

Case Report: Catheter-Related Epidural Abscess

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Abstract

Introduction: Catheter-related spinal epidural abscesses are rare but increasing in incidence. **Clinical Picture:** An elderly gentleman received 4 days of continuous epidural analgesia following multiple traumatic rib fractures. Five days subsequently, he developed an extensive epidural abscess accompanied by backache, lower limb weakness, fever, leukocytosis and Staphylococcal bacteraemia. **Treatment:** He received appropriate intravenous antibiotics and underwent an emergent decompressive laminectomy. **Outcome:** A good outcome was achieved because of prompt diagnosis, appropriate intravenous antibiotics and timely surgical intervention. **Conclusions:** It is important to be vigilant and continue to maintain good clinical practice and a high index of suspicion for this procedural-related complication.

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Key words: Antibiotics, Epidural analgesia, Infection, Prevention

Introduction

Epidural abscess complicating epidural catheterisation was first reported in 1974.¹ Two recent studies indicated a local infection incidence of epidural catheters of 4.3% to 12%^{2,3} and about 0.7% are reported to have central nervous system infection e.g. epidural abscess or meningitis.⁴

The increasing incidence of catheter-related epidural abscess may reflect an increased use of epidural analgesia especially for pain management and improved clinical recognition as well as the increased sophistication of spinal imaging techniques with the ability to diagnose even small abscesses.^{5,6}

Infection is a serious complication of epidural analgesia and anaesthesia. This case report hopes to insert a note of caution and highlights certain unresolved issues in the conduct and care of epidural analgesia and anaesthesia.

Case Report

A 61-year-old man gave a history of being involved in a "pub" brawl 2 weeks previously as a result of which he sustained multiple fracture ribs and scapular fracture on the right side. The patient had a background of significant alcohol ingestion, manic depressive and epileptic disorder.

An epidural catheter was inserted on second attempt at the T5,6 level under aseptic conditions in the operating theatre to provide continuous analgesia. An 18-gauge

Perifix epidural catheter with a 0.2 micron bacterial filter was used. The catheter was left 3 cm in the epidural space and secured at its insertional site with a Tegaderm transparent dressing. Anti-infection precaution taken post insertion included maintenance of a closed epidural infusion system, change of epidural infusate and daily inspection of the insertion site by an anaesthetist. Ropivacaine 0.2% in a 200 mL bag with 4 microgram/mL of fentanyl was infused at 4 to 8 mL/hour. The epidural catheter was left in-situ for 4 days. There were no signs suggestive of infection on removal of epidural catheter.

Five days after removal of the epidural catheter, the patient developed a temperature of 40°C, leukocytosis, backache and bilateral lower limb weakness in the ward. He had become lethargic and confused. Clinically the patient was drowsy with a Glasgow Coma Score of 13, pyrexia of 38°C, decreased motor power (grade 3 of 5) in both lower limbs and absent ankle reflexes. There were no other signs of cauda equina abnormalities and no local back tenderness. Computed tomographic (CT) scan of the spine on the same day showed an extensive soft tissue mass extending from the level of T5 to T9. One set of blood cultures for aerobic and anaerobic organisms was taken. Subsequently he was started empirically on intravenous dicloxacillin 500 mg qds and gentamicin 180 mg daily prior to transfer to the neurosurgical intensive care unit in

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a tertiary hospital.

Magnetic resonance imaging (MRI) of the spine at our hospital revealed a more extensive involvement with soft tissue mass extending from the level of C5 to L5 with no spinal cord or bony involvement. Cerebral CT scan was unremarkable.

Decompression laminectomies were done at T4-5, T8-9 and L4-5 levels 20 hours after presentation to the referring hospital. Pus was drained at these sites and was subsequently cultured positive for *Staphylococcus aureus* with sensitivity to ampicillin, dicloxacillin, erythromycin, tetracycline and clindamycin. There was no evident haematoma at the operative sites. His lower limb power recovered to grade 4+ of 5 about 3 hours postoperatively.

He required a brief period of noradrenaline support despite adequate fluid resuscitation. The preoperative non-oliguric acute renal failure responded to fluid resuscitation and maintenance of perfusion pressure. His creatinine level eventually normalised over the next 5 postoperative days. Blood cultures taken at the referring hospital grew *S. aureus* with sensitivity to penicillin, cloxacillin, cotrimoxazole, erythromycin and clindamycin. Gentamicin was ceased with advice from the microbiologist.

His fever however persisted. After 5 days, dicloxacillin was ceased and intravenous cephalothin 500 mg qds was commenced to provide some gram-negative coverage. There were no new positive microbiological cultures. A bone scan and transthoracic echocardiography were negative for infective sites. On microbiologist's advice, cephalothin was replaced by intravenous vancomycin 1 g bd with good response by the third day. He received intravenous vancomycin for a month followed by 4 months of oral rifampicin and fusidic acid. Monthly monitoring of erythrocyte sedimentation rate (ESR) and C-reactive protein showed improvements and normalization by the second month of follow-up. Monthly liver function tests did not show significant derangements.

On follow-up at 2 months after discharge, the patient was fully ambulant although he still complained of backache.

Discussion

Presentation

Symptoms of epidural infection occur at an average of 5 days after catheter placement, indicating that abscess formation is often an early complication of catheter use.⁷ In 1991 however, Strong⁸ reported 2 such cases that occurred nearly 1 month after catheter placement.

The clinical presentation of our patient concurred with the classical four developmental phases of the syndrome of spinal epidural abscess described by Heusner⁹ viz: backache, root pain, weakness of muscles and sphincters and finally paralysis. However, these classic manifestations only occur

in a minority of patients (37%).⁵ Other presenting features include fever, reflex changes, paraesthesia, urinary or bowel incontinence and encephalopathy. Absence of motor deficits occur in up to 29% of patients.⁵ As atypical clinical presentation is not infrequent,² any patient with or had an epidural catheter and fever or low back pain of unknown cause should be suspected of having an epidural abscess.

Our patient had a background of poor nutrition and self neglect which also predisposed him to developing an epidural abscess following epidural catheterisation. Other recorded predisposing factors include diabetes mellitus, multiple medical illnesses, trauma, prior spinal surgery, morbid obesity, steroids (epidurally or systemic), heparin, intravenous drug use, Human immunodeficiency virus (HIV) disease, malignancy and end-stage renal failure.^{5,6}

Pathogenesis

Catheter-related spinal epidural abscess may occur by several mechanisms. First, the organism may be introduced directly during needle or catheter insertion. Second, spread of infection may occur directly from an adjacent site of infection or third, indirectly via haematogenous spread from a distant focus. Fourth, infection may occur after injection of contaminated fluid; particularly with the use of multidose vials.^{2,10,11}

Some authors have proposed that the degree of catheter manipulation, colonisation and migration of microorganisms along the percutaneous catheters are major factors.^{12,13} There are no data suggesting that contamination of epidural infusates or administration sets is an important cause of infection.^{2,14} Routine surveillance cultures of epidural catheter tips or exit sites have not been shown to be beneficial.^{2,14}

Microbiology

S. aureus was found to be the main offending microbe in catheter-related epidural abscesses in the review by Kindler et al.⁶ The offending microbe in our patient was also *S. aureus*. Other organisms include *Staphylococcus epidermidis*, *Pseudomonas aeruginosa*, *Streptococcus pneumoniae* and *Xanthomonas maltophilia*. No organisms were isolated in up to 8% of patients in a review on spinal epidural abscesses by Sampath and Rigamonti.⁵

Although laboratory tests have historically been unreliable in the diagnosis of spinal epidural abscess,^{1,5,10} the ESR was consistently elevated in all the patients in the literature review. Serial ESR also showed good correlation with resolution of clinical signs.

Diagnosis

In the literature plain spinal radiographs alone are highly unreliable in diagnosing spinal epidural abscesses.¹⁵ CT

scan following intrathecal administration of contrast agent usually suggests the diagnosis. MRI provides rapid and accurate identification of inflammatory foci, defines the entire extent of epidural and paraspinal involvement and shows the predominant location of the abscess.

The principal disadvantage of MRI is the tendency to overestimate bony involvement; but when used in conjunction with plain radiograph or CT, MRI is accurate in diagnosis and defining the extent of the disease. MRI is particularly helpful in monitoring patients undergoing treatment.¹⁶

Therapy

All patients should be treated with antibiotics immediately after diagnosis of epidural abscess is made, irrespective of subsequent treatment. Positive blood cultures provide strong suggestive evidence of the causative infective agent.⁵ It is preferable to obtain a culture directly from the abscess if possible. Although starting empirical antibiotic therapy can result in failure to isolate the specific causative microbe, there appears to be a 48 to 72 hours window before cultures of abscesses become compromised.⁵

Sampath and Rigamonti prefer using vancomycin, given the high frequency of *methicillin-resistant staphylococcus*, along with an aminoglycoside or third generation cephalosporin until definitive cultures are obtained. Antimycobacterial antibiotics should be added in those patients with a possible history of tuberculosis and who fail to respond to empirical antibiotic therapy.⁵

The duration of antibiotic therapy varies. The level of immunocompetence, concomitant osteomyelitis, continued enhancement on MRI, persistently elevated ESR and systemic bacteraemia all dictate a longer antibiotic course. No patients should receive less than 4 weeks of intravenous antibiotics. The appropriate duration of antibiotic therapy is determined by clinical evaluation, serial white blood cell counts, ESR and radiological resolution of the lesion on follow-up imaging study.⁵

The mainstay of treatment for spinal epidural abscesses is prompt surgical epidural decompression, drainage of abscess and long-term antibiotic therapy. Our patient responded well to this therapy.

There is, however, a small role for non-surgical approach for patients with minimal or absent neurological deficits, extensive pan-spinal involvement, underlying medical conditions precluding surgery and paraplegia of more than 48 hours duration where neurologic improvement is unlikely.⁵

In general, patients with cervical or thoracic spinal epidural abscesses are treated more aggressively given the small subarachnoid space around the spinal cord and the potential for greater neurological deficits.

In contrast, patients with lumbosacral spinal epidural abscesses without neurological deficits are increasingly treated conservatively initially and undergo operative decompression only if deterioration occurs. This approach represents a significant shift in the treatment philosophy. However, it cannot be over-emphasised that non surgical management should be used extremely cautiously in such patients as rapid deterioration and permanent neurological deficits can and do occur.

How Long can Epidural Catheters be Safely Left in Place?

In the previous reports^{1,17,18} of epidural abscess associated with epidural catheters, the catheters were left in place only 1 to 4 days. On the other hand, Barretto¹⁹ and Strasser et al²⁰ were unable to culture bacterial growth from aspirates of epidural catheters left in place for 1 to 10 days.

Tunnelling of the epidural catheters as reported by Mandaus et al²¹ and Du Pen et al²² may provide additional prevention from infection. Du Pen et al also found in their series that the onset of infection seems to be unrelated to duration of catheter placement.

It is also interesting to note that although the incidence of contamination of epidural catheters has been reported to be as high as 22%,¹⁰ the incidence of clinically apparent infection is remarkably small. This probably reflects skin and tract colonisation as well as the culture technique.

The site of catheter insertion, however, does appear to be significant.^{6,23} Thoracic placement of epidural catheters is associated with a relatively high proportion of epidural abscess. This is surprising because thoracic epidural catheterisation is much less frequent than the lumbar route in most anaesthetic services. The disparity may reflect an increased difficulty in locating the epidural space as well as insertion.²³ Difficult insertion is more likely to cause an epidural haematoma which could provide a nidus for blood-borne infection.^{2,24} In addition, the thoracic epidural space is narrower and in closer proximity to the spinal cord such that even a small lesion may be clinically significant.^{6,25}

A significant proportion of catheter-related epidural abscesses occur in obstetric anaesthetic practice. There are two particular reasons for this phenomenon: 1) insertion of the epidural catheter carries a high risk of causing bleeding from the enlarged epidural vessels in the parturient causing haematoma formation and providing a nidus for infection and 2) the likelihood of contamination and infection during positioning of an epidural catheter is higher in the labour room as compared to the operating room.

Preventive Measures

Strict aseptic technique must be practised in the insertion of epidural or spinal catheters. Infection control measures aimed at minimising the risks of infection associated with

temporary epidural catheter use have been suggested.^{11,12} Those suggested by Brooks et al¹² include: (1) minimising catheter manipulation and maintaining a closed system as much as possible, (2) use of transparent, moisture vapour-permeable dressing on the insertion site, (3) inspecting the epidural site every 8 hours, (4) using a 0.22 µm 96-hour filter as part of the infusion system, (5) changing the line, filter and preservative-free solution at 96 hours or discontinuing the system by 96 hours, (6) using a large syringe that remains attached to the epidural catheter filter for administering primary or bolus dose anaesthesia and (7) determining whether the infusion should be continued if the infusion system becomes disconnected. An experienced anaesthetist should restore the system aseptically if the infusion is to be continued. If epidural catheter-related infection is suspected, the catheter should be removed and the tip cultured with the use of semiquantitative culture method.²⁶

Outcome

Neurologic recovery is inversely proportional to the severity and duration of impairment. Patients treated within 24 hours of establishment of diagnosis have better outcomes. Incomplete cord lesions as manifested by sensory sparing also indicate better recovery potential. Treatment after 36 hours after onset of severe motor deficit rarely, if ever, regain useful functional recovery. In a review by Sarubbi and Vasquez⁷ on 22 patients who developed spinal epidural abscesses after temporary epidural catheter use, 62% recovered without neurological deficits and 38% still suffered residual neurological deficits at the time of follow-up.

Conclusion

Catheter-related spinal epidural abscesses are rare but remain a condition of significant morbidity and mortality.

The true incidence of this severe complication cannot be established because sample sizes of surveys on epidural anaesthesia were not large enough to detect rare events such as epidural abscesses.²⁷ Large retrospective studies analysing up to 500,000 epidural catheters suffer from potential misclassification bias and other limitations associated with retrospective analyses.⁶

A high index of suspicion, knowledge of the spectrum of symptoms and early interventions are needed to decrease adverse outcomes. Audit of epidural-related complications must be maintained.

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