Lumbar Radiculopathy Contralateral to the Side of Lumbar Disc Herniation

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ABSTRACT. The charts and radiographic records of seven patients with lumbar radiculopathy contralateral to the side of lumbar disc herniation were examined to explain the resulting sciatica. All of these patients had L5 radiculopathy with contralateral disc herniation at the L4-L5 intervertebral disc. Two patients underwent L4-L5 discectomy by the disc herniation side approach. Because these were preoperative findings of lateral recess stenosis on the symptomatic side, two other patients underwent L4-L5 discectomy by the disc herniation side approach and opposite side fenestration. In both of these patients, epidural fat tissue around the disc herniation side L5 nerve root was present and opposite side epidural fat tissue was absent, with congested fibrous changes to the surface of the dural sac around the lateral recess. Another patient underwent percutaneous nucleotomy. Morphologically, it might be inferred that the friction radiculitis could have occurred as a lumbar radiculopathy due to compression toward the opposite side caused by disc herniation. The results of this study showed that lumbar radiculopathy contralateral to the side of lumbar disc herniation is related to lateral recess stenosis and friction radiculitis.

Key words : lumbar spine — disc herniation — contralateral radiculopathy

Lumbar radiculopathy due to intervertebral disc herniation is known to appear at the ipsilateral side of the disc displacement. There are also several reports of patients who exhibited lumbar radiculopathy contralateral to the side of the lumbar disc herniation.[1-7] The mechanisms of the clinical features of this condition are still not well understood.

The purpose of this study was to report cases of lumbar radiculopathy contralateral to the side of lumbar disc herniation and to explain the mechanisms of the resulting sciatica.

MATERIALS AND METHODS

Retrospective chart and radiographic reviews were performed on selecting patients from the periods of December 1984 through November 2003 who had lumbar radiculopathy contralateral to the side of posterolateral type lumbar disc herniation. Patients with central type disc herniation were excluded from this series. A total of seven patients met the inclusion

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criteria for this retrospective study.

The degree of disc herniation was classified into four grades; I: a contained disc herniation; II: the herniated disc extrusion through the annulus fibrosus without cephalad or caudad migration; III: the herniated disc migrating either cephalad or caudad; and IV: the herniated disc was sequestered.[8] The clinical results were assessed according to a clinical scoring system established by the Japanese Orthopaedic Association (JOA score).[9]

RESULTS (Table 1)

Three men and four women from 28 to 60 years of age (mean=45.6±10.5 years) were studied. The JOA scores of the lumbar disc herniation ranged from 5 to 22 points with a mean of 14.0±6.3 points. All patients had L5 radiculopathy, three of the right-side leg and four of the left-side leg, with contralateral disc herniation of the L4-L5 intervertebral disc. There were three Grade II, three Grade III and one Grade IV degree of disc herniation. The discs classified as Grades III and IV had migrated caudally in three cases and in the cephalad direction in one case.

Two patients (Case #1 and 4) underwent L4-L5 discectomy by the right side interlaminar approach. Subligamentous extrusion of Grade II herniation and transligamentous extruded fragment included by the inflammatory membrane of Grade IV herniation were seen at the ventral side of the right L5 nerve root. The opposite side was not exposed because there were no preoperative findings of lateral recess stenosis. The percent improvement of the JOA scores six months after surgery for those two patients were 93.8% and 100% (JOA score changes: 13 to 28 points; 8 to 29 points, respectively).

Because there were preoperative findings of lateral recess stenosis on the right side, two patients (Case #2 and 3) underwent L4-L5 discectomy by the left side interlaminar approach and opposite side fenestration for decompression of lateral recess stenosis. Transligamentous extrusion of Grade II herniation and subligamentous extrusion of Grade III herniation

TABLE 1. Data of Patients

Case	Age	Gender	Disc herniation				Operation	Operative findings		% JOA score
			Level	Side	Grade	Direction		Hernia side	Symptom side	
1	45	male	L4-5	right	IIs	–	conventional	EFT(+), LRS(-), IM(-)	not approached	93.8%
2	60	female	L4-5	left	IIt	–	microdiscectomy	EFT(+), LRS(-), IM(+)	EFT(-), LRS(+), DNR(+), CFC(+)	66.7%
3	28	male	L4-5	left	IIIs	cephalad	microdiscectomy	EFT(+), LRS(-), IM(-)	EFT(-), LRS(+), DNR(+), CFC(+)	100.0%
4	39	male	L4-5	right	IVt	caudad	MED	EFT(+), LRS(-), IM(+)	not approached	100.0%
5	43	female	L4-5	right	III	caudad	PN	not approached	instrument inserted	81.8%
6	49	female	L4-5	left	II	–	none	–	–	28.6%
7	55	female	L4-5	left	III	caudad	none	–	–	87.5%

% JOA score: % improvement of the Japan Orthopaedic Association score
conventional: conventional herniotomy under macroscopically
MED: microendoscopic discectomy
PN: percutaneous nucleotomy
EFT: epidural fat tissue
LRS: lateral recess stenosis
IM: inflammatory membrane
DNR: dimple deformity of the nerve root
CFC: congested fibrous change of surface of dural sac

were seen at the ventral side of the right L5 nerve root. Epidural fat tissues around the right L5 nerve root were seen. However, opposite side epidural fat tissues had disappeared and congested fibrous changes of the surface of the dural sac around the lateral recess were seen. Dimple deformities of the left L5 nerve roots were recognized after decompression of the lateral recess in both cases. The percent improvement of the JOA scores for those two patients six months after surgery were 66.7% and 100% (JOA score changes : 20 to 26 points ; 12 to 29 points, respectively).

One patient (Case #5), who had Grade II herniation of the right posterolateral type at the L4-L5 disc level, underwent percutaneous nucleotomy from the left posterolateral approach. The percent improvement of the JOA score for this patient six months after surgery was 81.8% (JOA score change : 18 to 27 points).

The remaining two patients (Case #6 and 7) had Grade II and Grade III herniations, respectively. In both cases, conservative treatment resulted in the improvement of symptoms. The percent improvement of the JOA scores for those two patients at three months of follow-up periods were 28.6% and 87.5% (JOA score changes : 22 to 24 points ; 5 to 26 points, respectively).

Case Presentation

Case 3 : A 28-year-old man was referred to a physiatrist for chronic pain in the right buttock that radiated to the posterior thigh and had intensified during the previous three months. The patient's pain level increased after prolonged sitting, walking and climbing stairs. He tried periods of rest and analgesic medication, but the pain progressively worsened. Treatment with a variety of nonsteroidal anti-inflammatory drugs and epidural steroids yielded no long-term benefit.

Physical examination revealed that the lumbar spine had restricted

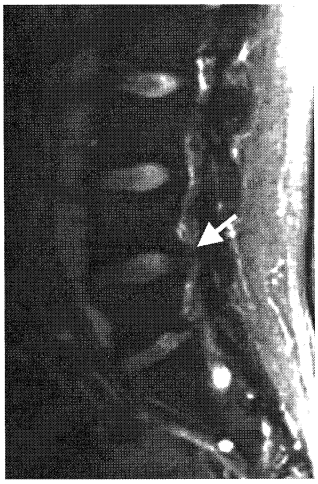

Fig 1. Sagittal T2-weighted magnetic resonance image (MRI) 5 mm left side from the mid-line showing the L4-L5 herniation extruded toward the cephalad direction (arrow).

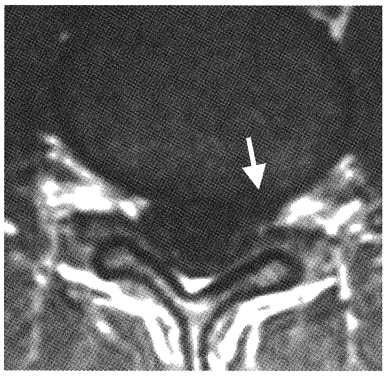

Fig 2. Axial T1-weighted magnetic resonance image (MRI) through the L4-L5 disc showing the left posterolateral disc herniation (arrow).

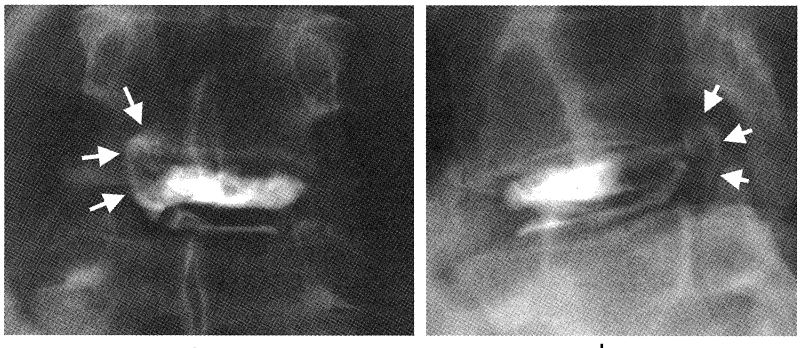

Fig 3. A L4-L5 discogram showing left the posterolateral extruded disc herniation (arrows). a : posterior-anterior view. b : lateral view.

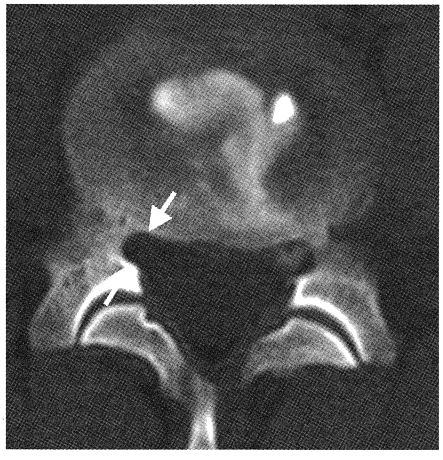

Fig 4. Post-discographfic computed tomogram of the L5 pedicle level showing right lateral recess stenosis with 3 mm of anterior-posterior distance (arrows), compared to 4 mm anterior-posterior distance of the left side.

anterior flexion. All radicular provocation test findings and neurological examinations of the left side were normal. Further examinations, however, revealed a positive right straight leg raising test of 45 degrees, right-sided moderate weakness of the extensor hallucis longus and hypoesthesia over the right L5 dermatome.

A sagittal T2-weighted section of 5 mm left side from the mid-line showed a L4-L5 herniation extruded in a cephalad direction (Fig 1). An axial T1-weighted section through the L4-L5 disc demonstrated a left

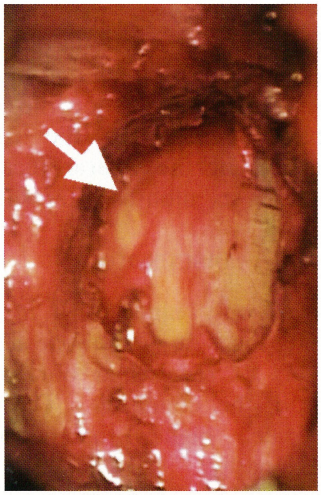

Fig 5. Intraoperative photogram of the left (disc-herniation side) L4-5 region. Epidural fat tissue around the left L5 nerve root (arrow) is present.

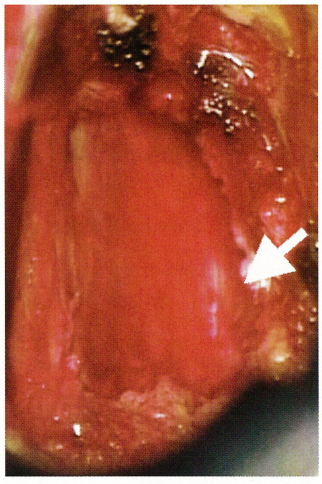

Fig 6. Intraoperative photogram of the right (symptomatic side) L4-5 region. Epidural fat tissue is absent and congested fibrous changes are present on the surface of the dural sac around the L5 lateral recess. A dimple deformity of the right L5 nerve root (arrow) is recognized after decompression of the lateral recess.

posterolateral disc herniation (Fig 2).

During provocation discography (Fig 3), this patient had unfamiliar pain in the left leg, which was the herniation side, with no pain on the right, or symptomatic, side. In the right L5 nerve root infiltration, an exact pain reproduction on his right side lower extremity was noticed. A post-discographic computed tomogram of the L5 pedicle level showed right lateral recess stenosis with 3 mm of anterior-posterior distance compared to 4 mm on the left side (Fig 4).

The patient underwent L4-L5 microscopic discectomy by the left side interlaminar approach and opposite side fenestration for decompression of lateral recess stenosis. Epidural fat tissue around the left L5 nerve root was present (Fig 5). The opposite side epidural fat tissue was absent with congested fibrous changes on the surface of the dural sac around the L5 lateral recess. A dimple deformity of the right L5 nerve root was recognized after decompression of the lateral recess (Fig 6). The percent improvement of the JOA score six months after surgery was 100%.

DISCUSSION

In 27 years, there were only nine cases in seven reports of lumbar radiculopathy contralateral to the side of lumbar disc herniation[1-7] (Table 2). Our study, covering 19 years of records at our institution alone, showed a remarkably higher incidence of this condition. Therefore, the actual incidence of these cases may be much higher than expected in a symptomatic population of lumbar radiculopathy.

In this study, we observed no abnormalities of the lumbar nerve root such as transverse and/or conjoined nerve roots. Therefore, an asymptomatic disc herniation is indicated as an etiological factor for the absence of radiculopathy of the affected nerve root by disc herniation. The existence of intervertebral disc herniation is not necessarily the cause of the sciatica. In recent reports on frequent abnormal imaging findings on MRI in asymptomatic individuals, Boden *et al.*[10] have reported at least one herniated disc in 20% of volunteers less than 60 years old and in 36% of those more than 60 years old. Jensen *et al.*[11] reported that 27% of the 98 asymptomatic subjects had a disc protrusion and 1% had an extrusion.

TABLE 2. Summary of Articles Reporting Patient Data

Study	Age	Gender	Disc herniation		Root abnormality (Hernia side)	Operative findings (Symptom side)
			Level	Side		
Choudhury *et al.*, 1978[1]	55	male	L4-5	right	lower emerging	enlarged facet, LRS*
	60	male	L2-3	left	lower emerging	enlarged facet, LRS*
	36	male	L3-4	left	conjoint nerve root	enlarged facet, LRS*
Auld *et al.*, 1979[2]	46	male	L4-5	right	lower emerging	—
Chou *et al.*, 1986[3]	42	male	L1-2	right	none	none
Shimamura *et al.*, 1991[4]	31	female	L5-S1	right	none	fibrosis of the root
Miyashita *et al.*, 1998[5]	43	female	L4-5	right	none	none
Higashi *et al.*, 2002[6]	28	female	L4-5	left	none	enlarged facet
Hayashi *et al.*, 2003[7]	69	male	L1-2	right	—	—

LRS* : lateral recess stenosis

Boos *et al.*[12] have presented evidence that an age, gender and occupational risk factors-matched group of asymptomatic patients had an incidence (76%) of herniated discs much higher than those in the preceding two reports. Morphologically, this cohort had nine patients with an asymptomatic disc herniation.

Concerning the causes of contralateral radiculopathy, lateral recess stenosis had an effect on clinical signs in two out of our seven cases. The most interesting finding in these cases was that congested fibrous changes of the surface of the dural sac and root sleeve, in a different region than the lateral recess, occurred, in spite of the existence of epidural fat tissue at the site of disc herniation. Morphologically, it might be suggested that the friction radiculitis may occur as a lumbar radiculopathy due to contralateral compression by the disc herniation. Smith *et al.*[13] have evaluated the effect of straight leg raising on nerve root motion using fresh human cadavers. They observed that the L5 nerve root not only moved distally 2.1 mm but also laterally toward the pedicle, perpendicular to the course of the nerve at the lateral recess. It can be hypothesized that in the case of an asymptomatic and/or symptomatic disc herniation of the opposite side, impingement of the nerve root on the pedicle would be exacerbated.

In our series, four of the seven discs showed caudal migration toward the lateral recess over the disc level. It has been suggested that compression of the neural structures toward the opposite side lateral recess is more frequent if the herniated disc is larger or if the sequestered disc migrates caudally.

With reference to the surgical approach, two of the four cases that had no lateral recess stenosis of the symptomatic side had only discectomy for the asymptomatic disc herniation, with a 96.9% improvement of the JOA score. This result showed that bilateral decompression of the nerve roots may not be required if there is no lateral recess stenosis on the symptomatic side. However, it is necessary to perform bilateral decompression in the case of lateral recess stenosis of the symptomatic side.

CONCLUSION

The results of this study showed that the etiology of lumbar radiculopathy contralateral to the side of lumbar disc herniation is related to lateral recess stenosis and friction radiculitis. The correct preoperative diagnosis of the spatial relationship of the nerve roots and osseous structure is important for understanding the pathologic anatomy in the lateral recess and for the proper surgical dissection of this lesion.

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