarsal tunnel.

5. Evaluation of treatment outcomes

The treatment outcomes were assessed on a numeric rating scale (NRS) and with the Roland-Morris Disability Questionnaire (RDQ). The scores were recorded before treatment and at the latest follow-up. The data were assessed with paired *t*-tests using StatMate III software (ATMS Co. Ltd., Tokyo, Japan). Differences of $p < 0.05$ were considered statistically significant.

Results

The findings for the 13 patients with recurrent or persistent pain are summarized in Table 1. In three of the patients (cases 1–3), the pain recurred at the level of the LDH. In another patient (case 4), the pain was due to lumbar spinal canal stenosis at the operated level. No abnormal findings were observed in lumbar magnetic reso-

Table 1. Patient characteristics

Case	Age (yr)	Sex	LDH		Symptom		Radiological findings		Treatment					Follow-up (mo)		
			Location	Side	Onset (after 1st LDH op.)	Course	Symptom	Side	Lumbar op.	SCN-EN	PN op (without SCN-EN)	Others	NRS		RDO	
1	36	M	L45	R	2 yr	Rec.	LBP+LP	R	Rec. LDH	Re-Disc.	Block+op	Right CPN-EN	-	6→2	9→6	34
2	44	M	L45	L	2 yr	Rec.	LBP+LP	L	Rec. LDH	Re-Disc.	Block	Left CPN-EN	-	8→1	21→0	34
3	55	F	L45	R	2 mo	Rec.	LBP+LP	R	Rec. LDH	Re-Disc.	Block+op	Right CPN-EN, bilateral TTS	GM op	6→0	9→0	25
4	66	F	L5S1	L	4 yr	Rec.	LBP+LP	L	Lumbar spinal stenosis	Laminectomy	Block	Left LFCN-EN	-	8→1	13→3	27
5	71	M	L45	R	5 yr	Rec.	LBP+LP	R	-	-	Block	Right CPN-EN, right TTS	-	5→4	8→6	30
6	50	M	L45	R	2 mo	Rec.	LBP+LP	Bi	-	-	Block	Right CPN-EN	-	7→3	5→0	9
7	68	M	L45	L	15 yr	Rec.	LP	-	-	-	-	Left CPN-EN	-	8→4	13→0	39
8	78	M	L45	L	25 yr	Rec.	LBP	L	-	-	Block	-	-	6→1	16→2	34
9	63	F	L5S1	L	30 yr	Rec.	LBP+LP	L	-	-	Block	-	-	5→2	14→0	28
10	55	F	L45	R	-	Pers.	LBP+LP	R	-	-	Block	-	GM block	8→1	19→3	12
11	71	F	L45	R	5 yr	Rec.	LBP+LP	Bi	-	-	Block	-	-	7→3	9→3	36
12	33	M	L45	L	1 wk	Rec.	LBP+LP	L	-	-	Block+op	-	-	7→3	9→2	16
13	67	M	L45	L	-	Pers.	LBP+LP	L	-	-	Block+op	-	-	8→0	11→0	19

LDH, lumbar disc herniation; op, operation; SCN, superior cluneal nerve; EN, entrapment neuropathy; PN, peripheral nerve; NRS, numerical rating scale; RDO, Roland-Morris Disability Questionnaire score; M, male; F, female; R, right; L, left; Rec., recurrent; Pers., persistent; LBP, low back pain; LP, leg pain; Disc., discectomy; CPN, common peroneal nerve; TTS, tarsal tunnel syndrome; LFCN, lateral femoral cutaneous nerve; Bi, bilateral; GM, gluteus medius.

nance imaging and computed tomography studies for the other nine patients.

Additionally, 11 patients reported both LBP and leg pain; one patient suffered only LBP, and one experienced only leg pain. The symptoms recurred a median of 2 years (range, 0–30 years) after the first LDH surgery. In four patients (cases 1–4), we observed radiological abnormalities indicative of lower limb radiculopathy along the dermatome; all had previously undergone same level lumbar surgery. These patients required lumbar re-operation.

SCN-EN was diagnosed in 12 patients; in 10 of these, the SCN-EN was unilateral and in nine of these the symptom was on the same side as the lumbar lesion. Of these, two patients (cases 10, 13) reported persistent ipsilateral pain after the first LDH surgery, and the symptoms of another patient (case 12) reappeared within the first week after the first LDH operation. SCN block was effective in eight patients, who did not undergo SCN-EN surgery. SCN-EN surgery was required for four patients.

PN rather than SCN-EN surgery was required for seven patients (CPN-EN, $n=6$; TTS, $n=2$; lateral femoral cutaneous nerve entrapment, $n=1$). Of these, four patients (cases 1–4) required lumbar re-operation: two patients (cases 1, 2) underwent PN surgery to address residual leg symptoms attributable to CPN-EN, one patient (case 3), who reported residual symptoms, was operated to address CPN-EN, bilateral TTS, and gluteus medius muscle (GMM) pain, and another patient (case 4) with residual symptoms was operated for left lateral femoral cutaneous nerve EN. The three other patients (cases 5–7) required CPN-EN surgery; patient of case 5 also needed TTS surgery to address leg symptoms. The treatments were successful for all but one of the patients (case 5), with significantly improved NRS scores ($6.8-1.9$, $p<0.05$) and RDQ scores ($12.0-1.9$, $p<0.05$) (Table 1).

Discussion

1. Failed back surgery syndrome after lumbar disc herniation surgery

Although surgical treatment for LDH can deliver good results, 5%–40% of operated patients manifest FBSS [1–6]. Of these, 3%–18% suffer recurrence of the LDH [4,5,20]. Patients with FBSS but no recurrence of the LDH have been observed to exhibit epidural fibrosis, epidural hematoma, inadequate decompression of coexisting segmental

stenosis, segmental instability, dural tear, and/or arachnoiditis [1–6]. Long-lasting back pain has been reported by 10%–30% of patients after primary discectomy for radiculopathy [21–23]. Consequently, the potential causes of postoperative pain must be considered in patients with FBSS manifesting as LBP after LDH surgery.

We evaluated and treated 13 patients with persistent or recurrent symptoms after LDH surgery. Radiological studies confirmed LDH recurrence in three of the patients and lateral recess stenosis in one patient; they underwent additional lumbar decompression surgery. The other nine patients manifested no radiological abnormalities that explained their persistent or recurrent symptoms. However, treatment for PN neuropathy resulted in symptom abatement in these patients, suggesting that factors other than lumbar disease were involved. We believe that the persistent postoperative symptoms of two patients with LDH (cases 10, 13) were due to coexisting PN neuropathy, which had not been addressed during the LDH surgery. Our findings indicate that concomitant PN disease should be considered in patients with persistent or recurrent symptoms after LDH surgery.

2. Symptoms due to superior cluneal nerve-entrapment neuropathy

Previously, we have documented the usefulness of less invasive treatments for PN neuropathy in patients with LBP and leg pain [8–13,16,18]. These symptoms are similar to those elicited by lumbar disease. The presence of SCN-EN in 1.4%–14% of patients is higher than is commonly expected [8–12,17]. Of our 13 patients with FBSS manifesting as persistent LBP, 12 required treatment for SCN-EN, with SCN block and SCN neurolysis proving beneficial. According to earlier reports, SCN block successfully addressed SCN-EN in 28%–100% of patients, even in those with severe LBP [12,17,24]. In the present study, eight of the 12 patients with FBSS reported abatement or disappearance of their pain after SCN blockage, suggesting that this procedure should be considered for patients with LBP after LDH surgery.

In nine of the 10 patients with unilateral symptoms due to SCN-EN, the symptoms were on the same side as the lumbar lesion. The sinuvertebral nerves around vertebral structures such as the outer annulus fibrosus of the intervertebral discs contribute to the elicitation of pain around the spine, including discogenic or vertebral joint pain [25]. Although the pathogenesis of SCN-EN remains unknown,

stimulation of the sinuvertebral nerve by LDH and/or unilateral nerve root irritation caused by radiculopathy may play a role, and SCN-EN may be misdiagnosed as lumbar herniation in patients with LBP.

3. Symptoms due to other peripheral nerve diseases

Out of the 13 patients, six underwent neurolysis for CPN-EN. This is the most common PN neuropathy of the lower limb and the most frequent cause of leg numbness and pain involving the affected area without severe paresis or intermittent claudication [13-16,26]. Because PN neuropathy can manifest symptoms similar to those of L5 radiculopathy due to lumbar lesions, a differential diagnosis is important, even after LDH surgery. CPN-EN can be treated by less invasive neurolysis under local anesthesia. However, the diagnosis of CPN-EN can be difficult because it cannot always be detected electrophysiologically; careful symptom assessment may yield a correct diagnosis. Previously, we have reported that the repetitive plantar flexion test is a useful provocation test for diagnosing CPN-EN [13,14,16].

TTS is an EN of the posterior tibial nerve within the tarsal tunnel. The symptoms are sensory disturbance in the sole of the foot without heel involvement, paresthesia, and a sensation of coldness or the presence of a foreign body [7,18,19]. The symptoms are exacerbated by prolonged standing or walking and the condition may be misdiagnosed as spinal disease. TTS has been observed in 4.8% of patients with lumbosacral radiculopathy [27], suggesting it may underlie the residual symptoms in patients with FBSS.

GMM is located in the buttock, partially beneath the gluteus maximus muscle. It can be the origin of buttock pain with lateral and/or posterior femoral pain [28,29]. The diagnosis of GMM pain is based on clinical symptoms. Treatment consists of GMM block and decompression surgery under local anesthesia [28,29]. As with lumbar disease, the pain is exacerbated by sitting, standing, and walking; a differential diagnosis in patients reporting LBP requires the identification of the underlying cause. Of our patients, two required treatment for GMM pain. Although GMM pain is not reflective of PN neuropathy, the latter should be considered for patients with residual symptoms due to FBSS.

4. Study limitations

This study had some limitations. The study population

was small, the follow-up period was short (mean, 26.7 months), and the interval between surgery and symptom recurrence varied among the patients. The symptoms were persistent in some and recurrent in others, and they manifested immediately after, soon after, or a long time after surgery. In addition, this was a retrospective study and not all patients underwent their first operation at our institution. Consequently, our findings may not accurately reflect the incidence of true PN neuropathy in patients with FBSS after LDH surgery. We do not know what proportion of the total number of patients operated during our study period manifested FBSS, and we cannot comment on the overall effectiveness of surgical PN treatment. Nonetheless, we recommend that spinal surgeons consider PN disease for patients with FBSS.

Conclusions

We successfully treated patients with persistent or recurrent pain after LDH surgery. Our findings highlight the importance of considering PN symptoms in these patients. Less invasive treatment for PN neuropathy should be considered.

Conflict of Interest

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

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