

## LATERAL RECESS SYNDROME AND COMPUTED TOMOGRAPHY

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### SUMMARY :

*It is easy to make the diagnosis of lateral recess syndrome(LRS) when radiological and clinical findings are evaluated together. Nerve roots are compressed at the lateral recess; centrally at the subarticular region by superior articular facet hypertrophy, congenital stenosis or posteriolateral osteophytes; at the distal portion of the lateral recess, foraminal stenosis, extreme lateral disc herniations, or osteophytic formations, cause nerve root entrapment. In this syndrome low back and leg pain are sclerotomal, and intermittent in nature. Typically it is not affected by the Valsalva manoeuvre. Pain is alleviated on sitting and neuroradiological findings are chronic and insignificant. In neuroradiological evaluation plain radiography, polytomography and myelography have significant importance. Similar results can be obtained by polytomography in addition to computed tomography(CT). Differential diagnosis is difficult by myelography and the findings appear as root amputation or flattening.*

*In the present study 48 patients are presented. The depth of their lateral recess measured by CT was found to be 2-3 mm. Patients with depths of 2-3 mm had the most significant symptoms and neurological findings. We could not detect any significant difference in the symptoms and the clinical findings of the groups with a depth of 3-4 mm and 4-5 mm. There was no symptomatic patient with a depth of >5 mm.*

*Only few literature sources have been found dealing with LRS; and our findings are similar to the results in these articles. Nowadays, high resolution computed tomography (HRCT) facilitates the diagnosis and differential diagnosis of this syndrome and certainly is more helpful and useful than myelography.*

### KEY WORDS :

*Lateral recess syndrome; low back pain; computed tomography.*

### INTRODUCTION

The lateral recess is the area bordered posteriorly by the superior articular facet, laterally by pedicle, and anteriorly by the posterior surface of the vertebral body. It is funnel-shaped, being narrowest in the cephalic portion at the superior border of the pedicle (Figure 1). The spinal nerve root leaves the dural tube, descends obliquely downward and outward through the lateral recess and emerges under the pedicle (11,14). As the lateral recess is longer at L4, L5 and S1 levels the nerve root can especially be compressed at these levels (7).

According to the results in previous publications: the percentage of cases of nerve root entrapment that are surgically proven to be lateral recess stenosis is 18.3 %, but nowadays with recent developments in the diagnostic procedures this percentage is 8 % (4,5,7). The causes of stenosis at the lateral recess are as follows: Secondary to hypertrophy of the superior articular facet; posteriolateral (vertebral) osteophytes;

lateral disc herniations, and spondylolysthesis. If there is primary central canal stenosis, in addition there can be lateral recess stenosis unilaterally or bilaterally. Also, without the presence of central canal stenosis, congenital lateral recess stenosis can be seen (4).

Epstein et al (5) has defined the clinical and radiological findings of the facet syndrome in detail. Though the symptomatology and clinical findings of this syndrome revealed some characteristics such as unilateral sciatic pain, mild neurological deficits, and suspect myelography findings, it was difficult to make an accurate diagnosis before CT. Though direct roentgenography, polytomography and myelography are used in the diagnosis, none gives such accurate results as CT. But high resolution CT should be used as only it reveals the cause of the stenosis and its depth (2,13). The depth of the lateral recess can be measured between the superior articular facet and the top part of the pedicle (Figure 1). A height of 3 mm or less is highly indicative of a lateral recess

stenosis, 5 mm or more in height rules out this possibility (4,7,10,13).

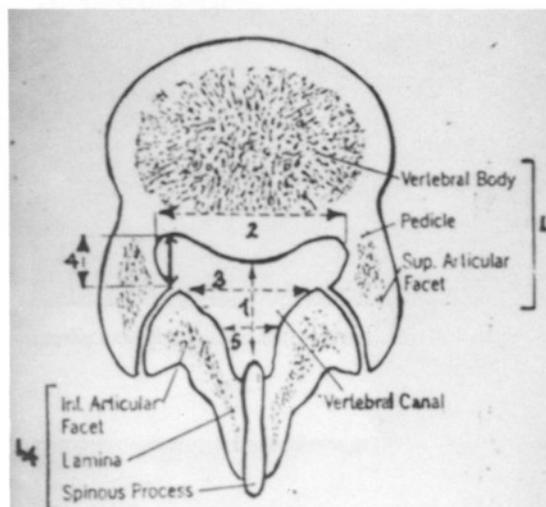


Fig 1 : The depth and localisation of lateral recess (LR) is shown in the figure by number 4.

In a review of the latest literature, it has been shown that the results of MRI in spinal canal pathologies are not superior to CT (9). In this research correlation of the clinical and CT findings of patients with sciatica and lateral recess stenosis diagnosed by CT are presented and discussed, with a review of the literature.

#### MATERIALS AND METHODS

The depth of lateral recess of 48 cases was measured by CT and diagnosed as lateral recess stenosis (syndrome). This research was carried out over a period of more than 4 years in the Departments of Radiology and Physical Medicine and Rehabilitation of Hacettepe Medical School. The average age of the patients was 53, and the history of symptoms ranged from 6 months to 7 years (average 3 years). In 40 patients there was moderate low back pain; in all of them, the essential clinical feature was disabling intermittent pain in one or both legs brought on by standing or walking for 5 to 10 minutes and relieved by squatting or sitting, but unaffected by coughing or grunting. There was paraesthesia in 36. On physical examination SLR was significantly positive in 12 cases, in 26 it was either negative or only mildly abnormal (Table 1). Mild motor deficit was detected in the dorsiflexors of 26 cases, and sensorial impairment and reflex changes in 8 (Table 1).

Table 1 : Neurological findings of 48 cases of LRS

Case No	Laseque SLR	Motor deficit	sensorial impairment	Reflex change
1	+	+	-	-
2	-	+	+	+
3	-	-	-	-
4	-	-	-	-
5	+	+	+	+
6	+	+	-	-
7	-	+	-	-
8	-	-	-	-
9	-	-	-	-
10	+	+	-	-
11	-	-	-	-
12	-	+	-	-
13	-	-	-	-
14	-	-	-	-
15	+	+	+	+
16	+	+	-	-
17	-	+	-	-
18	-	-	-	-
19	-	-	-	-
20	-	+	-	-
21	-	+	+	+
22	-	+	-	-
23	-	-	-	-
24	-	-	-	-
25	+	+	-	-
26	-	+	+	+
27	-	-	-	-
28	-	-	-	-
29	+	+	+	+
30	-	+	-	-
31	-	+	-	-
32	-	-	-	-
33	-	-	-	-
34	+	+	-	-
35	-	-	-	-
36	-	+	-	-
37	-	-	-	-
38	-	-	-	-
39	+	+	+	+
40	+	+	-	-
41	-	+	-	-
42	-	-	-	-
43	-	-	-	-
44	-	+	-	-
45	-	+	+	+
46	-	+	-	-
47	-	-	-	-
48	-	-	-	-

Neuroradiological findings: Frequently the facet joints at the L4-L5 levels were involved. In plain radiographs the presence of recess stenosis could be suggested, but accurate diagnosis depends on CT findings. Normally, the depth of the lateral recess diminishes from the upper to the lower lumbar region. AT L2, L3, L4 levels though this depth is 12-13 mm, the range is 5-20 mm. The depth is 9 mm for L5 (range: 2-15 mm) and 7-8 mm for S1 (range: 4-14 mm). There was stenosis at L5 level, in 30 cases; at L4 in 7; L3 in 1; S1 in 1 case.. L4-L5 level was involved most. If there is stenosis due to L5 superior articular facet this will give rise to neurological deficits involving L5 and S1 roots. There was bilateral stenosis in 20 cases, and in 2 cases the difference of depth between the left and right sides was 6 mm (Figures 2-9), (Table II). In our series of 48 cases, in 26 (55 %) the lateral recess was below 3 mm; except in 4 cases, all were below



Fig 2 : Lateral recess stenosis due to the presence of osteophytic formation L 4 - L 5)

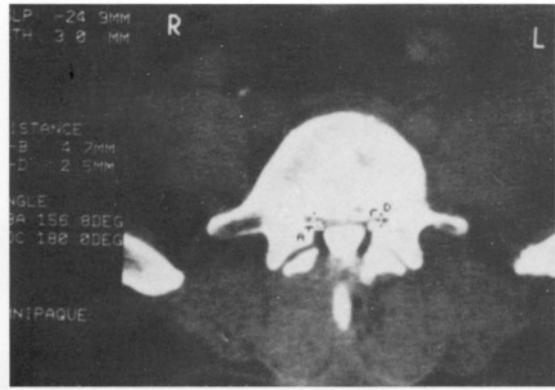


Fig 5 : Lateral recess stenosis (L4-L5) on the right side, with a depth of 2.5 mm (C-D)

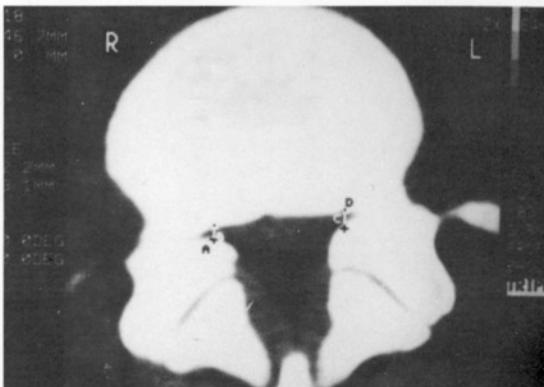


Fig 3 : The depth of lateral recess is measured as 2.2 mm (A-B) of left, and 3.1 mm (C-D) on right, indicating lateral recess stenosis.

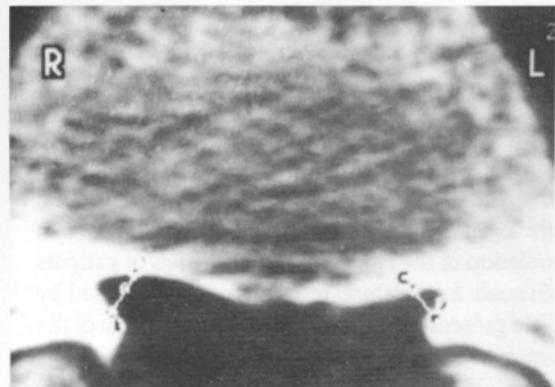


Fig 6 : LRS on the right side C-D : 3.3 mm (S1).

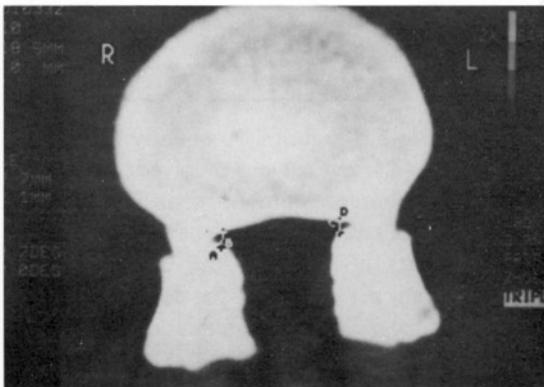


Fig 4 : The depth of lateral recess (L4-L) left. A-B : 2.7 mm. right. C-D : 2.1 mm



Fig 7 : Lateral recess stenosis on the left side. A-B : 3.2 mm (L4-L5)

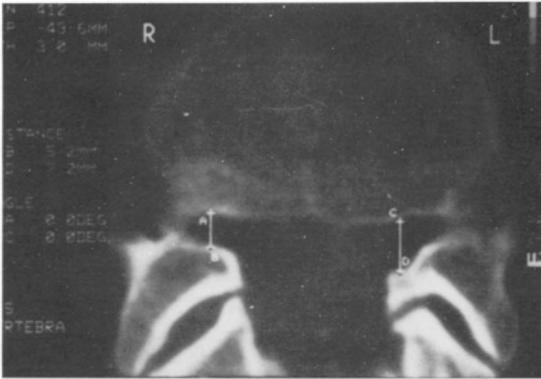


Fig 8 : Lateral recess at normal depth (L4-L5).

4 mm; and cases above 5 mm were asymptomatic (Figure 8). Primary recess stenosis was detected in 8 cases (17 %); secondary recess stenosis in 40 cases (83 %), 20 due to the presence of superior articular facet hypertrophy (42 %), 10 to osteophytic formation (21 %), 8 to lateral disc herniation (17 %), and 2 cases to postoperative fusion (Table III). After surgical intervention of disc herniations, in one case out of 8; lateral recess stenosis was detected.

**Table II: The involved levels in spinal column**

Level	Case No	%
L 2-3	2	4.1
L 3-4	14	29.1
L 4-5	30	62.5
L 5-S 1	2	4.1

## DISCUSSION

In 1972, Epstein et al (5) described lateral recess stenosis in detail, clinically and radiologically, in a series of 12 cases with superior articular facet hypertrophy. Lateral recess syndrome can be classified in two groups according to its aetiology: Primary, together with central canal stenosis or alone which

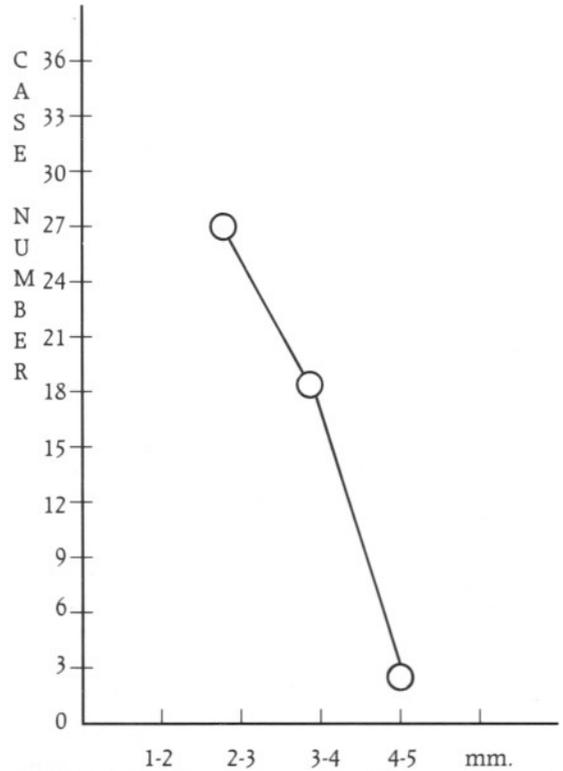


Fig 9 : The depth of lateral recess measured by computed tomography.

is congenital; and secondary mostly due to superior articular facet hypertrophy, osteophytic formations, lateral disc herniation (Table III).

**Table III : The aetiology in 48 cases of LRS**

Aetiology	Case No	%
S.A.F.H.*	20	42
Osteophytic formations	10	21
Lateral Disc Herniation	8	17
Primary stenosis	8	17
Postfusion	2	4.1

\* Superior Articular Facet Hypertrophy

Recently neuroradiological evaluation has specified the localization more accurately. Thus it is classified as: (a) subarticular recess stenosis, and (b) lateral stenosis (7,13). In the first group, the aetiological factors are: posteriolateral osteophytes, superior articular process hypertrophy, and disc herniations; in the second group, retrospondylolysthesis, extreme lateral disc herniation, osteophytic formations causing root compression at the foraminal level (7).

Lateral spinal stenosis (nerve root impingement within the intervertebral nerve root canal) causes entrapment of the exiting nerve root: subarticular recess stenosis produces entrapment of the nerve root which is crossing the intervertebral disc within the lateral aspect of the central spinal canal and exits at the level below. The use of the adjective "lateral" in stenosis of both the nerve root canal and subarticular regions has led to considerable confusion of the terms in radiological as well neurosurgical and orthopaedic literature. "Subarticular recess" is proposed as the preferred term, for that proximal portion of the lateral recess which underlines the medial portion of the superior articular process (7). In this syndrome, characterized by low back and leg pain, there are some specific characteristics, which are helpful in differential diagnosis.

Pain is brought on by standing and walking, and relieved by squatting and sitting. There is intermittent claudication brought on by mobilization that lasts 5-10 minutes. There is no neurological deficit, or slightly positive straight leg raising test in most cases.

Our findings are similar to the results in the literature (4,10,11) The symptoms are chronic in nature. Generally, in disc herniations, the progression is more rapid, the neurological deficits more significant, and the pain is aggravated on sitting. In LRS, during gait, lumbar lordosis increases and nerve root compression created by the superior articular process also increases and gives rise to pain. As motor symptoms and paraesthesia are intermittent in nature, this means that the radicular vascular supply is being compressed (4,5,10).

In the neurological evaluation of LRS, plain radiography, polytomography, myelography, CT, and MRI are used (4,5,7,10,13). The foraminal roentgenogram may suggest lateral recess stenosis, but we can not talk about any accurate localization. According to some authors, the results of polytomography and CT are similar in LRS (4,10,13). Myelography is valuable in diagnosing central stenosis, flattening and amputation, and compression of the nerve roots. These findings indicate that the contrast medium is insufficient or there is an epidural filling defect. If there is significant superior facet hypertrophy, constriction of the thecal sac can be observed as well (11).

In the diagnosis of LRS, CT is still superior to MRI (3,6,9). Marawilla et al (9) have suggested that MRI is superior in the differential diagnosis of recurrent disc herniations and postoperative scar formation. CT in particular has significant diagnostic value in degenerative disc herniations (8,9).

The depth of Lateral recess (LR) measured by CT, can be classified in 3 groups:

1. LR height: 2-3 mm (26 cases)
2. LR height: 3-4 mm (18 cases)
3. LR height: 4-5 mm (4 cases)

In the first group, the symptoms and neurological deficits were more significant; in the second and third groups, they were milder.

In our research, there was no symptomatic patient with a depth of more than 5 mm and this is similar in the literature (4,10). Though there was a difference between the symptoms of the first group and the other two, there was no significant difference between the second and third groups. Sagittal reformatted images are recommended strongly as an adjunct to axial images in the evaluation of the nerve root and its canal. The bony structures, variations in the LR, postimpingement swelling and oedema of the root (prestenotic or poststenotic) was also demonstrated in some cases by CT.

Differential diagnosis by CT is possible, whether there is stenosis due to superior articular facet hypertrophy or inferior articular process hypertrophy or both (2,7).

Carrera et al (2) detected facet joint pathologies in 64 patients out of 100 in their research. In these cases primarily hypertrophy, the reaction of bone against stress was seen. Due to the presence of hypertrophy, an irregular articular surface is created, thus abnormal mechanical stress causes root compression and pain.

Every facet joint is innervated by one of the small branches of the primary ramus which separates from the posterior root ganglion. The pain impulses that originate from facet joints are felt over the structures innervated by the posterior root ganglion. This sclerotomal pain is typical for facet joint disease and quite different from dermatomal pain seen in disc herniations in LRS; these variations; in addition to stenosis of bony structures should be considered (1,6,8). Both factors play an important role in the aetiology of LRS. Maybe for this reason we could not find any correlation between the clinical findings and recess depth of our second and third groups. Consequently, high resolution CT has emphasized the clinical importance of lateral recess stenosis. In central recess stenosis (subarticular stenosis) nerve root compression is due to the presence of a developmental defect, sequestered disc fragment, superior articular facet hypertrophy or a combination of all. If the nerve root is compressed by osteophytes or lateral disc

prolapsed at the foramina, this is termed foraminal lateral recess stenosis (7,13).

All this detailed information has significant importance in planning the treatment of the patient. The plan of the orthopaedic or neurosurgical intervention at the preoperative stage, that is decompression of the related facet root, foraminotomy, partial excision of the related facet joint, will be possible and the results will be successful. Therefore, to prevent failed back surgery syndrome (FBSS) due to unrecognized lateral recess stenosis, it is strongly recommended that all patients undergoing surgery for degenerative lumbar disease have high resolution CT of the lumbar spine including reformatted images.

Two different CT techniques are currently employed in the evaluation of low back pain (13). Both involve imaging the lumbar spine between L3 and S1. The first uses a series of angled scans coaxial to the intervertebral disc spaces, starting at the inferior aspect of the pedicle and ending at the superior end plate of the vertebral body below. In this technique the scan is coaxial to the disc in order to exclude any distortion of normal anatomy. With this method, unless the region of the pedicle is imaged in addition to the disc, failure to demonstrate central canal stenosis and free disc fragments may occur. By imaging the whole lower lumbar canal in continuity, complete reconstructions in the sagittal and coronal planes are possible allowing direct comparison at different levels. The alternative protocol and the most commonly used involves obtaining stacked contiguous images from the mid-pedicle of L3 to the inferior aspect of the S1 disc space. The important advantage of this protocol is that it covers the complete lower lumbar spine; no gaps are left unexamined and therefore pathology is unlikely to be missed (1,7,12). It must be pointed out that in order to make accurate diagnosis, there must be parallelism between the radiological and clinical findings. One of the commonest medical is low back pain with or without sciatica.

Specialists of physical medicine and rehabilitation, radiologists and neurosurgeons are dealing with the diagnosis and treatment of patients with low back

pain. Plain radiography, polytomography, myelography and consequently CT are used as diagnostic procedures. Myelography is an invasive technique and complications are well known. As high resolution CT is a noninvasive technique and gives more detailed information than myelography, it is also going to be accepted as a routine and one of the most helpful diagnostic procedures in the departments of Physical Medicine and Rehabilitation.

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