Spinal Epidural Lipomatosis in Lumbar Magnetic Resonance Imaging Scans

HISASHI SUGAYA, MD; TOSHIKAZU TANAKA, MD, PhD; TAKEHI OGAWA, MD, PhD; HAJIME MISHIMA, MD, PhD

abstract

The goal of this study was to quantify the frequency of advanced spinal epidural lipomatosis (SEL) detected on lumbar magnetic resonance imaging (MRI) scans performed at the authors’ hospital and to compare the frequency, cause, and progression 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 45 months was 1498 (705 men and 793 women; mean age, 60.3 years). After the MRI data were reduced (T1- and T2-weighted sagittal and axial images) on the basis of the exclusion criteria, the anterior and posterior diameters of the dural sac and spinal canal were measured, as well as the thickness of the epidural fat. On the basis of these parameters, the severity of SEL was classified as grade 0 to grade III. Five cases of grade III SEL were diagnosed. The frequency of grade III SEL noted in this study was 0.33% (5/1498). Obesity (body mass index greater than 27.5) was noted in 3 cases, and the use of exogenous corticosteroids was noted in 3 cases. Exogenous steroid usage associated with advanced SEL in this study was greater than that reported in the literature. Most symptoms of SEL progress slowly, and early diagnosis allows for a dose reduction of the prescribed steroids. Thus, lumbar MRI examinations should be conducted aggressively in patients with exogenous steroid use and presenting with low back pain or buttock pain.

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Spinal epidural lipomatosis (SEL) is a disease involving excessive deposition of normal adipose tissue in the spinal canal, thereby compressing the spinal cord. Some of the associated symptoms include low back pain, numbness, and intermittent claudication. In most cases, no clear clinical correlation is noted and the diagnosis is often made based on radiographic examination. Spinal epidural lipomatosis is generally diagnosed using axial slices of lumbar magnetic resonance imaging (MRI) scans. The typical images show compression of the dura by excessive deposition of adipose tissue. Advanced SEL 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.

The goal of this study was to quantify the frequency of advanced SEL detected on lumbar MRI scans as well as to compare the frequency, cause, and progression of SEL in these cases with those reported in the literature.

**Materials and Methods**

All patients provided informed consent and agreed to be research subjects. The protocol of this retrospective study was approved by the institutional review board of the authors’ hospital. The current study was designed as a retrospective investigation of lumbar spine MRI scans performed at this hospital. In all, 1498 scans (705 men and 793 women; mean age, 60.3 years) were performed at the study hospital over a period of 45 months (July 2005-April 2009). The MRI diagnosis was as follows: disk herniation in 660 scans, lumbar spinal canal stenosis in 309, lumbar spondylosis in 284, compression fracture in 168, pathologic fracture by metastases in 24, diskitis in 21, extradural tumor in 8, epidural hematoma in 6, SEL in 5, and normal spine in 13. In the case of multiple diagnoses, the 1 most appropriate for the symptoms was selected. Exclusion criteria for SEL in this retrospective study were as follows: spondylitis, diskitis, extradural tumor, pathologic fracture (eg, due to metastases), and previous lumbar spinal surgery or radiation therapy.

The MRI examinations were performed using a 1-T superconducting magnet. The following sequences were investigated, focusing on the lumbar spine:

1. Turbo spin-echo T1-weighted sagittal images (repetition time [TR]/echo time [TE], 500-600 ms/10-15 ms; matrix, 512x256; slice thickness, 5 mm; interslice gap, 10%).
2. Turbo spin-echo T2-weighted sagittal images (TR/TE, 3000-4000 ms/120 ms; matrix, 512x256; slice thickness, 5 mm; interslice gap, 10%).
3. Turbo spin-echo T1-weighted axial images (TR/TE, 400-600 ms/10-15 ms; matrix, 512x256; slice thickness, 5 mm; interslice gap, 10%).
4. Turbo spin-echo T2-weighted axial images (TR/TE, 3000-4000 ms/120 ms; matrix, 512x256; slice thickness, 5 mm; interslice gap, 10%).

After reduction of the MRI data on the basis of the exclusion criteria, the anteroposterior diameters of the dural sac and spinal canal as well as the thickness of the epidural fat were measured. On the basis of these ratios, SEL was classified into 3 grades according to the system proposed by Borré et al., with grade III indicating epidural fat deposition in more than 75% of the canal width, dural measurements of at least 30% of the width of the fat, or the presence of the characteristic stellate sign, or “Y” sign. The cases of grade III SEL were designated as “advanced SEL,” and the records of these patients were reviewed.

**Results**

Five patients (3 men, 2 women) were diagnosed with grade III SEL. The rate of

<table>
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<th>Case</th>
<th>Characteristics of Patients With Grade III Spinal Epidural Lipomatosis</th>
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<tbody>
<tr>
<td>Sex</td>
<td>Male</td>
</tr>
<tr>
<td>Age, y</td>
<td>63</td>
</tr>
<tr>
<td>BMI</td>
<td>27.5</td>
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<td>Symptoms</td>
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Abbreviations: BMI, body mass index; BP, buttock pain; IC, intermittent claudication; LBP, low back pain; NSAIDs, nonsteroidal anti-inflammatory drugs.
grade III SEL was 0.33% (5/1498), and the mean age was relatively high, at 72.2 years. Patient characteristics are summarized in Table 1. Most of the patients had low back pain and buttock pain. Obesity (body mass index >27.5) was noted in 3 patients (2 men, 1 woman); specifically, 2 patients were obese (2 men), and 1 was obese and received additional corticoid therapy (1 woman). Long-term use of exogenous corticosteroids for more than 1 year was recorded in 3 cases (1 man, 2 women) because of rheumatoid disease (1 man), malignant rheumatoid arthritis (1 woman), and aplastic anemia (1 woman with obesity). The treatment improved the symptoms of these 5 patients.

Case Reports

Case 1: A 73-year-old man presented with buttock pain and intermittent claudication. He was obese, with a body mass index of 36, and had diabetes and liver cirrhosis. He had no history of steroid use. This pain was not associated with any bowel or bladder incontinence. Neurologic examination showed that the patient was intact with no signs of nerve root tension, muscle weakness, or sensory loss. MRI examination showed deposition of excessive adipose tissue from L5-S1, and the “Y” sign was found at L5-S1 (Figure 2). A caudal block was performed and improved his symptoms.

Case 2: A 79-year-old man presented with low back pain and buttock pain. The patient had rheumatoid disease, namely, remitting seronegative symmetrical synovitis with pitting edema syndrome (RS3PE syndrome) for 2 years; therefore, he had been receiving steroids for 2 years (maximum dose, 30 mg/day; current dose, 10 mg/day). The pain was not associated with any bowel or bladder incontinence. Neurologic examination showed that the spine was intact, with no signs of nerve root tension, muscle weakness, or sensory loss. MRI examination showed excess adipose tissue deposition from L4-S1, and the stellate sign was found at L5-S1 (Figure 3). The patient was administered nonsteroidal anti-inflammatory drugs, and the dose of steroid was reduced from 10 mg/day to 7 mg/day. His condition improved gradually.

Figure 2: Sagittal T1-weighted magnetic resonance imaging scan showing the widening of adipose tissue in the spinal canal and compression of the dura from L5-S1 (A). Magnetic resonance imaging axial view at L5-S1 showing the “Y” sign, which appears as the letter Y, indicating compression by the excess adipose tissue (arrows) (B).

Figure 3: Sagittal T1-weighted magnetic resonance imaging scan showing the widening of adipose tissue in the spinal canal and compression of the dura from L4-S1 (A). Magnetic resonance imaging axial view of L5-S1 showing the stellate sign, which appears as a group of small ovals, indicating compression by the excessive deposition of adipose tissue (arrows) (B).
DISCUSSION

The first case of SEL was reported in 1975 by Lee et al\(^2\) in a patient who had undergone renal transplantation. Subsequently, more than 100 cases have been reported by Fogel et al.\(^4\) With the widespread use of MRI, SEL is no longer a rare condition.

As expected, symptom presentation differs with the region affected. Spinal epidural lipomatosis affecting the thoracic spine primarily presents with spinal symptoms. Symptoms of SEL affecting the lower lumbar spine include low back pain, signs of nerve root tension,\(^5\) and symptoms of cauda equina; however, some patients are asymptomatic.\(^4,6\) Most symptoms progress slowly, but some patients report difficulties with bowel or bladder control within 48 hours.

In the study by Fogel et al.,\(^2\) SEL occurred in the thoracic region in 46% to 61% of cases and in the lumbar region in 39% to 44% of cases. None of the patients had SEL in the cervical spine.\(^4,7,8\)

Studies have shown that 75% to 88% of patients affected by SEL are men;\(^2\) thus, SEL has primarily been considered a disease of men. MRI examination is useful for the diagnosis of SEL. The characteristic MRI findings in SEL include the presence of a massive lesion on T1-weighted high-intensity imaging and T2-weighted low-intensity imaging scans. Typical MRI scans in these cases show compression of the dura by excessive deposition of adipose tissue. Advanced SEL can appear as a small oval or the letter Y in the axial slice of the MRI; this sign is commonly referred to as the stellate sign, or the “Y” sign. One of the criteria for the diagnosis of SEL is excessive adipose tissue that is thicker than 7 mm.\(^8\) The extent of excessive adipose tissue deposition has been classified by Borré et al\(^2\) into 4 grades (grades 0, I, II, and III), according to the percentage of adipose tissue deposition.

Although SEL is similar to lipoma and filum terminale lipoma, a lipoma is a mass lesion enveloped by a capsule and filament terminale lipoma is limited to the sacrococcygeal region. Because SEL involves the diffuse hypertrophy of adipose tissue, MRI examination of SEL is different from that of lipoma and filament terminale lipoma.

Some cases of SEL are idiopathic,\(^2,5,6\) but SEL has been associated with obesity, exogenous steroid use, and endocrine disease (eg, Cushing syndrome, hypothyroidism).

The management of SEL includes conservative therapy and surgery. Conservative therapy mainly involves the administration of nonsteroidal anti-inflammatory drugs and causal block. Weight loss is recommended if the condition is associated with obesity, and a reduction in the steroid dose is recommended if SEL is associated with exogenous steroid use.\(^4\) Most often, surgery, including laminectomy or resection of adipose tissue, is performed if the symptoms are rapidly progressive.\(^10\)

This study compared the current results with those reported by Borré et al\(^2\) (Table 2). As seen in Table 2, the frequencies of grade III SEL and obesity in the current study were lower than those reported previously. In contrast, the percentages of men and exogenous steroid use were greater in this study than in the study by Borré et al.\(^2\) Notably, direct comparison of the results of Borré et al\(^2\) and the current findings is difficult because this study included fewer cases of advanced SEL. However, in these cases of grade III SEL, exogenous steroid use was much higher than in the study by Borré et al.\(^2\)

### Table 2

| Comparison of Results With Those Reported by Borré et al\(^2\) |
|-----------------------------|---------------------|---------------------|---------------------|
| Rate of Grade III Spinal Epidural Lipomatosis | Male (Grade III) | Obesity (Grade III) | Exogenous Steroid Use (Grade III) |
| Current study | 0.33% | 60% | 60% | 60% |
| (5/1498) | (3/5) | (3/5) | (3/5) |
| Borré et al\(^2\) | 2.1% | 56% | 87% | 17% |
| (52/2528) | (29/52) | (44/52) | (9/52) |

**CONCLUSION**

The frequency of grade III SEL in this study was 0.33% (5/1498), with a relatively high percentage of exogenous steroid use. Thus, the authors suggest that if a patient with exogenous steroid use presents with low back or buttock pain, SEL should be considered in the differential diagnosis. Moreover, even if the symptoms are mild, thorough lumbar MRI examination should be performed to enable early detection of SEL. Early diagnosis can reduce overall steroid use and potentially avoid the need for surgical intervention.

REFERENCES


