Methicillin-Resistant *Staphylococcus aureus* Vertebral Osteomyelitis Following Epidural Catheterization: A Case Report and Literature Review

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**Abstract**

Indwelling epidural catheters are frequently used to manage postoperative pain. This report describes a patient who developed methicillin-resistant *Staphylococcus aureus* (MRSA) vertebral osteomyelitis of the lumbar spine following epidural catheterization.

To the best of our knowledge, this is the first reported case of MRSA vertebral osteomyelitis secondary to epidural catheter use in the English orthopedic literature. The patient and his family consented to publishing the data.

**Keywords**

- MRSA
- epidural anesthesia

**Case Report**

A 63-year-old man underwent open left nephrectomy for a nonfunctional kidney secondary to stricture urethra. He also had bilateral inguinal hernia for which he underwent bilateral inguinal hernia repair with mesh reconstruction. He did not have any comorbid conditions. An epidural catheter was inserted for postoperative analgesia. The catheter was maintained for 4 days after the operation. The postoperative period was uneventful and he was discharged. One month later he developed a fever with low back pain. An abscess developed over the site of previous epidural puncture, which ruptured and drained pus that same day. Following the rupture of the abscess, he became afebrile. The patient reported to the local hospital 2 days later for persisting drainage and was treated with dry dressings and analgesics. No antibiotics were given, nor were samples sent for bacterial culture. However, the draining sinus in his back persisted for 1.5 months and patient was then referred to our spine unit. Examination of the patient showed erythema around the sinus with tenderness over the L1 spinous process. The neurological examination was normal. His laboratory parameters showed erythrocyte sedimentation rate (ESR) of 55 mm/h and serum C-reactive protein (CRP) level of 79 mg/L. A computed tomography (CT) scan showed a sinus tract reaching up to the spinous process of L1 vertebra (►Fig. 1). A magnetic resonance imaging (MRI) did not show any evidence of an epidural abscess. He underwent sinus tract excision along with removal of the posterior half of the L1 spinous process. The histopathology of the spinous process was consistent with chronic osteomyelitis (►Fig. 2). Culture of the tissue from the sinus tract grew methicillin-resistant *Staphylococcus aureus* (MRSA) sensitive to linezolid. He was treated with intravenous linezolid for 6 weeks and the surgical wound healed. At 1-year follow-up, he remained symptom-free.
Discussion

There has been an increasing trend toward epidural anesthesia and analgesia and the placement of catheters in the epidural space for the management of chronic and postoperative pain. Back pain developing after epidural anesthesia is common and its incidence varies from 2 to 31%. The common causes of back pain after regional anesthesia are thought to be due to ligamentous trauma, reflex paraspinal muscle spasm, and ligamentous strain during patient positioning secondary to skeletal muscle relaxation. Symptoms related to back pain are usually mild and respond well to conservative management. Infections following epidural catheter insertion are uncommon; epidural abscess is a well-recognized complication. Vertebral osteomyelitis and discitis after epidural catheterization are extremely rare. To the best of our knowledge, MRSA vertebral osteomyelitis secondary to epidural catheter use has not been reported earlier in the English orthopedic literature.

A literature search of published articles in English found only 10 cases of vertebral osteomyelitis as a complication of epidural catheter use. This report analyzes the clinical presentation, laboratory results, therapeutic interventions, and outcome of these patients including the present reported patient (Table 1). There were six women and five men who ranged in age from 34 to 79. The duration of epidural catheter analgesia ranged from 7 hours to 6 days with all patients having back pain (100%). Two of them had draining purulent material (18%). Only one patient developed paraparesis (9%), which completely recovered following treatment. Eight patients had some degree of immune compromise (73%) such as chronic steroid use, ulcerative colitis, chronic alcohol abuse with pancreatitis, diabetes mellitus, and malignancy. The most common organism isolated was Pseudomonas aeruginosa (64%; Table 2). One patient had pneumonia caused by P. aeruginosa and subsequently developed a spinal infection with the same organism following epidural use. Two healthy patients were infected with Propionibacterium acnes, which is a normal anaerobic and weakly pathogenic saprophyte in the skin, sebaceous glands, and hair follicles. Nonoperative management was successful in seven patients (64%) and surgical management in four patients (36%).

Vertebral osteomyelitis and discitis following epidural catheter use could be due to hematogenous spread of organisms from infective foci elsewhere in the body or direct invasion either by skin bacteria through the needle track, contaminated syringes, or contaminated local anesthetics. The diagnosis of vertebral osteomyelitis requires a high index of suspicion. The clinical features include severe back pain, fever, and painful restriction of movements with or without neurological involvement. Early laboratory findings include leukocytosis followed by elevated ESR and CRP levels. Epidural and psoas abscess formation may complicate pyogenic spondylodiscitis. Plain radiographs are normal in the early period of infection. MRI is the study of choice, and it is the most sensitive and specific imaging technique for the diagnosis of a spinal infection. However, tissue sampling is often required for characterization of the infecting organism by CT-guided aspiration or by open biopsy.

In the present patient, vertebral osteomyelitis most likely developed through the epidural track itself for several reasons. A nephrectomy was performed for renal dysfunction...
due to chronic obstructive noninfective pathology. The patient did not have any comorbid conditions or other foci of infection. The perusal of anesthesia notes revealed repeated attempts to insert epidural catheter due to bloody tap. At the initial stages of the wound infection, no antibiotics were given by the treating physician and the MRI did not show evidence of epidural abscess.

From the analysis of the published literature, it is evident that immunocompromised patients (8/11) are at a higher risk of developing infective complications following epidural catheter use, and these patients should be closely monitored. Daily inspection and prompt removal of epidural catheter should be done on any suspicion of infection, as even healthy patients can develop infection. Therefore, strict aseptic technique of epidural catheter insertion should be practiced, and the anesthesiologist as well as the treating surgeon should be aware of the rare possibility of infection even after uneventful epidural analgesia.

Authors’ Contributions
Dr. R. Krishnakumar designed the study, collected data, performed the literature search, and prepared the manuscript. Dr. J. Renjitkumar analyzed the data, reviewed the manuscript, and edited the manuscript.

Disclosures
R. Krishnakumar, None
J. Renjitkumar, None

References

Table 1 Clinical Characteristics of Patients with Vertebral Osteomyelitis following Epidural Catheter Usage Reported in the Literature

<table>
<thead>
<tr>
<th>Study (Reference No.)</th>
<th>Age, Sex</th>
<th>Epidural Analgesia Indication</th>
<th>Epidural Analgesia Duration (d)</th>
<th>Symptoms</th>
<th>Vertebral Level Involved</th>
<th>Risk Factors</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>76, M</td>
<td>Thoracotomy</td>
<td>4</td>
<td>BP</td>
<td>L1</td>
<td>Steroid therapy</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>4</td>
<td>47, M</td>
<td>Radical cystectomy</td>
<td>NS</td>
<td>BP, sensory blunting</td>
<td>L1–3</td>
<td>None</td>
<td>Surgery + IV antibiotics</td>
</tr>
<tr>
<td>6</td>
<td>46, F</td>
<td>Total colectomy</td>
<td>10</td>
<td>BP</td>
<td>NS</td>
<td>UC, steroid therapy</td>
<td>Surgery + IV antibiotics</td>
</tr>
<tr>
<td>9</td>
<td>67, F</td>
<td>Ovarian cystectomy</td>
<td>4</td>
<td>BP, paraparesis</td>
<td>L2–4</td>
<td>UC</td>
<td>Surgery + IV antibiotics</td>
</tr>
<tr>
<td>10</td>
<td>59, M</td>
<td>Total colectomy</td>
<td>NS</td>
<td>BP, sciatica</td>
<td>T12–L4</td>
<td>UC, DM</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>11</td>
<td>51, F</td>
<td>Hysterectomy</td>
<td>4</td>
<td>BP</td>
<td>L5–S1</td>
<td>Nil</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>12</td>
<td>34, F</td>
<td>Labor pain</td>
<td>7</td>
<td>BP, fever</td>
<td>L1–2</td>
<td>Hypothyroidism, beta-thalassemia</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>5</td>
<td>79, F</td>
<td>Bilateral TKR</td>
<td>NS</td>
<td>BP</td>
<td>L2–3</td>
<td>RA, steroid therapy</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>7</td>
<td>42, M</td>
<td>THR</td>
<td>3</td>
<td>BP, fever</td>
<td>T12–L2</td>
<td>Pancreatitis, alcoholism</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>8</td>
<td>66, F</td>
<td>Spondylolisthesis</td>
<td>6</td>
<td>BP, fever, pus discharge</td>
<td>T11–12</td>
<td>DM</td>
<td>IV antibiotics</td>
</tr>
<tr>
<td>PR</td>
<td>63, M</td>
<td>Nephrectomy</td>
<td>4</td>
<td>BP, sinus</td>
<td>L1</td>
<td>UTI</td>
<td>Surgery + IV antibiotics</td>
</tr>
</tbody>
</table>

BP, back pain; IV, intravenous; NS, not specified; UC, ulcerative colitis; DM, diabetes mellitus; TKR, total knee replacement; THR, total hip replacement; PR, present report; UTI, urinary tract infection; RA, rheumatoid arthritis.

Table 2 Cultured Organisms in Patients with Catheter-Related Vertebral Osteomyelitis Described in the Literature

<table>
<thead>
<tr>
<th>Organism</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pseudomonas aeruginosa</td>
<td>7 (64%)</td>
</tr>
<tr>
<td>Propionibacterium acnes</td>
<td>2 (18%)</td>
</tr>
<tr>
<td>Staphylococcus aureus</td>
<td>1 (9%)</td>
</tr>
<tr>
<td>MRSA</td>
<td>1 (9%)</td>
</tr>
</tbody>
</table>

MRSA, methicillin-resistant Staphylococcus aureus.
13 Saady A. Epidural abscess complicating thoracic epidural analgesia. Anesthesiology 1976;44:244–246