

MULTILEVEL SPINAL EPIDURAL EMPYEMA: SERIES OF CLINICAL CASES AND BIBLIOGRAPHIC

EMPIEMA EPIDURAL ESPINHAL MULTINÍVEL: SÉRIE DE CASOS CLÍNICOS E REVISÃO BIBLIOGRÁFICA

EMPIEMA EPIDURAL ESPINAL MULTINIVEL: SERIE DE CASOS CLÍNICOS Y REVISIÓN BIBLIOGRÁFICA

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ABSTRACT

Multilevel spinal epidural empyema (SEE) is a rare and serious infection of the spine with a high rate of morbidity and mortality. Although abscesses or empyema of the spine sector are well studied, this pathology is surprising due to its rarity and diagnostic and therapeutic challenge. It stands out for being more common in adulthood and in males and is associated with predisposing pathologies. The bacteriological agent responsible in most cases is *Staphylococcus aureus*. Early treatment is essential and is based on two pillars: antibiotic therapy and decompressive surgery. We present two clinical cases with multilevel involvement that evolved favorably both infectiously and neurologically without causing spine instability, and we carried out a bibliographic review of the subject. **Level of Evidence IV; Case Report.**

Keywords: Empyema; Laminectomy; Spine.

RESUMO

*O empiema epidural espinhal multinível (EEE) é uma infecção rara e grave da coluna vertebral, com alta taxa de morbidade e mortalidade. Embora os abscessos ou empiemas de um setor da coluna vertebral sejam bem estudados, esta patologia surpreende pela sua raridade e desafio diagnóstico e terapêutico. Destaca-se por ser mais comum na idade adulta, no sexo masculino, e estar associada a patologias predisponentes. O agente bacteriológico responsável na maioria dos casos é o Staphylococcus aureus. O tratamento precoce é essencial e baseia-se em dois pilares: antibioticoterapia e cirurgia descompressiva. Apresentamos dois casos clínicos com envolvimento multinível que evoluíram favoravelmente tanto infecciosa quanto neurologicamente sem causar instabilidade da coluna vertebral e realizamos uma revisão bibliográfica do assunto. **Nível de Evidência IV; Estudo de Caso-controle.***

Descritores: Empiema; Laminectomia; Coluna Vertebral.

RESUMEN

*El empiema epidural espinal (EEE) multinivel es una infección rara y grave de la columna vertebral con alta tasa de morbimortalidad. Si bien los abscesos o empiemas de un sector de la columna están bien estudiados, esta patología sorprende por su rareza, reto diagnóstico y terapéutico. Se destaca por ser más frecuente en la edad adulta, en el sexo masculino y se ve asociada a patologías predisponentes. El agente bacteriológico responsable en la mayoría de los casos es el Staphylococcus aureus. El tratamiento precoz es fundamental y está basado en dos pilares: antibioticoterapia y quirúrgico descompresivo. Presentamos dos casos clínicos con afectación multinivel que evolucionaron favorablemente tanto en lo infeccioso como en lo neurológico sin provocar una inestabilidad del raquis y realizamos revisión bibliográfica del tema. **Nivel de Evidencia IV; Estudio de Caso-control.***

Descritores: Empiema; Laminectomía; Columna Vertebral.

INTRODUCTION

Spinal epidural empyema (SEE) is a rare and severe infection of the epidural space around the spinal cord. It is an infection characterized by the collection of purulent material in the space between the dura mater and the osteoligamentous sector that forms the spinal canal. It has an incidence of 0.2-2/10,000 hospital admissions. It is more common in men 2:1, between the sixth and seventh decade of life. Its most frequent location is at the thoracic spine level (35%).

In some publications, it predominates at the lumbar level, with the cervical level being the least frequent topography (18-36%).^{1,2}

Early diagnosis and treatment are essential due to the high mortality rate, which ranges from 4.6% to 31%.³

Some factors predispose to this infection, such as diabetes, alcoholism, human immunodeficiency virus (HIV) infection, transplantation, kidney disease, intravenous drug use, septicemia, morbid obesity, and the use of epidural catheters for analgesia.⁴

Study conducted by the Centro de Deformidades de Columna del Uruguay, CEDEFECO, Montevideo, Uruguay.

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Among the most frequent pathogens identified through blood cultures and by direct culture during surgery is *Staphylococcus aureus*, followed by Streptococcus, gram-negative bacilli in patients with intravenous drug abuse, Mycobacterium, fungi, and parasites are rare pathogens that cause this pathology and are associated with vertebral osteomyelitis.

It reaches the epidural space by distant dissemination (skin, urinary, respiratory infections), contiguity (vertebral osteomyelitis, psoas abscesses), or direct inoculation (epidural catheter, spinal surgery, lumbar puncture).⁵ Clinically, it is manifested by lumbar pain, fever, and neurological deficit, which can be progressive. Early diagnosis is essential to reduce high morbidity and mortality.⁵⁻⁸ The presence of empyemas in one sector of the spine, cervical, lumbar, or thoracic, can be resolved with medical treatment alone or simple laminectomy. There are very few reported cases of spinal epidural empyema affecting more than five levels of the spine.⁹⁻¹² In very few cases, it is found at the level of the entire cervical-thoracic-lumbosacral spine, as we will show here.

Treatment is based on two pillars: surgical decompression of purulent material, early irrigation, and flushing associated with multiple intravenous (I/V) antibiotic treatments, directed according to the antibiogram and prolonged over time.

OBJECTIVE

To present two clinical cases of this rare, serious condition, which is still a surgical challenge. Discuss possible medical and surgical treatments and interdisciplinary approaches.

MATERIAL AND METHOD

Clinical case 1

Male patient, 58 years old, from Germany. No personal history to highlight. He was referred to the emergency department of the Hospital for lumbar pain that had been developing for ten days, starting after exertion and radiating to the left lower limb (LL), accompanied by paresthesias and paresis in the LL. Axillary fever of 38 °C. The neurological examination highlighted paresis of the (LL) with proximal predominance and involvement of the psoas, quadriceps, and tibialis anterior muscles, which was becoming more severe. Rotulian, Achillian, and plantar cutaneous hyporeflexia. Lassegue positive to the left at 45°. The initial blood test showed elevated infectious parameters (leukocytosis 41000, C-reactive protein 518).

He was admitted to the Intensive Care Unit (ICU) with a sepsis plan but Multiple Organ Dysfunction (MOD) due to probable spondylodiscitis, requesting a nuclear magnetic resonance (NMR) scan that could not be carried out in the first few hours due to pain.

At 24-48 hours, there was lacerating pain and right hemiparesis at the C5 brachial level. It does not overcome gravity 1/5, and there are no sensory alterations and paresis of the lower limbs below the knee, level L2-L3.

Magnetic resonance: Epidural collection in the posterior sector of the spinal canal with positive diffusion and contrast enhancement in the periphery, extending from the cervical-cranial junction to the sacrum, which corresponds to empyema. The spinal cord is compressed forward without altering its sign. At the lumbar level, the collection occupies the anterior and posterior sectors of the canal from L1 to L4. At L4-L5-S1, the collection is located in the anterior canal sector and compresses the dural sac towards the back. The collection is at the level of the left psoas, 80 mm in diameter from L4 to the sacrum. Probable infectious process in the left facet joint of L4-L5 accompanied by a collection at this level. (Figure 1)

Surgical Technique

Given the clinical presentation and the imaging results, it was decided to carry out a surgical intervention: left L4-L5 facetectomy and left L3-L4 decompression laminectomy, obtaining the outflow of abundant pus through the anterior intertransverse space and the

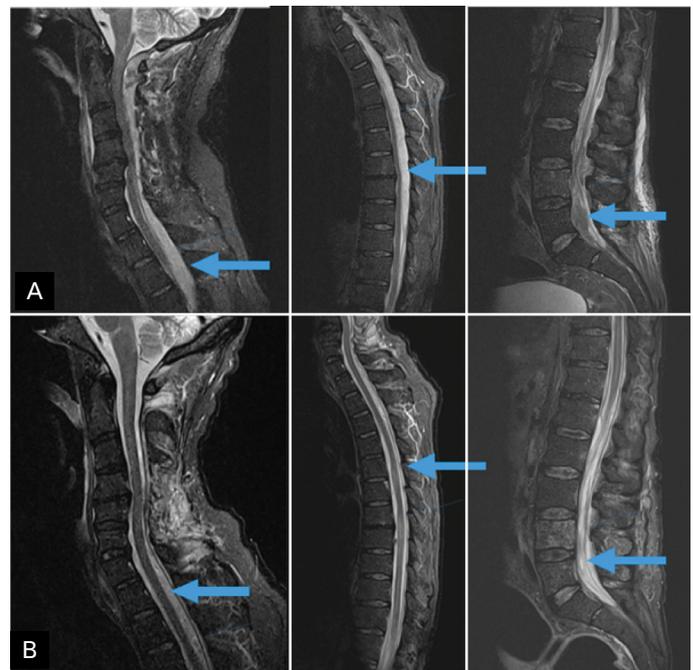


Figure 1. A: Diagnostic cervical - thoracic - lumbosacral MRI showing spinal epidural empyema B: Cervical - thoracic - lumbosacral MRI 15 days after surgery.

lumbar canal. An abundant flush with lumbar saline is carried out during irrigation. The dural sac is moved with Penfield to the contralateral side. With root separators, we reach the anterior sector of the sac, achieving the exit of purulent material from the anterior sector of the spinal canal. Irrigation with physiological saline continues until the turbid liquid is clarified and drains out of the canal, leaving subfacial, lumbar, and another drain at the level of the psoas abscess at the end of the transverse apophysis. Subsequent hemostasis control and closure by planes.

C3-C4 decompressive hemilaminectomy on the right was performed at the cervical level, resulting in an outflow of abundant pus. An abundant flush with physiological saline is carried out at cervical and lumbar levels. There is also subfacial drainage at the cervical level.

The surgical procedure had no complications and was carried out in an estimated time of less than 2 hours with a blood loss of less than 200ml. (Figure 2)

In the immediate postoperative period, the patient began to show progressive improvement at the motor level from distal to proximal, recovering paresis of upper and lower limbs with a strength of 3/5 (Daniels scale) at the right brachial level and 5/5 MSI, MID 3/5. The left hemisphere recovers completely on both the upper and lower limbs.

Intravenous antibiotic treatment began with vancomycin plus trimethoprim sulphamethoxide (TMP SMX). In bacteriological cultures, methicillin-sensitive *Staphylococcus aureus* was developed, with antibiotic treatment rotated to cefazolin and vancomycin suspended.

Subsequently, TMP SMX was suspended due to side effects, and cefazolin plus ciprofloxacin I/V was continued until 21 days of treatment had been completed. Progressively, the thermal curve and infectious parameters (blood count, erythrocyte sedimentation rate (ESR), C-reactive protein (CRP)) began to fall, and post-operative magnetic resonance imaging showed no abscess or intracanal collection.

Clinical case 2

A female patient, 62 years old, with a history of asthma, hypothyroidism, diabetes mellitus, and obesity, was consulted for lumbar pain associated with fever. A facet block of the lumbar spine L3-L4 bilateral had been performed ten days previously. On admission, paraplegia with T12-L1 sensory level and sphincter incontinence for urine were noted.



Figure 2. A: Patient in ventral decubitus position with an image of the cervical and lumbar approaches. B: Cervical approach. C: In the lumbar approach, purulent secretion can be seen in the last two images. The images show the outflow of intracanal purulent material through the laminectomies performed.

With confusional syndrome and sepsis with DOM, he enters the ICU.

Intravenous antibiotic treatment was started empirically with vancomycin plus trimethoprim sulfamethoxazole (TMP/SMX). Hemocultures and bacteriological cultures of surgical material revealed methicillin-sensitive *Staphylococcus aureus*. MRI: anterior extradural intrarachid collection from C2 to C6 with a thickness of 7mm. It produces slight compression of the spinal cord without changing the spinal signal. At the level of the vertebral perispondylous parts of the lumbar region at levels L3, L4, and L5, a liquid collection of approx. 55mm on right paravertebral muscles. Right-hand L3-L4 facet collection.

There is a laminated liquid collection surrounding the cauda equina roots and an intrarachid liquid collection at the posterior level of the sacral and thoracolumbar spinal canal. (Figure 3)

Surgical technique

Given the patient's clinical condition and the imaging, it was decided to carry out a lumbar approach centered on L3-L4. When the muscular fascia was opened, we were surprised by the abundant outflow of frank pus connecting the right L3-L4 facet and proceeded with the right L3-L4 facetectomy. Bilateral L3-L4 laminectomy is performed where the pus outflow is again observed from the epidural space, we continued with the bag's movement, irrigation, and lavage with abundant physiological saline until a clear lavage fluid was obtained. After undergoing prolonged treatment for three months, the patient is currently at 5/5 strength in both the upper and lower limbs, as shown in Figure 4.

The Ethics Committee of CEDEFECO approved this work.

DISCUSSION

Multilevel SEE is a rare and serious pathology of bacterial etiology accessed by the hematogenous route, the most frequent germ being *Staphylococcus aureus*. It is a complex pathology due to the infectious factor and, on the other hand, the compressive mechanical factor generated at the level of central and peripheral neurological structures, with possible irreversible damage to them.^{1-3,5,8,9}

Very few cases in the literature involve multivessels throughout the entire length of the spine, as well as an appropriate single treatment. Numerous controversies arise when defining a therapeutic course of action, whether a single medical treatment or an associated surgical one is appropriate for a good outcome. Another controversy is the placement of intracanal drains as an irrigation method

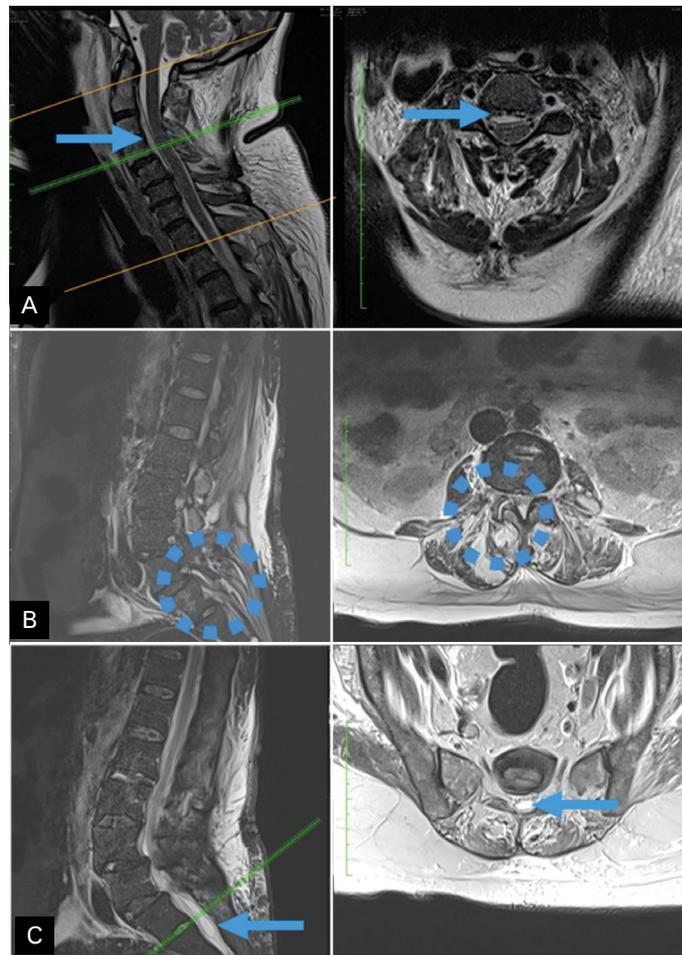


Figure 3. A: A cervical MRI shows a collection at the anterior level. B: facet arthritis L4L5. C: Intracanal collection at the lumbosacral level.

using Fogarty tubes⁹ with or without laminectomies. However, the need for surgical treatment in cases of progressive neurological deficit has not yet been questioned. It should be borne in mind that multilevel laminectomies increase surgical times and can present multiple complications, such as bleeding or mechanical instability.

Therefore, we stress the importance of not causing spinal instability and the role of chronic infections and biofilm formation in instrumentation. There is different consensus on which segment is most affected, among which some articles state that the thoracic segment is the most affected. In contrast, others mention that the lumbar is the most affected site. The cervical spine is the least affected. It is a disease with high morbidity and mortality in which the time factor in reaching a diagnosis plays a fundamental role in the patient's vital prognosis.

In addition to symptoms, inflammatory markers help diagnose and monitor the patient's progress. For definitive diagnosis, magnetic resonance imaging with gadolinium is the study of choice in cases of spinal epidural empyema due to its high sensitivity and specificity.⁴⁻⁸

As a surgical treatment, we opted for small incisions of multilevel laminectomy at the cervical and lumbar levels, as it is a quick surgery with little bleeding, does not cause destabilization, and does not require instrument fixation. In clinical case 1, the thoracic approach was not required, as the cervical and lumbar approaches were sufficient to drain the empyema that was present throughout the spinal extension during the surgery, and which was later confirmed by the magnetic resonance imaging performed 15 days after surgery, in addition to the good clinical evolution with improvement in pain and neurological deficit, as well as inflammatory parameters. We did not insert an intracanal drainage tube because the drainage was

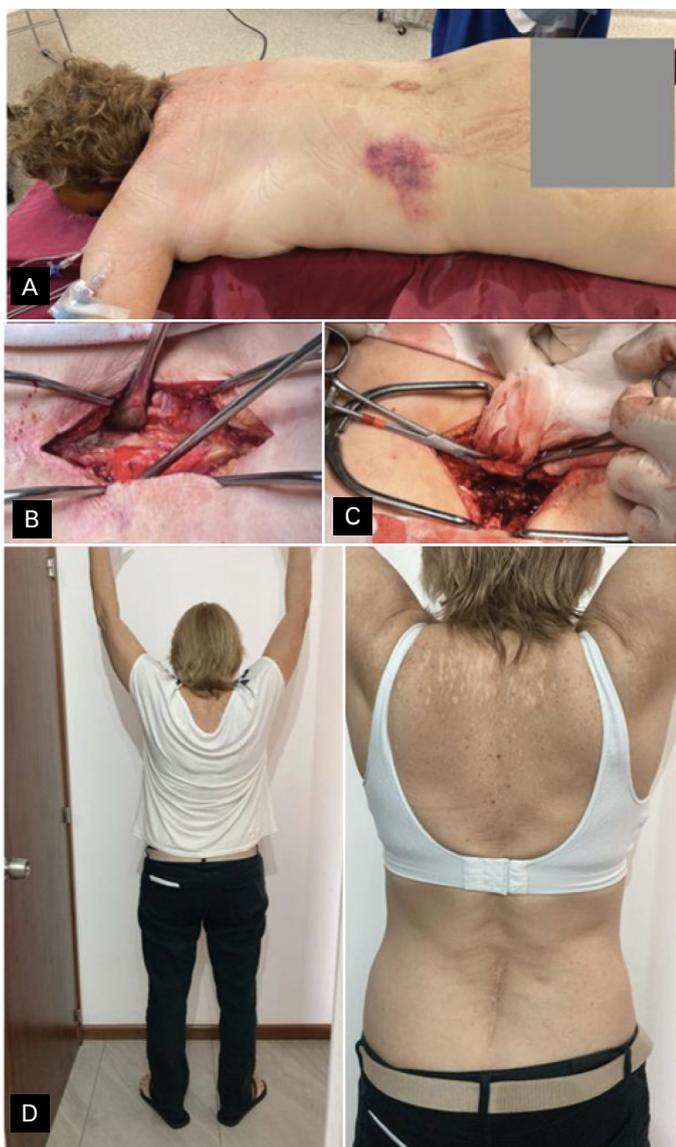


Figure 4. A: Position of the patient on the orthopedic table. B: cervical approach with the outflow of purulent fluid. C: Lumbar approach where purulent discharge is observed. D: Patient's current motor function.

abundant, and the purulent material had the characteristics of a thin liquid pus, thus avoiding the risks of increased intracanal pressure or neurological spinal cord injury when introducing the tube.

In clinical case 2, we started from a right L3-L4 facet arthritis, opting for a facetectomy at this level associated with bilateral laminectomy, abundant irrigation, and placement of a subfacial drain for two weeks, with subsequent outflow of purulent material until the condition remitted. Both patients cultivated the same bacteria (*Staphylococcus aureus*), were in the ICU for the first week, and then were moved to moderate care for 30 days.

The antibiotic treatment was longer than 12 weeks in both cases, guided by an infectious disease doctor, with a good clinical and paraclinical response from the patients. Given the lack of consensus on its duration, we don't know the optimal antibiotic treatment time for this pathology.

They had neurological improvement; in case 2, it was a total of 3 months, and in case 1, it was partial. They currently have normal inflammatory parameters (blood count, ESR, CRP). Although we present two clinical cases, we believe that knowledge of this pathology and correct medical and surgical treatment will lead to more cases.

Finally, there are very few cases reported with spinal epidural empyema compromising more than five levels at the vertebral level.⁹⁻¹²

CONCLUSION

Multilevel SEE is a serious and very infrequent disease and a challenge in diagnosis and medical and surgical treatment. It has a high morbidity and mortality rate, with severe neurological problems and a high mortality rate, requiring intensive care and prolonged hospitalization in moderate care. Surgical treatment is required employing decompression, irrigation, and drainage of the multilevel epidural purulent material to reduce the neurological consequences of this condition. In the two cases presented, urgent surgical treatment was carried out through laminectomy, decompression, and irrigation, achieving total drainage of the multiple epidural empyema in a short surgical time, with bleeding of less than 200ml and without rachis destabilization or adverse effects. Associated with prolonged antibiotic treatment, initially empirical and later directed according to the antibiogram. Achieving an improvement in neurological status. We believe that knowledge of this pathology and correct medical and surgical treatment will lead to more cases.

All authors declare no potential conflict of interest related to this article.

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