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Clinical Study

The prevalence of spinal epidural lipomatosis on magnetic resonance imaging

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Abstract

BACKGROUND: Spinal epidural lipomatosis (SEL) refers to an excessive accumulation of fat within the epidural space. It can be idiopathic or secondary, resulting in significant morbidity. The prevalence of SEL, including idiopathic and secondary SEL, and its respective risk factors are poorly defined.

PURPOSE: We sought to: (1) assess the prevalence of SEL among patients who underwent a dedicated magnetic resonance imaging (MRI) scan of the spine—including incidental SEL (ie, SEL without any spine-related symptoms), SEL with spine-related symptoms, and symptomatic SEL (ie, with symptoms specific for SEL); and (2) assess factors associated with overall SEL and subgroups. In addition, we assessed differences between SEL subgroups.

METHODS: We reviewed the records of 28,902 patients, aged 18 years and older with a spine MRI (2004 to 2015) at two tertiary care centers. We identified SEL cases by searching radiology reports for SEL, including synonyms and misspellings. Prevalence numbers were calculated as a percentage of the total number of patients. We used multivariate logistic regression analysis to identify factors associated with overall SEL and subgroups.

RESULTS: The prevalence of overall SEL was 2.5% (731 of 28,902): incidental SEL, 0.6% (168 of 28,902); SEL with symptoms, 1.8% (526 of 28,902); and symptomatic SEL, 0.1% (37 of 28,902).

Factors associated with overall SEL in multivariate analysis were the following: older age (odds ratio [OR]: 1.01, 95% confidence interval [CI]: 1.01–1.02, p<.001), higher modified Charlson comorbidity index (OR: 1.10, 95% CI: 1.07–1.13, p<.001), male sex (OR: 2.01, 95% CI: 1.71–2.37, p<.001), BMI>30 (OR: 2.59, 95% CI: 1.97–3.41, p<.001), Black/African American race (OR: 1.66, 95% CI: 1.24–2.23, p=.001), systemic corticosteroid use (OR: 2.59, 95% CI: 1.69–3.99, p<.001), and epidural corticosteroid injections (OR: 3.48, 95% CI: 2.82–4.30, p<.001).

CONCLUSIONS: We found that about 1 in 40 patients undergoing a spine MRI had SEL; 23% of whom with no symptoms, 72% with spine-related symptoms, and 5% with symptoms specific for SEL. Our data help identify patients who might warrant an increased index of suspicion for SEL.

Keywords: MRI; Prevalence; Risk factors; SEL; Spinal epidural lipomatosis; Symptomatic spinal epidural lipomatosis; Incidental spinal epidural lipomatosis

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The present study was approved by our Institutional Review Board.

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Introduction

Spinal epidural lipomatosis (SEL) is characterized by an accumulation of histologically normal, unencapsulated fat within the epidural space [1,2]. For diagnosis, magnetic resonance imaging (MRI) is the most sensitive and specific imaging modality. Typical findings include compression of the dural sac, visualized by a small oval or "Y" sign (stellate sign) seen on T1-weighted high-intensity axial images [3,4].

SEL can be idiopathic or secondary. Secondary SEL has been associated with hypercortisolism, obesity, hypothyroidism, hyperprolactinemia, and protease inhibitors in highly active antiretroviral therapy in patients with human immunodeficiency virus (HIV). Exogenous hypercortisolism may be related to chronic corticosteroid use or epidural corticosteroid injections; endogenous hypercortisolism is found in relation to Cushing's syndrome and Cushing's disease, or corticotrophin-secreting tumors [4–7].

SEL can be incidental or symptomatic, causing spine-related symptoms including radiculopathy, neurogenic claudication, and symptoms of spinal cord compression [3,5,6]. Nonetheless, the prevalence of SEL, including incidental and symptomatic SEL, remains poorly characterized in the literature [6,8,9].

In this investigation, we sought to: (1) assess the prevalence of SEL among patients who underwent a dedicated MRI scan of the spine—including incidental SEL (ie, SEL without spine-related symptoms), SEL with spine-related symptoms, and symptomatic SEL (ie, with SEL-specific symptoms); and (2) assess factors associated with overall SEL, incidental SEL, SEL with symptoms, and symptomatic SEL. In addition, we assessed differences between SEL subgroups.

Methods

Study design

We obtained institutional review board approval for this retrospective study, and a waiver of informed consent was granted. We reviewed the records of all patients, aged 18 years and older, who had a spine-dedicated MRI scan between January 2004 and January 2015 at two tertiary care academic medical centers. For this purpose, we performed a search in our Research Patient Data Registry, a centralized registry collecting clinical information from various affiliated hospitals, to obtain reports of MRI scans. We identified spine-dedicated MRIs by searching for synonyms of "spine" in the radiology reports' descriptions and texts. We did not exclude patients based on missing or incomplete data, but described missing values in our analyses. We identified SEL by a word-based query searching the patients' radiology reports' text for synonyms, abbreviations, and truncations of epidural lipomatosis (eg, "epidural fat," "adipose tissue," and "EL"). We included 7,955 cervical, 1,404 thoracic, and 12,621 lumbosacral MRI scans, and 6,922 MRI scans describing multiple segments. We excluded incomplete and canceled reports.

We manually reviewed the 1,619 reports that were identified by this word-based query, and one of the senior authors—an experienced orthopedic spine surgeon—evaluated the images of 12 questionable MRI reports. Of the patients without SEL, we used the chronologically first MRI scan in our data registry to assemble the reference group.

Outcome measures and explanatory variables

The primary outcome measure was the overall prevalence of SEL. Secondary outcome measures were the prevalence of the following: (1) incidental SEL (ie, SEL without spine-related symptoms); (2) SEL with spine-related symptoms; and (3) symptomatic SEL (ie, with symptoms specific for SEL). We considered SEL to be incidental (1) in absence of a prior SEL diagnosis, and (2) if the SEL was found incidental to the indication for the MRI. We defined spine-related symptoms as radiculopathy/myelopathy (ie, neck or back pain radiating to the arm/leg, abnormal reflexes, numbness), sciatica, or neurogenic claudication (including cauda syndrome). We did not consider nonradiating back pain as a symptom of SEL, as it is both nonspecific and rarely an isolated symptom in association with this condition [10–12]. Lastly, we identified patients with a distinct relation between SEL and clinical symptoms, which we termed "symptomatic SEL." These were patients with spine-related symptoms in which we felt certain that the SEL was responsible for causing the symptoms (ie, patients with spine-related symptoms concordant with the level of SEL without coexisting spinal pathology at that level). Coexistent spinal pathology included herniated disc, disc bulge, facet arthropathy, spondylolisthesis, ligamentum flavum hypertrophy, synovial cysts, and metastatic lesions.

Based on previously described SEL risk factors, we included the following explanatory variables for all 28,902 patients: age in years at the time of the MRI, gender, race, body mass index (BMI) in kg/m^2, comorbidity status, Cushing's syndrome or Cushing's disease, hypothyroidism, hyperprolactinemia, systemic corticosteroid use, and epidural corticosteroid injections. Race labeled as "other" included American Indian/Alaska native, native Hawaiian or Pacific Islander, and race not recorded (Tables 1 and 2). Diagnoses of Cushing's syndrome or disease, hypothyroidism, hyperprolactinemia, and systemic corticosteroid use were considered before the MRI, and defined based on International Classification of Disease, Ninth Revision (ICD-9) codes (Appendix A). Similarly, epidural corticosteroid injections were considered before the MRI and defined based on Current Procedural Terminology (CPT) codes to the included patients (Appendix A). We classified the comorbidity status using the Modified Charlson comorbidity index and its individual comorbidities, based on ICD-9 codes (Appendix B) [12–14]. This scoring system is based on 12 comorbidities summing up to a scale ranging from 0 to 24, with a higher score reflecting a more severe comorbidity status [13–15].