Acta Neurochir (Wien) (1994) 127: 203–209

Acta Neurochirurgica

Printed in Austria

Extreme Lateral Lumbar Disc Herniation: Clinical Presentation in 178 Patients

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Summary

A retrospective analysis of clinical characteristics of 178 consecutive patients with extreme lateral lumbar disk herniation, amongst 3047 patients operated on for herniated lumbar disc, is presented. The level specific incidence of extreme lateral disc herniation (ELLDH) ranged from a low of 4.5% at L 4–5 to peak of 17.4% at L 3–4 although the largest number of ELLDH occurred at L 4–5 and L 5–S 1 for a total number of 139 cases (78.1%). 43.6% of all L 3 radiculopathies were caused by an L 3–4 ELLDH, whereas only 4.4% of all L 5 radiculopathies were caused by an L 5–S 1 ELLDH.

Leg pain, either of the sciatic or the femoral type, was the first and dominant clinical symptom of radiculopathy, but pain radiation occurred not always in the appropriate dermatomal segment. ELLDH at upper levels (L 2–3 and L 3–4) caused usually none or only minor low back signs (76.2%), whereas ELLDH at lower levels more often caused moderate or major lumbar symptoms and signs (59.6%). Positive femoral nerve traction test with upper ELLDH showed a high frequency (84.4%) and reliability and is therefore an important clinical parameter in this situation. Motor deficits occurred more often (78.8%) than sensory deficits (46.6%), were usually of the monoradicular type and were therefore a more reliable clinical sign than sensory disturbances.

Keywords: Extreme lateral lumbar disc herniation; clinical characteristics; lumbar spine; incidence.

Introduction

In 1974 Abdullah first described the entity of extreme lateral lumbar disc herniation (ELLDH) as a cause of lumbar radiculopathy[1]. At that time, myelography and discography were the only radiographic tests available for the diagnosis of lumbar disc disease. The anatomical features of ELLDH have become better appreciated with the advent of computerized tomography (CT) and magnetic resonance imaging (MRI).

The clinical presentation of ELLDH has been discussed in several articles[3, 10, 11, 13, 16, 17, 20–22, 24]. In the earlier literature there is some disagreement concerning the frequency of ELLDH at different lumbar levels and concerning the typical clinical presentation[1, 2, 4, 5, 7, 8, 11–15, 19–23].

The purpose of our retrospective study was to further clarify the clinically features of this disorder including signs and symptoms at presentation, overall frequency, and relative incidence at each level.

Materials and Methods

A retrospective review of the clinical records of 178 cases of ELLDH operated on in our department between January 1982 and December 1989 was undertaken. The diagnostic criteria for inclusion in this study as an ELLDH were:

1) the description of a herniation within or lateral to the intervertebral foramen in the surgeons' operative record;

2) the myelogram, if performed, was either normal or showed minor abnormalities of the nerve root sleeve above the herniation, most commonly a shortening and widening at the level of the pedicle;

3) CT or MRI, if performed, demonstrated a herniated disc within or lateral to the intervertebral foramen.

The clinical presentation and physical examination of the 178 patients with ELLDH as recorded on admission was carefully analysed for the following parameters: level of herniation, age, sex, pattern of pain, low back signs, results of nerve traction tests, and sensory or motor signs. The neuroradiological reports, available CT, and operative records were also analysed to ensure proper diagnosis and inclusion in this study.

A further review of the total number and levels of all disc herniations, both ELLDH and classical paramedian herniations, operated on during the same time period was performed by computer search in our medical records.

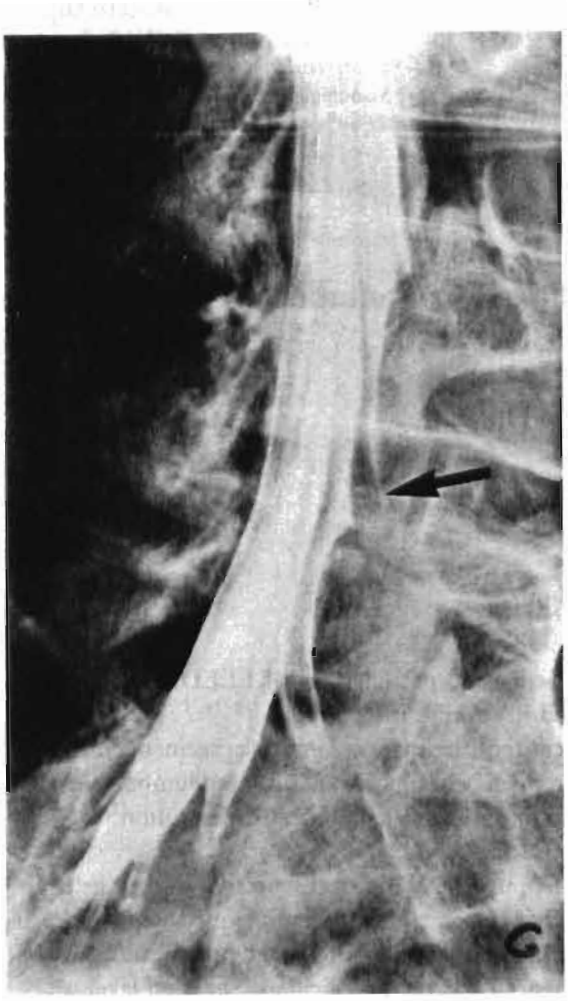

Fig. 1. Myelogram showing left L 5–S 1 extreme lateral disc herniation with shortening and enlargement of the left L 5 nerve root sleeve (arrow) beneath the pedicle L 5

Table 1. *Level Specific Frequency of ELLDH*

Level	All lumbar DH	ELLDH	Percentage
L 2–3	48	8	16.5%
L 3–4	178	31	17.4%
L 4–5	1556	70	4.5%
L 5–S 1	1265	69	5.5%
Total	3047	178	5.8%

Table 2. *Distribution of ELLDH and Classical Disc Herniation (DH) Per Level*

Level	ELLDH	Percentage	Classical DH	Percentage
L 2–3	8	4.5%	40	1.4%
L 3–4	31	17.4%	147	5.1%
L 4–5	70	39.3%	1486	51.8%
L 5–S 1	69	38.8%	1196	41.7%
Total	178	100%	2869	100%

Table 3. *Aetiology of Radiculopathy Expressed as Probability of ELLDH at Different Levels*

Nerve root	Classical disc herniation		Extreme lateral disc herniation		Probability of ELLDH
S 1	L 5–S 1	1196		–	0%
L 5	L 4–5	1486	L 5–S 1	69	4.4%
L 4	L 3–4	147	L 4–5	70	32.2%
L 3	L 2–3	40	L 3–4	31	43.6%

Results

Incidence

From January 1982 to December 1989, 178 cases of ELLDH were operated on in our department out of a total of 3047 lumbar disc operations. This corresponds to an overall incidence of 5.8%.

The level specific frequency ranged from a low of 4.5% at L 4–5 to a peak of 17.4% at L 3–4 (Table 1). An analysis of distribution of ELLDH compared with classical disc herniation is seen in Table 2. The largest number of ELLDH occurred at L 4–5 and L 5–S 1 with a total of 139 cases or 78.1% of all ELLDHs. There were 39 cases or 21.9% at L 2–3 and L 3–4 levels.

Of a total of 226 disc herniations in the upper lumbar spine (L 2–3 and L 3–4) there were 39 ELLDH with an incidence of 17.2%. Of a total 2821 disc herniations in the lower lumbar spine (L 4–5 and L 5–S 1) there were 139 ELLDH with an incidence of 4.9%.

Aetiology of Radiculopathy

Assuming that all classical paramedian and lateral herniations listed in Table 2 caused a lower root syndrome and all ELLDH caused an upper root syndrome, we calculated the probability of an ELLDH for each nerve root syndrome. The incidence of ELLDH as the aetiology of the lumbar radiculopathy ranged from a low of 4.4% of all L 5 radiculopathies to a high of 43.6% of all L 3 radiculopathies (Table 3).

Age and Sex Distribution

The age of the patients ranged from 18 to 84 years (Table 4). 71% of the patients were between 40 and 70,

Table 4. *Age Distribution*

Age	n	Percentage
< 21	2	1.2%
21–30	12	6.7%
31–40	27	15.2%
41–50	33	18.5%
51–60	62	34.8%
61–70	32	17.9%
71–80	9	5.1%
> 80	1	0.6%
Total	178	100%

Table 5. *Pain Pattern*

Level	Sciatic type	Femoral type	Unclassified
L 2–3	–	8	–
L 3–4	–	28	3
L 4–5	12	40	18
L 5–S 1	67	–	2
Total	79	76	23

with a peak incidence in the 6th decade. There were 127 males (71%) and 51 females (29%).

Pattern of Pain

The patient's pain complaints was divided into 3 types (Table 5).

The pain was classified as sciatic type if it radiated down the posterior aspect of the thigh and the calf[15], and as femoral type if it radiated into the anterior aspect of the thigh and down along the anterior tibial region[2]. If the patients' pain pattern did nor clearly fit either of these categories the pain was considered as unclassified.

The sciatic type of pain was present in 79 cases, the femoral type in 76 cases, whereas in 23 patients the pain radiation could not be classified. Out of 70 L 4–5 ELLDH 40 patients showed a classical femoral type pain, 18 cases were unclassified and 12 patients were classified as in the sciatic group. The pain pattern of L 5–S 1 ELLDH was rather characteristic with a sciatic type of radiation in all but 2 cases, both of whom showed an unclassified distribution. All 39 ELLDH at level L 2–3 or L 3–4 showed the expected femoral type pain pattern with the exception of 3 cases with diffuse pain radiation.

Low Back Signs

Low back signs and symptoms such as lumbar pain, local paraspinal muscle stiffness and restriction of spinal movements[21] were present in 158 cases (88.8%). The intensity of low back signs and symptoms was classified in 4 grades:

1) absent

2) minor symptoms included lumbar pain without restriction of movements

3) moderate symptoms included some painful restriction of lumbar movements and

4) major symptoms included substantial pain combined with finger-to-floor distance of 50 cm or more on maximal forward flexion of the spine or inability to keep upright[2].

The results are listed in Table 6: 100 patients (56.2%) showed a moderate or major low back syndrome, whereas 20 patients (11.2%) did not have low back signs or symptoms. In a subgroup consisting of the 83 most recent consecutive cases we analysed the frequency of absent or minor low back signs versus the frequency of moderate or major complaints at each level of herniation (Table 7). Out of 21 L 2–3 and L 3–4 ELLDH only 5 patients (23.8%) produced moderate or major low back signs and symptoms whereas 37 out of 62 (59.6%) L 4–5 and L 5–S 1 ELLDH produced moderate or major lumbar pain.

Table 6. *Low Back Signs in ELLDH*

Absent	20	11.2%
Minor	58	32.6%
Moderate	60	33.7%
Major	40	22.5%

Table 7. *Relation Between Severity of Low Back Signs and Level of ELLDH in the Recent 83 Consecutive Patients*

Low back signs and symptoms							
Level	None		Minor	Moderate		Major	
L 2–3	2	76.2%	4	1	23.8%	–	
L 3–4	2		8	1		3	
L 4–5	5	40.4%	10	14	59.6%	5	
L 5–S 1	5		5	9		9	

Table 8. *Nerve Traction Test*

Level	Sciatic type	Femoral type	Both	None
L 2–3	–	8	–	–
L 3–4	1	19	7	4
L 4–5	7	36	22	5
L 5–S 1	54	–	3[a]	12
Total	62	63	32	21

[a] 3 out of 178 ELLDH (1.7%) had a positive femoral nerve traction test that led to a false suspicion of the anatomical location.

Table 9. *Motor Deficit*

Absent	38	21.3%
Minor	61	34.3%
Moderate	65	36.5%
Severe	14	7.9%

Table 10. *Sensory Deficit*

Normal	77	43.3%
Dermatomal		
Mild	74	41.6%
Severe	9	5.0%
Non-dermatomal	18	10.1%

Nerve Traction Tests

The sciatic nerve traction test (L asègue's manoeuvre) was considered positive if radicular pain occurred at 70° or less on the symptomatic side. The femoral nerve traction test was considered positive if radicular pain was provoked in the anterior thigh by passive extension of the hip with flexion of the knee on the symptomatic side. Amongst the 69 L 5–S 1 ELLDH, 57 (82.6%) produced a positive Lasègue's manoeuvre and 3 (4.3%) of them presented in addition with a positive femoral nerve traction test (Table 8). Of 109 cases of ELLDH at L 2–3, L 3–4 or L 4–5, levels which should theoretically present with a positive femoral traction test, there were 92 (84.4%) with a positive femoral traction test, including 29 cases with additional positive Lasègue's manoeuvre. In 8 patients with either an L 3 or an L 4 nerve root compression (L 3–4 or L 4–5 ELLDH), the sciatic nerve traction test was paradoxically positive in the absence of a positive femoral traction test. In only 3 cases of all 178 ELLDH was the femoral nerve traction test paradoxically positive (1.7%). 21 patients (11.8%) had neither a positive sciatic nor a femoral nerve traction test.

Motor and Sensory Deficit

The patient's motor examination was reviewed and the degree of motor deficit was classified as – 1) absent – 2) minor, defined as slight weakness of toes or knee detectable only by clinical examination – 3) moderate, defined as weakness of ankle or knee without impairement of gait – 4) severe, defined as weakness with inability to walk on toes or heels or to climb stairs.

The patients sensory examinaiton was classified as – 1) normal – 2) mildly decreased sensation with a single dermatomal distribution – 3) severely decreased or absent sensation within a single dermatomal distribution – 4) non-dermatomal sensory loss. Motor deficits were detected in 140 patients (78.7%) (Table 9). 61 patients had not noticed their slight weakness on their own (34.3% grade 2). Disability of walking provoked by either high stepping of the foot (5 cases) or a severe paresis of the quadriceps (9 cases) appeared in only 14 cases (7.9% grade 4). In 82% of all ELLDH the corresponding reflexes were diminished or absent. Sensory deficits varied widely and were present in 101 patients (56.7%) (Table 10). Clinically well defined radicular sensory deficits were present in slightly less than half of all cases (46.7%). Non-dermatomal sensory-loss was noted in 18 cases (10.1%), often accompanied by diffuse paraesthesiae.

Discussion

Since the introduction of CT scan ELLDH has become a familiar disease to spinal surgeons and is usually included in the differential diagnosis of low back syndromes. Failure of classical disc surgery as a result of a negative exploration by standard hemilaminectomy has become rare. It is now well known that radiculopathy can be caused by an extreme lateral lumbar disc herniation with compression of the upper nerve root of a vertebral segment either in or lateral to the intervertebral foramen. Several papers dedicated exclusively to this pathological entity and to the different surgical techniques have been published[1, 2, 4–15, 19–22, 25].

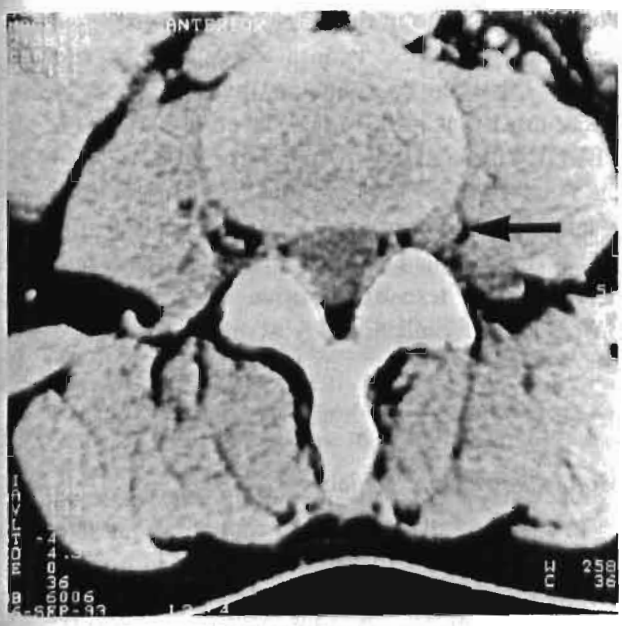

Fig. 2. Computed tomography showing a left sided extreme lateral lumbar disc herniation at the level L 3–L 4 (arrow) (slice thickness: 3 mm)

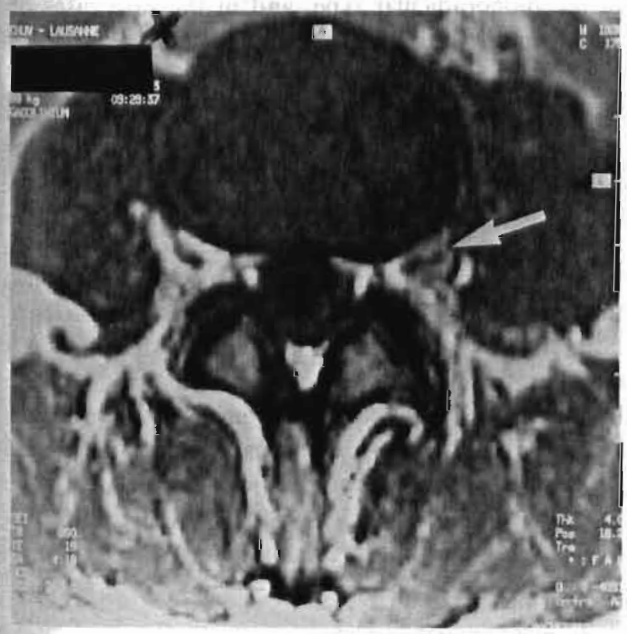

Fig. 3. T 1 weighted spin-echo transverse image L 3–L 4 after Gadolinium injection (DOTA) showing the same extreme lateral lumbar disc herniation as in Fig. 2. Note the contrast enhancement of inflammatory tissue around the herniated disc fragment (arrow)

Incidence

In different surgical or radiological series the overall incidence of ELLDH ranges from 0.7% to 11.7%[1, 12, 13]. In our series we calculated an overall incidence of ELLDH of 5.8% over a period of 8 years, which confirms the findings of other reports. More interesting however was to compare the incidence of ELLDH at the upper (L 2–3 and L 3–4) versus the lower (L 4–5 and L 5–S 1) lumbar levels: the incidence ranged from 4.9% at lower levels to 17.2% at the upper lumbar levels, confirming the opinion of several authors[1, 9, 14, 18, 20, 22] that a higher overall frequency of ELLDH is found in the upper lumbar levels. Analysing the level distribution of ELLDH, we found that 78.1% of all ELLDH occurred at the L 4–5 and L 5–S 1 levels with almost equal frequency (39.3% resp. 38.5%). Similar findings were emphasized by Maroon *et al.*[14] in their review of the literature, except that in this review the frequency of L 5–S 1 ELLDH was only 17%. We finally calculated as a crude approximation the probability of ELLDH as the aetiology of lumbar radiculopathy for each root syndrome (Table 3): An L 3 radiculopathy had a 43.6% probability to be caused by an L 3–4 ELLDH, and L 4 radiculopathy had a 32.2% probability to be caused by an L 4–5 ELLDH and an L 5 radiculopathy only a 4.4% probability to be caused by an L 5–S 1 ELLDH.

The high index of suspicion of ELLDH in upper lumbar radiculopathies is consequently justified.

Age and Sex Distribution

In accordance with several other series of ELLDH[1, 2, 4, 8, 11–15, 21] the majority was found in men, confirming the overall higher incidence of disc herniation in the male population. The age distribution showed a peak incidence in the sixth decade indicating a slightly higher mean age of patients with ELLDH than is commonly found with classical disc herniations[5, 12, 13].

Pattern of Pain

Leg pain either of the sciatic, the femoral or the unclassified type usually was the first and dominant clinical sign of radiculopathy. We did not find a typical pain radiation in the expected dermatomal segment in every cases which contrast with the finding of Epstein *et al.*[7], who noted an unequivocal pain distribution in their small series of 12 cases. In our series classical femoral pain was noted in 76 out of 109 patients with upper nerve root involvement (L 2 to L 4) whereas 12 showed a sciatic type and 21 an unclassified type of pain (Table 5). The pain pattern alone is not an unequivocal localizing parameter of radiculopathy in ELLDH, however we have to emphasize that leg pain was strictly unilateral in all ELLDH.

Low Back Signs

Statements about low back signs and symptoms differ widely from author to author. Abdullah[1] noted no back pain in his first series of ELLDH.

This was confirmed by Osborne *et al.*, who also described absence of low back signs in 16 patients with ELLDH[19]. On the other hand several authors[7–9, 11–13, 23] confirm the presence of low back signs in the majority of their cases with ELLDH, with an incidence ranging from 50%[12] to 96%[8]. The reproduction of pain by lateral bending towards the side of the lesion is mentioned in several series[2, 6, 7, 14, 19, 20]. We cannot comment about this clinical sign because it was not tested systematically.

158 patients of our series complained about low back pain (88.8%) of various degrees. Exactly two thirds of all patients with ELLDH showed minor or moderate low back signs (Table 6) and 22.5% suffered from major low back pain. It is worth emphasising that ELLDH at upper levels (L 2–3 and L 3–4) produced usually no or minor low back signs (76.2% of 21 cases) whereas patients with ELLDH at lower levels complained more often of moderate or major lumbar symptoms. This lower incidence of low back signs in ELLDH at upper levels is probably due to the lesser static charge of the spine near the thoracolumbar junction.

Nerve Traction Test

With ELLDH the fragments move superiorly and laterally from their level of origin and compress the superior nerve root. Therefore an L 4 root syndrome is produced by an L 4–5 ELLDH, and an L 3 root syndrome by an L 3–4 ELLDH. The mechanisms of amplified compression of the nerve root caused by nerve traction tests remain unchanged in extreme laterally lumbar disc diseases. This means that the femoral nerve traction test should be positive in all ELLDH at or above the level L 4–5. We found a rather close correlation between the nerve traction test and the anatomical location of ELLDH. 84.4% of ELLDH at or above L 4–5 level provoked a positive femoral nerve traction test (Table 8). Only in 3 cases of all ELLDH (1.7%) the femoral nerve traction tests led us to a false suspicion of the anatomical location of the disease. Therefore we emphasize the high frequency and reliability of this test with upper ELLDH, even when Lasègue's manoeuvre is also positive. These findings correspond to the results of Mc Cullock[15], Epstein[7] and Postacchini[21], who in their series also described a high frequency of positive femoral nerve traction tests in ELLDH with upper radiculopathy. The sciatic nerve traction test was positive in 52.8% (94 patients) of all ELLDH although only 69 patients had an ELLDH at the L 5–S 1 level. Therefore, the Lasègue's manoeuvre is less reliable concerning the anatomical location of ELLDH. If both, Lasègue's manoeuvre and femoral nerve traction tests are positive, we found a higher probability of radiculopathy at or above nerve root L 4.

Motor and Sensory Deficit

In 78.8% of all patients a motor deficit was detected on admission (Table 9). This incidence of motor deficits is rather high as compared to other reports[1, 8, 11–15, 21] where the incidence ranged from a low of 50%[12] to a peak of 100%[21]. Minor or moderate paresis accounted for the majority of motor weaknesses (70.8%) without impairment of walking. Usually the motor deficit was of the monoradicular type, and in the rare cases of double root motor deficits, the dominant weakness was due to the entraped nerve root in the intervertebral foramen. While Ebeling *et al.*[6] and Epstein *et al.*[7] reported similar results, Patrick[20] emphasised that most patients had no significant motor deficits.

Concerning the sensory deficits, we agree with the findings of Abdullah *et al.*[1] and Godersky *et al.*[11] who reported rather sparse and inconsistent correlation with the anatomical location of the lesion. In our series a distinctly lower percentage of sensory deficits were noted, as compared to motor deficits, namely 46.6%. In our experience the clinical finding of a motor deficit was more reliable than sensory disturbances in patients with upper nerve root compression.

Conclusions

ELLDH does not have specific clinical characteristics contrasting with classical paramedian or lateral disc herniation, but its incidence per level increases with rising lumbar spine levels. However there is a clinical constellation, including advanced age, pain pattern of the femoral type, positive femoral nerve traction test, minor or no low back signs and monoradicular motor deficit of an upper lumbar nerve root, that should raise a high degree of suspicion and should guide our investigations to detect a likely ELLDH.

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