

Surgical treatment of an all-spine epidural empyema

ABSTRACT

Spinal epidural empyema (SEE) is a severe infectious disease of the spine which may cause significant morbidity and mortality. Surgical drainage of the empyema is a key feature. However, approach-related morbidity may be significant in very extensive collections. We present the case of a 55-year-old female with an empyema due to methicillin-susceptible *Staphylococcus aureus* spanning from C2 to S1. She underwent drainage of the pus through skip-level laminectomies and catheter epidural saline irrigation. The technique described was both safe and effective at treating the SEE, and the patient returned to normal life.

Keywords: Myelopathy, spinal empyema, surgical drainage

INTRODUCTION

Spinal epidural empyema (SEE) is a serious condition that poses a significant challenge despite advances in diagnostic and treatment tools.^[1,2] Although relatively rare, with an incidence of 1/10,000 hospital admissions,^[3] there has been a significant increase in new cases in recent decades driven by an aging population, higher frequency of invasive procedures (including spinal instrumentation) and intravenous illicit drug consumption.^[4] The linchpin of SEE treatment is prolonged antibiotic therapy directed against an isolated agent – a minimum of 6 weeks, with longer regimens in cases of refractory infection and failure to normalize inflammatory parameters.^[5]

Surgical treatment remains an important adjuvant. In most cases, SEE extends up to 4 levels,^[6] afflicting the lumbar and thoracic spines in most cases (48% and 31%, respectively^[7]). Classically, the technique entails full exposure of the empyema, with laminectomies extending until the closest healthy level.^[4] However, such an approach is not practical for SEE extending over several levels, and the available literature presents little evidence regarding the best course of action in such cases. We present the case of a patient with a very extensive SEE, focusing on the surgical technique used to deal with such extreme cases.

CLINICAL CASE

A diabetic 55-year-old female presented with low back pain irradiated to both lower limbs (Visual Analog Scale [VAS] 6), fever, and meningeal signs but no motor deficits. The patient elicited a history of antibiotic treatment for an infected scalp sebaceous cyst in recent weeks. The blood works revealed leukocytosis (19,000 white blood cells, with 90% of neutrophils) and C-reactive protein of 34 mg/dL. Cervical computed tomography scan showed only a hypodense posterior epidural collection in C2–4 [Figure 1a]. A lumbar puncture was performed with immediate pus drainage, whose culture led to the isolation of methicillin-susceptible

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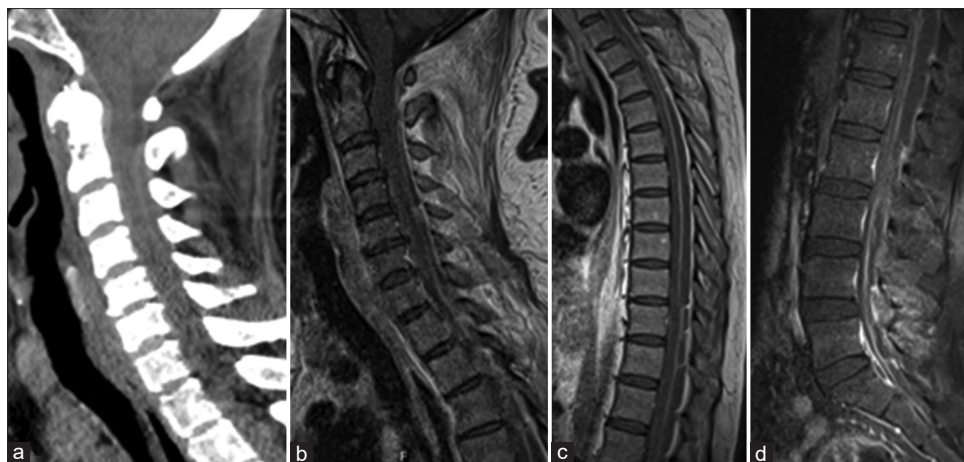


Figure 1: (a) Noncontrast computed tomography scan showing a posterior epidural collection, (b-d) All-spine contrast-enhanced magnetic resonance imaging showing very extensive epidural empyema, encompassing all segments of the spine. Mass effect is particularly pronounced in the thoracolumbar segments

Staphylococcus aureus. Intravenous flucloxacillin plus rifampicin was initiated according to antibiogram, and she undertook full-spine magnetic resonance imaging (MRI), which showed an extensive posterior epidural empyema, spanning from C2 to C4 and from C6 to S1 [Figure 1b-d]. By this point, severe neuropathic pain in all four limbs prevented ambulation despite the patient having no formal motor deficit.

A decision was made to operate in light of previous experience within the department with spinal epidural hematomas. The empyema's extent prevented its complete exposure, which would entail all-spine laminectomies – instead, skip laminectomies were performed in the four levels where compression was the most severe – C4, T1, T11, and L4 [Figure 2a]. After coagulation and fenestration of the empyema capsule, its content was drained followed by extensive rinsing with saline and oxygen peroxide (diluted with saline in a 50/50 proportion) [Figure 2b]. Once local control was achieved, a Nelaton® catheter was inserted into the epidural space and was made to progress between opened levels while continuous saline irrigation was performed [Figure 2c and d]. Once one of the exposed levels was reached, the procedure was repeated in the inverse direction. Should any resistance be met that precluded progression, no attempt was made to forcefully overcome it. Instead, the reverse path would be attempted to wash away any epidural content with saline – in this particular case, no such obstacles were met. Vancomycin powder was applied in the end. No instrumentation was needed, and epidural drains were left in place for each level at the end [Figure 2f].

The patient experienced a significant reduction in pain, regained ambulation, and was discharged to a rehabilitation center after 8 weeks of antibiotic treatment. At the last follow-up, she was fully autonomous with only residual pain in

the proximal upper and lower limbs (VAS2), leading a normal life (mRankin 0) [Figure 2e]. A control MRI was performed at 13 months postoperative, and it showed complete resolution of the empyema in all segments, confirming the trend toward the resolution of previous control MRI [Figure 3].

Potential complications

Hematomas and surgical site infections (both deep and superficial) are potential issues. Procedure-related complications include iatrogenic myelopathy due to forceful progression of the catheter. Cerebrospinal fluid leak entails the risk of myelitis to be avoided with careful surgical technique. The risk of spinal instability is minimal with the procedure as described.

DISCUSSION

SEE is a serious spinal infection which often causes important morbidity and mortality. There are published cohorts of patients treated conservatively with antibiotic courses and supportive care,^[6] in patients with severe comorbidities, or empyemas considered too extensive to benefit from surgical drainage.^[6,7] However, the majority of patients will require surgery.^[7] Drainage of epidural pus is instrumental in treating an infection in a topography with lower antibiotic penetration, and decompresses neural elements,^[7] and provides samples to guide the antibiotic scheme. Darouiche^[4] stated that surgical drainage of a SEE decreases mortality and morbidity, and the benefit seems to be maximal in those with little preoperative morbidity.^[8] Fixation may be used in selected cases of documented instability, as described by Chaker *et al.*^[9]

The technique presented minimizes approach-related morbidity and offers a solution for cases with extensive

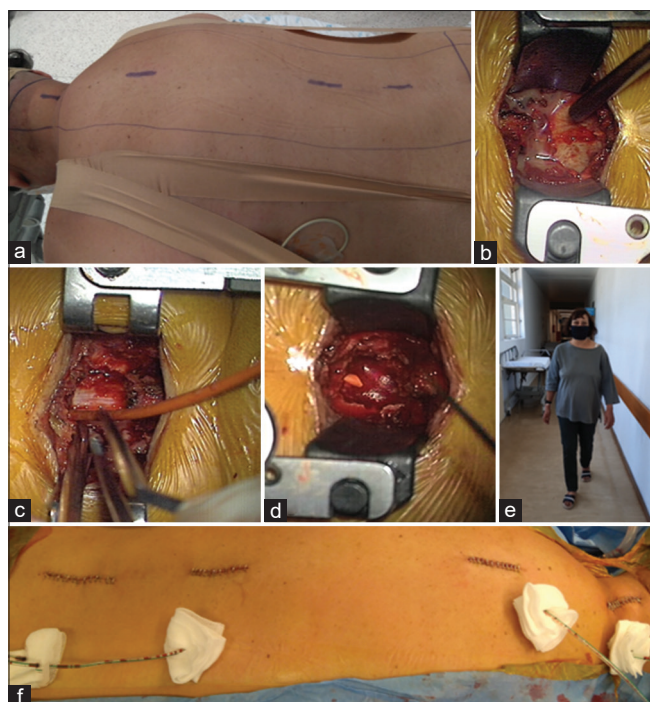


Figure 2: (a) Patient positioned in ventral decubitus, with planned incisions for the most compressed spinal segments – C4, T1, T11, and L4, (b) T11 laminectomy, with immediate drainage of pus, (c and d) Extensive irrigation with saline and oxygen peroxide at each operated level, followed epidural exploration with a flexible catheter, through which saline was instilled to wash the epidural space as much as possible, (e) A patient presented with independent ambulation at a 13th-month postoperative appointment, (f) Epidural catheters left in each level at the end of surgery

empyemas while useful for SEE with shorter extension. It proved effective at decompressing the spinal cord – the levels with the most severe compression were chosen for laminectomy, with the added principle of such levels being close enough to allow communication. The catheter used is readily available to most neurosurgical departments, making this technique easy to replicate in either resource-rich or poor settings.

Early surgery leads to better outcomes^[10] – even patients with preoperative deficits may present with significant improvement when drainage is performed <24–36 h after symptom onset.^[8] The low invasiveness of the technique may help improve outcomes by allowing earlier ambulation and rehabilitation. It may be also offered to patients with severe comorbidities deemed inoperable for its risk profile. Our patient presented with a favorable preoperative status with no neurological deficits – she was able to regain ambulation early after surgery and return to a normal life within months [Figure 2e]. Good radiological outcomes were also achieved, with complete resolution of the infection on MRI, further demonstrating the efficacy of the technique.



Figure 3: Control contrast-enhanced magnetic resonance imaging showing complete drainage of the empyema (a,b) with good decompression of the spinal cord in all segments(a-c)

To sum up, surgical drainage of SEE with targeted laminectomies and saline irrigation through the placement of an epidural catheter is both safe and effective, especially for cases of very extensive empyemas.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient (s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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