Spinal epidural abscess

Spinal infection in the epidural space.

see Cervical spinal epidural abscess.

see Lumbar spinal epidural abscess.

Key concepts

● should be considered in a patient with back pain, fever, and spine tenderness

● major risk factors: diabetes, intravenous drug abuse, chronic renal failure, alcoholism

● may produce progressive myelopathy, sometimes with precipitous deterioration, therefore early surgery has been advocated by some even if no neuro deficit

● fever, sweats or rigors are common, but normal WBC and temperature can occur

● classical presentation of a skin boil (furuncle) occurs in only ≈ 15% somewhere on the body

● treatment: controversial. Many patients improve with antibiotics alone, but some may deteriorate precipitously

Epidemiology

The incidence of SEA has doubled in the past decade, owing to an aging population and to increased use of spinal instrumentation and vascular access.

Incidence: 0.2–1.2 per 10,000 hospital admissions annually ¹, possibly on the rise ². Average age: 57.5 ± 16.6 years ³. Thoracic level is the most common site (≈ 50%), followed by lumbar (35%) then cervical 82% were posterior to the cord, and 18% anterior in one series ⁴. SEA may span from 1 to 13 levels ⁵.

Spinal epidural abscess (SEA) is often associated with vertebral osteomyelitis (in one series of 40 cases, osteomyelitis occurred in all cases of anterior SEA, in 85% of circumferential SEA, and no cases of posterior SEA) and intervertebral discitis.

Etiology

Organisms

Staphylococcus aureus is the most common organism identified, and the infectious source in SEA emanates from skin and soft tissue infections in about 20% of instances. The thoracic spine is most
often involved followed by the lumbar spine.

Operative cultures are most useful in identifying the responsible organism, these cultures may be negative (possibly more common in patients previously on antibiotics) and in these cases blood cultures may be positive. No organism may be identified in 29–50% of cases.

1. Staph. a ureus: the most common organism (cultured in >50%) possibly due to its propensity to form abscesses, its ubiquity, and its ability to infect normal and immunocompromised hosts (these facts help explain why many SEA arise from skin foci)

2. aerobic & anaerobic streptococcus: second most common

3. E.coli

4. Pseudomonas aeruginosa

5. Diplococcus pneumoniae

6. Serratia marcescens

7. Enterobacter

8. chronic infections:
   a) TB is the most common of these, and although it has become less widespread in the U.S. it is still responsible for 25% of cases of SEA,74 it is usually associated with vertebral osteomyelitis, see Pott’s disease
   
   b) fungal: cryptococcosis, aspergillosis, brucellosis
   
   c) parasitic: Echinococcus

9. multiple organisms in ≈ 10%

10. anaerobes cultured in ≈ 8%

**Co-morbid conditions**

Chronic diseases associated with compromised immunity were identified in 65% of 40 cases 6).

Associated conditions included diabetes mellitus (32%), IV drug abuse (18%), chronic renal failure (12%), alcoholism (10%), and the following in only 1 or 2 patients: cancer, recurrent UTI, Pott’s disease, and positivity for HIV. Chronic steroid use and recent spinal procedure or trauma (e.g. GSW) are also risk factors 7). Skin infection (e.g. furuncle).

**Source site of infection**

1. hematogenous spread is the most common source (26–50% of cases) either to the epidural space
or to the vertebra with extension to epidural space. Reported foci include:

a) skin infections (most common): furuncle may be found in 15% of cases

b) parenteral injections, especially with IV drug abuse

c) bacterial endocarditis

d) UTI

e) respiratory infection (including otitis media, sinusitis, or pneumonia)

f) pharyngeal or dental abscess

2. direct extension from:

a) decubitus ulcer

b) psoas abscess:

c) penetrating trauma, including: abdominal wounds, neck wounds, GSW

d) pharyngeal infections

e) mediastinitis

f) pyelonephritis with perinephric abscess

g) dermal sinus

3. following spinal procedures (3 of 8 of these patients had readily identified perioperative infections of periodontal, UTI, or AV-fistula)

a) open procedures: especially lumbar discectomy (incidence = 0.67%)

b) closed procedures: e.g. epidural catheter insertion for spinal epidural anesthesia, lumbar puncture

4. a history of recent back trauma is common (in up to 30%)

5. no source can be identified in up to 50% of patients in some series.

Pathophysiology

Although some cord symptoms may be due to mechanical compression (including that due to vertebral body collapse), this is not always found. A vascular mechanism has also been postulated, and various combinations of arterial and venous pathology have been described (one autopsy series showed little arterial compromise, but did show venous compression and thrombosis, thrombophlebitis of epidural veins, and venous infarction and edema of the spinal cord). Occasionally, there may be infection of the spinal cord itself, possibly by extension through the meninges.
Clinical features

Clinical signs, duration of symptoms and the rate of neurological deterioration show a high inter-individual variability, and the classic triad (spinal pain, fever and neurological deficit) is often not found, especially not at first presentation to a physician. However, most patients complain of severe localized back pain.

Usually presents with excruciating pain localized over spine with tenderness to percussion. Radicular symptoms follow with subsequent distal cord findings, often beginning with bowel/bladder disturbance, abdominal distension, weakness progressing to para- and quadriplegia. Average time is 3 days from back pain to root symptoms; 4.5 days from root pain to weakness; 24 hrs from weakness to paraplegia. Fever, sweats or rigors are common, but are not always present. A furuncle (skin boil) somewhere on the body may be identified in 15%. Patients may be encephalopathic. This may range from mild to severe and may further delay diagnosis. Meningismus with a positive Kernig’s sign may occur. Patients with post-operative SEA may demonstrate surprisingly few signs or symptoms (including lack of leukocytosis, lack of fever) aside from local pain.

Diagnosis

Changes on plain radiographs appear at least 3 to 4 weeks after the onset of disease. Bone scan is a sensitive but not a specific test. Computed tomography provides structural details in the bone and intervertebral disc but magnetic resonance imaging is a superior imaging test for diagnosing infections earlier and more accurately. In many patients, percutaneous or open biopsy is required to make the definitive diagnosis of discitis or osteomyelitis and the organism responsible for the infection. Early and accurate diagnosis of spinal infections will lead to less invasive treatment for the patient.

Inflammatory parameters in the blood are generally elevated, but not specific.

Gadolinium-enhanced magnetic resonance imaging is the most sensitive, specific and accurate imaging method.

Magnetic resonance imaging has permitted earlier diagnosis, although significant delays in diagnosis are common due to the nonspecific symptoms that frequently attend the disorder.

They could have high morbidity and mortality if left untreated.

If patients present with acute neurological deficits and evidence of a multilevel ventral spine abscess on neuroimaging, blood cultures should be taken and the abscess emergently evacuated in patients able to tolerate surgical interventions.

Laboratory tests

CBC: leukocytosis common in acute group (average WBC= 16,700/mm3), but usually normal in chronic (ave. WBC= 9,800/mm3)

ESR elevated in most,75 usually >30, CRP.
LP: performed cautiously in suspected cases at a level distant to the clinically suspected site (C1–2 puncture may be needed to do myelogram) with constant aspiration while approaching thecal sac to detect pus (danger of transmitting infection to subarachnoid space); if pus is encountered, stop advancing, send the fluid for culture, and abort the procedure. CSF protein & WBC usually elevated; glucose normal (indicative of parameningeal infection). 5 of 19 cases grew organisms identical to abscess.

Blood cultures: may be helpful in identifying organism in some cases.

Anergy battery: (e.g. mumps and Candida) to assess immune system.

Radiographic studies

Plain films

Usually normal unless there is osteomyelitis of adjacent vertebral bodies (more common in infections anterior to dura). Look for lytic lesions, demineralization, and scalloping of endplates (may take 4–6 weeks after onset of infection).

MRI

Imaging study of choice. Diferentiates other conditions (especially transverse myelitis or spinal cord infarction) better than myelo/CT, and doesn’t require LP.

Typical findings: T1WI→hypo- or iso-intense epidural mass, vertebral osteomyelitis shows up as reduced signal in bone. T2WI →high intensity epidural mass that often enhances with gadolinium (3 patterns of enhancement: 1) dense homogeneous, 2) inhomogeneous with scattered areas of sparse or no uptake, and 3) thin peripheral enhancement) but may show minimal enhancement in the acute stage when comprised primarily of pus with little granulation tissue. Vertebral osteomyelitis shows up as increased signal in bone, associated discitis produces increased signal in disc and loss of intranuclear cleft. Unenhanced MRI may miss some SEA, gadopentetate dimeglumine enhancement may slightly increase sensitivity.

Myelogram-CT

Usually shows findings of extradural compression (e.g. “paintbrush appearance” when complete block is present). In the event of complete block, C1–2 puncture may be needed to delineate upper extent (unless post-myelographic CT shows dye above the lesion). See cautions above regarding LP.

CTscan

Intraspinal gas has been described on plain CT. Post-myelographic CT is more sensitive.
Differential diagnosis

SEA should be considered in any patient with backache, fever, and spine tenderness, especially diabetics, IV drug abusers or immunocompromised patients.

1. meningitis
2. acute transverse myelitis (paralysis is usually more rapid, radiographic studies are normal)
3. intervertebral disc herniation
4. spinal cord tumors
5. post-op SEA may appear similar to pseudomeningocele.

A case of a 21-year-old woman presenting with quadriplegia which was initially diagnosed with an epidural abscess in view of her MR scan and raised inflammatory marker levels. Histology revealed an epidural extra-osseous Ewing's sarcoma (EES). Epidural location of EES is a very rare condition which can be very challenging to diagnose. Early diagnosis and surgical excision followed by chemotherapy represent the main stem of management.

Treatment

Although neurosurgical decompression is still the treatment of choice in the majority of cases, less invasive procedures (e.g. computed tomography-guided needle aspiration) or antimicrobial treatment alone can be applied in selected cases. The choice of the most appropriate therapy should be discussed immediately after a confirmed diagnosis in consultation with infectious disease, radiology and spinal surgery specialists.

Spinal epidural abscesses usually are surgical emergencies because of concurrent neurologic deficits.

Due to the rarity of this condition, there have been few randomized controlled trials to evaluate new treatment strategies, and most recommendations regarding treatment are based on case series studies often derived from the experiences at a single center.

When an SEA is widespread, extensive decompression with laminectomy is often impossible, as it may subject the patient to very long operative times, extensive blood loss, and mechanical instability. A technique called “skip laminectomy” has been described in the literature, in which laminectomies are performed at the rostral and caudal ends of an abscess that spans 3-5 levels and a Fogarty catheter is used to mechanically drain the abscess, much like in an embolectomy.

The optimal management of SEAs in patients 50 years of age and older remains a matter of considerable debate. In an older patient population with multiple comorbidities, whether intravenous antibiotics alone or in combination with surgery lead to superior outcomes remains unknown.

Results of a study suggest that in patients 50 years of age and older, early surgical decompression combined with intravenous antimicrobial therapy was not associated with superior clinical outcomes.
when compared with intravenous antimicrobial therapy alone \(^{30}\).

**Complications**

The outcome of SEA is largely influenced by the severity and duration of neurological deficits prior to surgery, stressing the importance of early recognition.

If untreated, an expanding suppurative infection in the spinal epidural space impinges on the spinal cord, producing sensory symptoms and signs, motor dysfunction, and, ultimately, paralysis and death. Intervention early in the course of the disease undoubtedly improves the outcome. Frequently, diagnosis is understandably delayed because the initial presentation may be only nonspecific back pain. One half of cases are estimated to be misdiagnosed or have a delayed diagnosis \(^{31}\).

see [Methicillin resistant Staphylococcus aureus epidural spinal abscess](https://operativeneurosurgery.com/32).

see [Streptococcus epidural spinal abscess](https://operativeneurosurgery.com/33).

**Outcome**

The spinal epidural abscess, although uncommon, can cause permanent neurologic dysfunction and fatality if not treated immediately.

In most such cases, spinal epidural abscess is not suspected initially. The clinician should thus have a high index of suspicion for spinal epidural abscess in order to ensure an early and accurate diagnosis.

In clinical practice, a diagnosis of SEA is often not considered, particularly in the early stages of the disease when neurological symptoms are not apparent. Knowledge of persons at risk, clinical features and the required diagnostic procedures may decrease the number of initially misdiagnosed cases \(^{32}\).

**Case series**

An analysis of 154 consecutive patients who initially presented to a tertiary-care, academic medical center with SEA, and were subsequently treated with surgery between 2010 and 2015 was performed.

Postoperative pre-discharge ASIA impairment scale, 6-month follow-up encounter ASIA scores, need for revision surgery, and mortality during SEA surgery were the primary outcomes.

Fisher's exact and Wilcoxon rank-sum tests were used to assess the associations between patient-level factors and surgical outcomes. Moreover, an interactive, predictive model for postoperative pre-discharge ASIA score was developed using a proportional odds regression model. There was no funding secured for this study and there are no conflict of interest-associated biases.

154 patients (mean age of 58 years) were treated using surgical decompression in addition to antibiotics. The majority of patients were Caucasian (81%) and male (61%). No intraoperative mortality was reported. A second SEA surgery was performed in 8% of patients. A comparison of the preoperative and postoperative pre-discharge AIS scores showed that 49% of patients maintained a
score of E or improved, while 45% remained at their preoperative status and 6% worsened. Among a subset of patients (n=36; 23%) for whom a 6 month follow-up encounter occurred, 75% maintained an AIS score of E or improved, 19% remained at their preoperative status, and 6% worsened. Both the presence and longer duration of preoperative paresis was associated with an increased risk of remaining at the same AIS score or worsening at the predischarge encounter (both p < 0.001). A predictive model for predischarge AIS scores was developed based on several patient characteristics.

Surgical decompression can contribute to improving or maintaining AIS scores in a high percentage of SEA patients. The presence and duration of preoperative paresis are prognostic for poorer outcomes and suggest that rapid surgical intervention before paresis develops may lead to improved postoperative outcomes. Our modeling tool enables an estimation of probabilities of patients' predischarge condition.

2015

12 cases (8 males, average age 9.6 years). Clinical presentation was mainly fever, back pain and elevation of inflammation markers. All cases were initially misdiagnosed. Lumbar puncture was performed in 36% of patients. Etiological diagnosis was obtained in 8 cases. MSSA was isolated in 4 patients, methicillin-resistant S. aureus in 1 patient, and S. aureus with unknown susceptibility patterns in 2 cases. The average of therapy duration was 6 weeks. Patients' spine was always evaluated by gadolinium-enhanced magnetic resonance imaging; most abscesses were localized at thoracic and lumbar area, without osteomyelitis. In 8 cases, laminectomy and/or abscess drainage were performed in association with medical therapy; 3 cases were successfully treated with antimicrobial therapy only; no data were available in one case. A good outcome was obtained in all patients, except a reported residual headache and paraspinal pain lasting for 3 years. The rarity and the possible differential diagnosis can lead to underestimate SEA occurrence in children without risk factors. It seems therefore essential to maintain a high attention to pediatric SEAs. A prompt diagnosis and adequate therapy are essential prognostic factors for remission.

2014

Eighty-two patients underwent treatment for a spinal epidural abscess between 1999 and 2013. There were 46 men and 36 women, whose overall mean age (± SD) was 65 ± 8.58 years (range 50-82 years). The mean duration of clinical follow-up was 41.38 ± 86.48 weeks. Thirty patients (37%) underwent surgery for removal of the abscess, whereas 52 (63%) were treated more conservatively, undergoing CT-guided aspiration or receiving antibiotics alone based on the results of blood cultures. The correlation between pretreatment variables and outcomes was evaluated in a multivariate regression analysis.

Back pain and severe motor deficits were the most common presenting symptoms. Compared with baseline neurological status, the majority of patients (68%) reported being neurologically “better” or “unchanged.” Twelve patients (15%) had a good outcome (7 [23%] treated operatively vs 5 [10%] treated nonoperatively, p = 0.03), while clinical status in 41 patients (50%) remained unchanged (10 [33%] treated operatively vs 31 [60%] treated nonoperatively, p = 0.01). Overall, 20 patients (25%) died (9 [30%] treated operatively vs 11 [21%] treated nonoperatively, p = 0.43). In a multivariate logistic regression model, an increasing baseline level of pain, the presence of paraplegia or quadriplegia on initial presentation, and a dorsally located SEA were independently associated with poor outcomes.
The results of the study suggest that in patients 50 years of age and older, early surgical decompression combined with intravenous antimicrobial therapy was not associated with superior clinical outcomes when compared with intravenous antimicrobial therapy alone.

Case reports

2016

Spinal Epidural Abscess with Pregnancy Leading to Paraplegia.

Septic arthritis of a lumbar facet joint with epidural and paraspinal abscess: Report of a case.

A case of tubercular spinal epidural abscess (SEA) without osseous involvement that mimicked an acute bacterial abscess. This case manifested quite unusual findings not only radiographically, but also clinically compared with previously reported cases of tubercular SEA.

2015

A 57-year-old man presented with lower back pain, which progressed to include urinary retention and evidence of lumbar discitis/osteomyelitis on magnetic resonance imaging. The patient was started on antibiotic therapy. After the patient developed new cervical pain, interval magnetic resonance imaging showed extension of the abscess to involve the cervical, thoracic, and lumbar spine with intraventricular extension. The decision was made to perform a C4 corpectomy and insert a flexible ventriculoperitoneal catheter to serially flush out the abscess. Omnipaque dye was then used to ensure that the entire abscess was evacuated and no septations existed in the anterior epidural space.

The patient's neurological deficits completely resolved, and he is intact a year after the operation. In selected patients with pan-spinal epidural abscesses associated with acute neurological deficits, a combination of an open approach and a catheter-based procedure in addition to an intraoperative monitoring option to ensure complete evacuation of the abscess and absence of septations in the

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anterior epidural space is a low-morbidity option in the armamentarium of the surgeon\(^\text{40}\).

In a report of 2 patients, the authors present, which they call “apical laminectomies” to allow for irrigation and drainage of an extensive SEA spanning the entire length of the vertebral column (C1-2 to L5-S1). Two patients presented with cervico-thoraco-lumbar SEA. Laminectomies were performed at the natural apices of the spine, namely, at the midcervical, midthoracic, and midlumbar spine levels. Next, a pediatric feeding tube was inserted in the epidural space from the thoracic laminectomies up toward the cervical laminectomy site and down toward the lumbar laminectomy site, and saline antibiotics were used to irrigate the SEA. Both patients underwent this procedure with no adverse effects. Their SEAs resolved both clinically and radiologically. Neither patient suffered from mechanical instability at 1 year after treatment. For patients who present with extensive SEAs, apical laminectomies seem to allow for surgical cure of the infectious burden and do not subject the patient to extended operating room time, an increased risk of blood loss, and the risk of mechanical instability\(^\text{41}\).

2014

Actinomyces species may lead to slowly progressive infection of almost any site once mucosal breakdown exists; hence, it has the name “great pretender.” Its diagnosis may be unthinkable unless proper cultures/histologies are taken. We describe a patient with lumbar spondylodiscitis and epidural abscess. This is an exceptional another disease by actinomycosis\(^\text{42}\).

A case of a 30-month-old girl with a history of remitting varicella infection, diagnosed for a lumbar epidural abscess and sacro-ileitis, secondary to group A Streptococcus (GAS).

This is the third case of SEA from GAS reported in the literature in a pediatric population with varicella infection\(^\text{43}\).

References

\(^{1)}\) \(^{4)}\), \(^{15)}\), \(^{20)}\)
\(^{2)}\)
\(^{3)}\)
\(^{5)}\), \(^{7)}\), \(^{17)}\)
\(^{6)}\), \(^{9)}\), \(^{21)}\)


