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Clinical Study

Predicting patients with concurrent noncontiguous spinal epidural abscess lesions

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Abstract

BACKGROUND CONTEXT: Spinal epidural abscess (SEA) is a serious condition that can lead to significant morbidity and mortality if not expeditiously diagnosed and appropriately treated. However, the nonspecific findings that accompany SEAs often make its diagnosis difficult. Concurrent noncontiguous SEAs are even more challenging to diagnose because whole-spine imaging is not routinely performed unless the patient demonstrates neurologic findings that are inconsistent with the identified lesion. Failure to recognize a separate SEA can subject patients to a second operation, continued sepsis, paralysis, or even death.

PURPOSE: To formulate a set of clinical and laboratory predictors for identifying patients with concurrent noncontiguous SEAs.

STUDY DESIGN: A retrospective, case-control study.

PATIENT SAMPLE: Patients aged 18 years or older admitted to our institution during the study period who underwent entire spinal imaging and were diagnosed with one or more SEAs.

OUTCOME MEASURES: The presence or absence of concurrent noncontiguous SEAs on magnetic resonance imaging or computed tomography (CT)-myelogram.

METHODS: A retrospective review was performed on 233 adults with SEAs who presented to our health-care system from 1993 to 2011 and underwent entire spinal imaging. The clinical and radiographic features of patients with concurrent noncontiguous SEAs, defined as at least two lesions in different anatomical regions of the spine (ie, cervical, thoracic, or lumbar), were compared with those with a single SEA. Multivariate logistic regression identified independent predictors for the presence of a skip SEA, and a prediction algorithm based on these independent predictors was constructed. Institutional review board committee approval was obtained before initiating the study.

RESULTS: Univariate and multivariate analyses comparing patients with skip SEA lesions (n=22) with those with single lesions (n=211) demonstrated significant differences in three factors: delay in presentation (defined as symptoms for ≥7 days), a concomitant area of infection outside the spine and paraspinal region, and an erythrocyte sedimentation rate of >95 mm/h at presentation. The predicted probability for the presence of a skip lesion was 73% for patients possessing all three predictors, 13% for two, 2% for one, and 0% for zero predictors. Receiver operating characteristic curve analysis, used to evaluate the predictive accuracy of the model, revealed a steep shoulder with an area under the curve of 0.936 ($p<.001$).

FDA device/drug status: Not applicable.

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CONCLUSIONS: The proposed set of three predictors may be a useful tool in predicting the risk of a skip SEA lesion and, consequently, which patients would benefit from entire spinal imaging.

Keywords: Epidural abscess; Skip lesion; Concurrent; Noncontiguous; Prediction; Algorithm

Introduction

Spinal epidural abscess (SEA) is a serious disease that can rapidly lead to neurologic deficit, sepsis, or even death if not promptly diagnosed and appropriately treated. Although SEA is relatively uncommon, with previous estimated incidences ranging from 0.2 to 1.2 cases per 10,000 hospital admissions [1], more recent data indicate the incidence has increased to 12.5 cases per 10,000 admissions [2]. This rise is likely a reflection of an aging population, increasing prevalence of predisposing comorbidities such as diabetes mellitus and immunosuppression, and more widespread intravenous drug use (IVDU) and alcoholism [3,4]. Despite advances in imaging techniques, antibiotic therapy, and surgical techniques, the overall mortality of SEA is still about 5% [3], and up to 22% of patients suffer irreversible paralysis [3,5]. Timely diagnosis and initiation of appropriate treatment is key to reducing the morbidity and mortality associated with this potentially devastating disease [6–10].

Identifying patients with a single SEA lesion can be challenging as the most common presenting complaint is nonspecific back or neck pain [3,7]. In a metaanalysis of 915 patients with SEAs, about three-quarters had back or neck pain, half had a fever, and only a quarter had neurologic deficits [10]. The classic clinical triad of back pain, fever, and neurologic deficit is only present in a minority of patients with SEA and exhibits a diagnostic sensitivity of only 8% [7].

Simultaneous noncontiguous SEAs in different anatomical regions of the spine (ie, cervical, thoracic, or lumbar), also known as skip lesions, pose an even greater diagnostic challenge. Unless a patient exhibits signs and symptoms that are not concordant with a detected, single SEA, practitioners do not reflexively order additional imaging of other spinal regions [11,12]. Failing to detect a skip SEA can lead to continued sepsis or neurologic decline.

Further complicating the diagnostic dilemma is the fact that additional SEAs may initially be asymptomatic or present with pain only. Pfister et al. [11] described a patient with skip SEAs (cervical and lumbar) in whom the lumbar SEA was missed on the initial work-up. It was not until the patient had undergone a cervical decompression and continued to deteriorate neurologically that a whole spine magnetic resonance imaging (MRI) was performed and the lumbar SEA lesion was identified.

With the exception of case reports and small case series, there is a dearth of clinical data concerning skip SEAs [11,13,14]. The purpose of our study was to formulate a set of clinical and laboratory predictors to help identify patients with skip SEAs in different regions of the spine based on a large retrospectively-collected database.

Materials and methods

Study design

Cases of SEA treated within a large health-care system between 1993 and 2011 were retrospectively reviewed. Inclusion criteria were patients aged 18 years or older with an entire spinal imaging using MRI with IV contrast or computed tomography (CT) with myelogram and IV contrast and found to have a spinal epidural abscess with a fluid collection. Patients with spondylodiscitis or osteomyelitis with granulation tissue (ie, phlegmon) but without a clear epidural fluid collection were excluded. Secondary SEAs occurring in patients who previously had a lumbar puncture, epidural injection, laminectomy, or laminotomy at the level or adjacent levels to the SEA were excluded. Patients with insufficient information were also excluded.

In total, 233 adults were included in the study. Two hundred thirty-one patients underwent entire spine MRIs with IV contrast, whereas two patients underwent CT-myelograms with IV contrast of the entire spine (one had a pacemaker and one could not physically fit inside the MRI machine). Two hundred eleven patients had a single lesion and 22 patients had concurrent noncontiguous epidural abscess lesions in different anatomical regions of the spine (ie, skip lesions). Complete medical records were obtained on these 233 individuals and the following data were collected for each patient: demographics (age and gender), medical history (diabetes mellitus, immunosuppression, alcohol use, tobacco use, and IVDU), maximal temperature in the hospital before any medical or surgical treatment, laboratory test values at the time of presentation before any medical or surgical treatment (white blood cell count and erythrocyte sedimentation rate [ESR]), location of epidural abscess lesion(s), any delay in presentation of 7 days or more from the time of symptom onset to hospital presentation, and presence of other sites of infection distant to the spine and paraspinal areas (eg, septic knee, pneumonia, subcutaneous abscess, etc). The presence of a lower urinary tract infection (ie, cystitis) did not qualify as a separate site of infection, given the frequency of urinary catheter use and their related infections. Fever was defined as a maximal temperature of $>100.5^{\circ}$F before any medical or surgical treatment. There is great variability in the SEA