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Lumbar Spinal Epidural Lipomatosis: Prevalence and Patterns

Original research article

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Abstract: *The aim of this study was to assess the prevalence and identify the patterns of lumbar spinal epidural lipomatosis in our institute (Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research). The study included the Spinal Epidural Lipomatosis (SEL) detected on lumbar spine Magnetic resonance imaging (MRI) scans performed at the author's hospital and to compare the frequency& patterns of SEL in these cases with that reported in the literature. The total number of MRI examinations of the lumbar spine performed at this hospital over 30 months was 400. After the MRI data was analyzed (T1- and T2-weighted sagittal and axial images and myelography), A total number of 30 patients shown to be having SEL.*

Keywords: *spinal epidural lipomatosis ,low back pain, lumbar spine MRI.*

I. Introduction

Spinal epidural lipomatosis(SEL) is a condition with excessive deposition of normal adipose tissue in the spinal canal epidural space, thereby causing mass effect on cauda equina and spinal nerve roots in the spinal canal. Some of the associated symptoms include low back pain, numbness, radiculopathy and neurogenic claudication. It is known to cause symptoms in dorsal region, but unclear whether this is responsible for the patient symptoms in the lumbar regions. In most cases, no clear clinical correlation is noted and the diagnosis is often made based on morphological characteristics in MRI.

Best sequence to review Spinal epidural lipomatosis is T1WI sequence due to its excellent contrast between CSF in thecal sac and epidural fat. Typical SEL case shows compression of the thecal sac by excessive deposition of adipose tissue. Severity of mass effect on thecal sac in Spinal epidural lipomatosis is generally assessed using axial slices of lumbar spine by magnetic resonance imaging (MRI) scans, where as lumbar spine sagittal images being used to see the proximal extent of the disease. In advanced SEL thecal sac can appear as a small oval or the letter Y on the axial slice of the MRI scan, commonly referred to as the Stellate sign, or the "Y" sign [1,2]. MR Myelography reveals thecal sac compression with abrupt cut off of the thecal sac at proximal extent of the disease in these patients.

II. Materials And Methods

This study was approved by the ethical committee of Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research, located in Chinnaoutpalli, Krishna district, Andhra Pradesh, India.

From the total number of MRI examinations of the lumbar spine performed at this hospital over 30 months we have taken 400 cases of MRI lumbar spine. We have excluded scans of pediatric age group from the study. We have also excluded all the cases with epidural space pathologies. All the MRI scans have been performed using 1.5T Philips Achieva MRI machine using following parameters.

Sag-T1WI – TR –400 / TE –80 / Thickness – 3mm / Flip angle- 90^0
Sag-T2WI – TR –3098 / TE -120 / Thickness– 3mm / Flip angle-90^0
STIR Sag – TR–3500 / TE–80 / Thickness – 3.5mm.
AXIAL T1WI – TR –483 / TE–80 / Thickness– 4mm.
AXIAL T2WI – TR – 2482 / TE –120 / Thickness – 4mm.
MR Myelography- (single shot) TR- 8000 / TE-1000 /slab thickness-40mm.

Two radiologists who have experience in MRI reporting for more than a decade reviewed all the positive cases. Usually thecal sac ends in the sacrum at S2 level, where epidural fat surrounds thecal sac normally and fills the canal below this level. We have selected cases where in epidural fat is the predominant content in the spinal canal with or without thecal sac compression at or above S1 sacral segment level.

Limitations of the study: Since it is a retrospective study, we have not excluded patients who are on steroids or used steroids in the past, which may influence the epidural fat. Synchronous dorsal SEL is not assessed or not included in this study. We have not done quantitative assessment of amount of epidural fat in relation with thecal sac volume.

III. Results

SEL was diagnosed based on excessive accumulation of adipose tissue in the epidural space at and above S1 sacral segmental level. Out of 400 MRI scans of lumbosacral spines 30 scans were positive for SEL. So the prevalence of lumbar SEL is about 7.5% in our institute.

Out of 30 patients we observed 21 were males (70%) and 9 were females (30%). The youngest patient in the study is 18 years old and the oldest patient's age is 75 years. Mean age of the patients is 46 years with median 49 and SD of 14.

In our study most patients(16) presented with low back ache (50%). In the remaining cases, 6 patients presented with low back ache with right sciatica (20%),3 Patients presented with low back ache with left sciatica(10%), 2 patients presented with low back ache with bilateral sciatica(6.6%), 2 patients presented with trauma (6.6%),1 patient presented with neurogenic claudication(3.3%).

In our observation the lumbar spinal lipomatosis is always distal to proximal. Hence we graded SEL based on the proximal extent. In most patients i.e. 14, proximal extent of lumbar SEL is up to L5 vertebral level (46.7%). In this study, Proximal most extent of SEL is up to the level of L2 vertebra.

Out of 30 patients with SEL 13 patients(43.3%) showed significant thecal sac compression with cauda equine crowding without visible CSF signal in the axial MRI scans. Remaining 17 patients (56.6%) showed varying degree of thecal sac compromise from nil to mild and moderate compromise of the thecal sac as shown in table 4.

In this study 4 patients (13.3%) showed developmental canal stenosis and 26 patients showed mild to moderate degenerative disease (86.7%). Some of the patients showed coexistence of both the entities along with the epidural lipomatosis. We have classified severity based on the proximal extent of Epidural Lipomatosis as below:

Mild – only at sacral level
Moderate – up to L5 level
Severe – L4 level or beyond

Table 1: Showing distribution of clinical symptoms of patients with MR showing features of SEL.

Presentation	Frequency	Percent
Low back ache	16	50
Low back ache with right sciatica	6	20
Low back ache with left sciatica	3	10
Low back ache radiating to both lower limbs	2	3.3
Trauma	2	6.6
Neurogenic claudication	1	3.3
Total	30	100

Table 2: Showing distribution of patients with MR findings of cauda equine fibres crowding.

Crowding of cauda equina	Frequency	Percent
Absent	17	57
Present	13	43
Total	30	100

Figure 1: Pie chart diagram showing distribution of patients with MR findings of cauda equine fibres crowding.

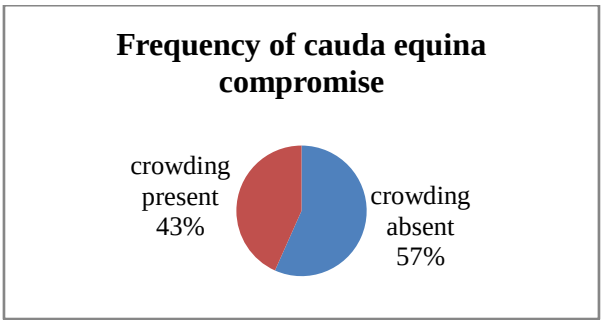

Table 3: showing distribution of starting level of lipomatosis in various patients of lumbar SEL.

Starting level of lipomatosis	Frequency	Percent
L2 Vertebra	1	3.3
L4 vertebra	5	16.7
L4-L5 disc	3	10
L5 vertebra	14	46.7
L5-S1 disc	5	16.7
S1 vertebra	2	6.7
Total	30	100

Fig 2: Pie chart diagram showing distribution of starting level of lipomatosis in various patients of lumbar SEL

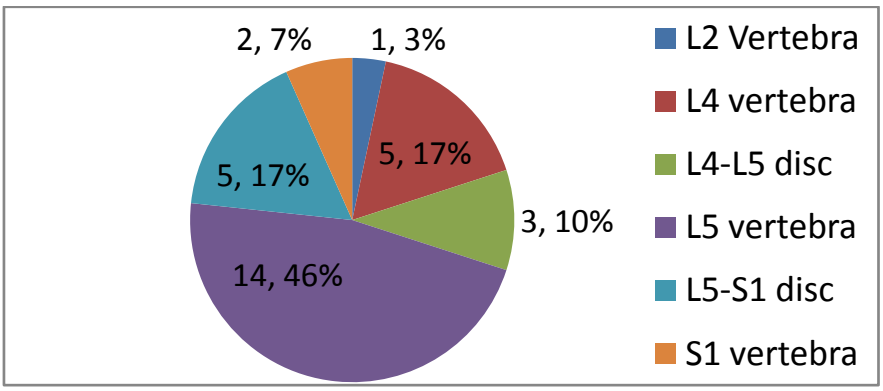

Table 4: showing distribution of patients with thecal sac findings.

Status of thecal sac	**Frequency**	**Percent**
Nil	4	13.3
Thecal sac indentation (Mild)	9	30
Thecal sac narrowing (Moderate)	4	13.3
Thecal sac narrowing with cauda equina compromise (Severe)	13	43.3
Total	**30**	**100**

Fig 3– Sagittal T1W MR image of a 39year male shows significant epidural lipomatosis which is near totally filling the S1 canal and L5 level canal. Fat prominence is extending upto L4-L5 disc.

Fig 4– Parasagittal T1W MR image of the same patient is showing epidural space, which is almost completely filled with fat through which nerve roots are seen.

Fig 5 - Mid sagittal T2 W image of a 60 yr male shows epidural lipomatosis compromising terminal thecal sac and cauda equina. It is difficult on T2 to differentiate fat signal from fluid signal.

Fig 6- MR Myelogram of the same patient shows abrupt termination of thecal sac at L5 upper end plate which otherwise should show smooth tapering at S2 level.

Fig - 7 Axial T2 images of the same patient show adequate lumbar spinal canal, but compromised thecal sac and cauda equina due to excessive fat in the epidural space.

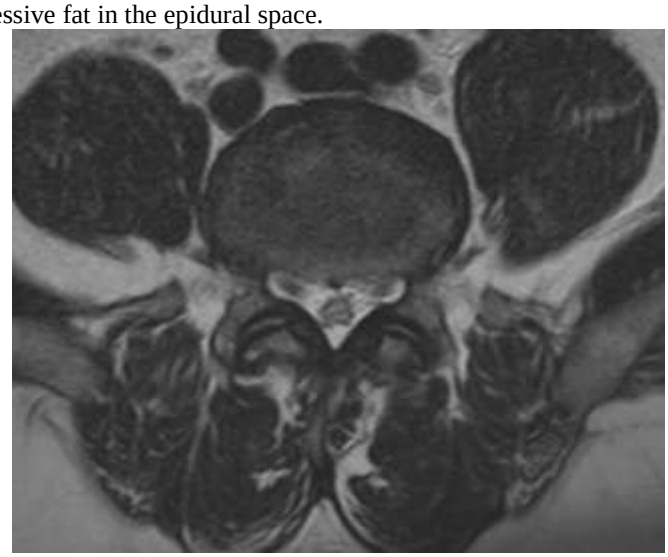

Fig -8. Axial T1 image of an 80 yr male shows excess epidural fat causing compression of the thecal sac producing 'Stellate' or 'Y' configuration.

IV. Discussion

The first case of SEL was reported in 1975 by Lee et al [3] in a patient who had undergone renal transplantation. Subsequently more than 100 cases have been reported by Fogel et al [4]. With widespread use of MRI, SEL is no longer a rare condition. Studies have shown that 75% to 88% of patients affected by SEL are men [5], thus SEL has primarily been considered a disease of men.

MRI examination is useful in diagnosing SEL, and to differentiate it from Lipoma and Filum terminale Lipoma, as lipoma is a discrete mass lesion with a capsule and Filum terminale lipoma is located within the thecal sac

SEL is associated with exogenous steroid use in 55.3%. Obesity is the second most common associated category with 24.5 % and Cushing's syndrome have been reported to associate with SEL in 3.2% [4,7]. Finally the idiopathic cases where no identifiable associations with SEL are found constitute 17% of our cases [4].

On T1W images, epidural fat shows very high signal intensity and CSF in thecal sac shows low signal intensity. The significant contrast difference in these signal intensities enables us to identify excess accumulation of epidural fat and its extent. Axial T1W images usually show a polygonal, speculated, 'Y' shaped or Stellate deformation of the dural sac in association with epidural fat overgrowth [7]. Geers at al [7] indicated that this could be explained by the presence of structures connecting the outer surface of the dura matter to the osteo fibrous walls of the lumbar spinal canal and location and compression of continuous meningo vertebral ligaments in the epidural space. Spiculations of the polygonal sections correspond to the dural insertion site of the ligaments and the intervening depressions corresponding to the mass effect of excessive epidural fat which narrows spinal canal and makes nerve roots vulnerable in these patients.

V. Conclusion

In this study prevalence of lumbar SEL in our institute, which is situated in Krishna district of A.P is about 7.5% with mean age of 46 years. Male preponderance is observed with 70% of the total number of patients being males. This is in consistence of the study done by Kawai M at,al.[5] 43.3% of the patients showed morphological severe form with complete thecal sac compression with cauda equine crowding. Epidural lipomatosis should be in the checklist of all the spinal reports.

Conflict of interest statement: The authors have no conflict of interest.

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