EXTRADURAL ABSCESS COMPPLICATING EXTRADURAL ANAESTHESIA FOR CAESAREAN SECTION

W. D. NGAN KEE, M. R. JONES, P. THOMAS AND R. J. WORTH

SUMMARY
Extradural abscess has been described infrequently as a complication of extradural anaesthesia and analgesia. We describe an abscess that developed 5 days after operation in a patient who had extradural anaesthesia for Caesarean section and postoperative analgesia, and review the literature on extradural abscess complicating extradural catheterization, including a discussion on pathogenesis, clinical presentation, diagnosis and management. There have now been 16 reported cases of extradural catheter-related extradural abscess. Only one previous case has been in obstetric practice, despite the widespread use of these techniques in this specialty. A disproportionate number of cases have involved thoracic catheters. Duration of catheterization ranged from 40 h to 6 weeks, the majority of catheters being in place for 5 days or less. The time from catheter placement to development of symptoms ranged from 72 h to 5 months. The causative organism was isolated in 11 cases: Staphylococcus aureus was identified in nine (82%) and Staphylococcus epidermidis in two (18%). Outcome was reported in 15 cases, of which seven (47%) had a full or near full recovery and eight (53%) had a persistent neurological deficit. One case was managed successfully without surgery. Fifty percent of all cases have been reported in the past 5 years. With the increasing use of extradural techniques for anaesthesia and analgesia, this serious complication may be seen more frequently in the future. (Br. J. Anaesth. 1992; 69: 647-652)

KEY WORDS

CASE REPORT
A 26-yr-old, 80-kg woman presented for Caesarean section at 34 weeks gestation. She was in early labour with a twin pregnancy and a footling breech. The pregnancy had been complicated by mild pre-eclampsia, but platelet count and coagulation profile were normal. She had a past history of mild, non-incapacitating back pain and penicillin allergy.

Extradural anaesthesia was performed by the on-call anaesthetic registrar who scrubbed with 7.5% povidone-iodine (Betadine) and donned sterile gown and gloves, mask and cap. The patient's back was disinfected using 1% iodine in spirit. After skin infiltration with 1% lignocaine, an attempt was made to locate the extradural space at the L2-L3 interspace using a 16-gauge disposable Tuohy needle. After two needle insertions struck bone, this interspace was abandoned and another attempt was made using the same needle at the L3-L4 interspace. Here, the extradural space was located at 7 cm depth and a catheter inserted 5 cm into the space. The puncture site was covered with a folded sterile gauze square and a transparent dressing (Tagaderm, 3M). A test dose of 1.5% lignocaine 3 ml in 7.5% glucose with adrenaline 15 µg was administered via the catheter. Anaesthesia to T4 was produced using 18 ml of a solution made by adding 8.4% sodium bicarbonate 2 ml and adrenaline 100 µg to 2% lignocaine 20 ml. A dose of 50 mg of preservative-free pethidine was also administrated extradurally. All drugs were believed to be sterile, drawn from single-use ampoules, and delivered via a 0.2-µm bacterial filter (Portex). Surgery was uneventful. Prophylactic antibiotics were not administered.

As is standard practice in our institution, the extradural catheter was left in situ for the delivery of postoperative analgesia. This consisted of intermittent 10-ml doses of 0.5% sterile, preservative-free pethidine drawn from single-use ampoules and injected through the filter, which was capped between doses. A total of 14 doses was given before the catheter was removed 50 h postpartum.

The patient remained well until the 5th day after operation when she developed low back pain, a fluctuating fever that spiked to 39.5 °C and rigors. She was noted to have "offensive appearing" lochia and there was tenderness, bruising and a pustular lesion at the extradural site. A provisional diagnosis of endometritis was made. Blood cultures, a high vaginal swab and a swab from the extradural site were taken and i.v. cefuroxime 750 mg 8-hourly was commenced. Her back pain increased and by the 7th day after operation she had pain radiating to her legs.

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and feet and experienced difficulty with weight bearing. Her white cell count was increased to 26.9 x 10^9 litre^-1 and her temperature fluctuated between 36.4 and 37.6 °C. Neurological examination was normal at this time.

During the next day, the patient developed paraesthesia and weakness of both legs and had difficulty passing urine. Her temperature increased to 38.4 °C and she had absent ankle jerks and diminished sensation to pinprick from S1 to S5 on the left and from L4 to S5 on the right. Results from the high vaginal swab showed normal commensals, but the blood cultures grew *Staphylococcus aureus* resistant to penicillin and sensitive to fluoxacillin. She was referred to the neurosurgical team for urgent investigation. A myelogram was performed via a lateral C1–2 puncture and showed a complete block to contrast at T12 (fig. 1). Laminectomy was performed and an extradural abscess extending to the left paravertebral muscle was identified and drained. Culture of this pus subsequently grew *Staphylococcus aureus*. Antibiotic therapy was changed to a combination of i.v. cefotaxime 1 g 6-hourly, continued for 12 days, together with oral rifampicin 450 mg 12-hourly, continued for 4 weeks. Recovery was hindered by persistent radicular pain, but this improved gradually and, when reviewed 8 weeks after operation, the patient had made a full recovery.

Bacteriophage typing of the staphylococcal isolate from blood and abscess was performed and both isolates had identical typing patterns. The isolate from the extradural site was not available for typing. At the 8-week follow up, nasal and perineal swabs taken from the patient both grew *Staphylococcus aureus*, but of a phage type different from that found in the abscess. *Staphylococcus aureus* was not isolated from swabs taken from the skin surrounding the operative site. The anaesthetist who had inserted the extradural catheter was screened for staphylococci at the same time, but nasal and perineal swabs did not yield *Staphylococcus aureus*. Routine sterility testing of extradural test doses over the past 2 years has not identified contaminated batches.

**DISCUSSION**

Infection of the extradural space is a recognized, albeit rare, complication of extradural anaesthesia and analgesia. Extradural abscess complicating extradural catheterization was first reported in 1974 [1, 2]. A search of the literature has identified 15 further cases, of which only one has been in obstetric practice [3–14] (table 1). Fistula formation after extradural catheterization has also been described [15], and extradural abscess has occurred after single-shot extradural injections [16, 17], caudal extradural anaesthesia [18] and spinal anaesthesia [19–21]. Extradural abscess unrelated to anaesthesia is well reported, with an estimated incidence of 0.2–1.2 per 10000 hospital admissions [3].

In obstetric practice, extradural anaesthesia with or without the use of catheters is used extensively for pain relief and operative obstetrics and has a low incidence of serious complications [10, 22, 23]. Infections of the extradural space are rare, despite the difficulties of performing techniques aseptically on the labour bed [8]. In a retrospective study carried out by postal questionnaire of serious, non-fatal complications associated with extradural blocks in obstetrics, Scott and Hibbard found only one case of extradural abscess in 505000 extradural blocks performed in the U.K. from 1982 to 1986 [10]. Fatal extradural abscess has occurred after continuous caudal extradural analgesia in labour [18]. Other infective complications of extradural anaesthesia in obstetrics have included non-abscess infection of the extradural space [24] and meningitis [25]. Meningitis has also been described after spinal anaesthesia in obstetrics [26, 27].

Infection of the extradural space may occur by several mechanisms after extradural anaesthesia [17]. First, organisms may be introduced directly during needle or catheter insertion. This mechanism has been implicated in one case in which the infecting organism was later isolated from nasal swabs taken from the anaesthetist [4]. Second, infection may occur after injection of contaminated fluid, as has occurred with the use of multidose vials [4]. Third, spread may occur directly from an adjacent area of infection [28]. Fourth, infection may be indirect via haematogenous spread from a distant focus of infection [2, 24].

The incidence of contamination of extradural catheters has been reported to be as great as 22% [29]; however, the incidence of clinically apparent infections is remarkably small. The reasons why some cases manifest as abscesses are unclear. The majority of cases of catheter-associated extradural abscess have involved catheters in place for 5 days or less, therefore a long duration of catheterization is
### Table 1. Extradural abscesses associated with extradural catheterization

<table>
<thead>
<tr>
<th>Reference</th>
<th>Extradural site</th>
<th>Indication</th>
<th>Extradural drugs used</th>
<th>Duration of catheterization</th>
<th>Time after insertion to significant symptoms</th>
<th>Infecting organism</th>
<th>Outcome</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1], [2]</td>
<td>Thoracic</td>
<td>Postoperative anaesthesia</td>
<td>Local anaesthetic, morphine</td>
<td>40 h, 40 h</td>
<td>4 days, Not specified</td>
<td>Staphylococcus aureus</td>
<td>Mild sensory deficit</td>
<td>Same case reported twice</td>
</tr>
<tr>
<td>[3]</td>
<td>Not specified</td>
<td>Priapism</td>
<td>Local anaesthetic</td>
<td>72 h</td>
<td>10 days</td>
<td>Staphylococcus aureus</td>
<td>Full recovery</td>
<td>A: Contaminated drug vial used</td>
</tr>
<tr>
<td>[4]</td>
<td>A: Lumbar</td>
<td>Rib fractures</td>
<td>Local anaesthetic</td>
<td>4 days</td>
<td>4 days</td>
<td>Staphylococcus aureus</td>
<td>Sensory impairment</td>
<td>B: Causative organism isolated from anaesthetist</td>
</tr>
<tr>
<td>[4]</td>
<td>B: Thoracic</td>
<td>Rib fractures</td>
<td>Local anaesthetic</td>
<td>4 days</td>
<td>4 days</td>
<td>Staphylococcus aureus</td>
<td>Full recovery</td>
<td>Patient with diabetes and chronic renal failure</td>
</tr>
<tr>
<td>[5]</td>
<td>Thoracic</td>
<td>Rib fractures</td>
<td>Morphine</td>
<td>80 h</td>
<td>20 days</td>
<td>Staphylococcus aureus</td>
<td>Weakness, urinary retention</td>
<td></td>
</tr>
<tr>
<td>[6]</td>
<td>Lumbar</td>
<td>Knee surgery</td>
<td>Not specified</td>
<td>4 days</td>
<td>2-3 weeks</td>
<td>Staphylococcus epidermidis</td>
<td>Near full recovery</td>
<td></td>
</tr>
<tr>
<td>[7]</td>
<td>Lumbar</td>
<td>Peripheral vascular disease</td>
<td>Not specified</td>
<td>6 weeks</td>
<td>5 months</td>
<td>Not specified</td>
<td>Persistent pain</td>
<td></td>
</tr>
<tr>
<td>[8]</td>
<td>Thoracic</td>
<td>Chronic pain</td>
<td>Local anaesthetic</td>
<td>72 h</td>
<td>72 h</td>
<td>Not specified</td>
<td>Parasthesiae, back spasm</td>
<td>Patient with cancer</td>
</tr>
<tr>
<td>[9]</td>
<td>Lumbar</td>
<td>Rib fractures</td>
<td>Local anaesthetic</td>
<td>13 days</td>
<td>12 days</td>
<td>Staphylococcus aureus</td>
<td>Full recovery</td>
<td>Patient with cancer</td>
</tr>
<tr>
<td>[10]</td>
<td>Not specified</td>
<td>Obstetrics</td>
<td>Local anaesthetic</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Not specified</td>
<td>Incomplete recovery</td>
<td>Treated non-surgically</td>
</tr>
<tr>
<td>[12]</td>
<td>Lumbar</td>
<td>Cancer pain</td>
<td>Local anaesthetic</td>
<td>Morphine</td>
<td>4 weeks</td>
<td>Staphylococcus epidermidis</td>
<td>Full recovery</td>
<td>B. Patient on oral steroids</td>
</tr>
<tr>
<td>[13]</td>
<td>A: Thoracic</td>
<td>Herpes zoster</td>
<td>Local anaesthetic</td>
<td>1st: 36 h, 2nd: 3 days</td>
<td>31 days (after 1st catheter)</td>
<td>Staphylococcus aureus</td>
<td>Full recovery</td>
<td>Patient with rheumatoid arthritis</td>
</tr>
<tr>
<td>[14]</td>
<td>B: Cervical</td>
<td>Reflex sympathetic dystrophy</td>
<td>Local anaesthetic</td>
<td>1st: 5 days, 2nd: 5 days</td>
<td>7 weeks (after 1st catheter)</td>
<td>None identified</td>
<td>Full recovery</td>
<td>I.m. steroids given</td>
</tr>
<tr>
<td>[14]</td>
<td>Thoracic</td>
<td>Perioperative analgesia</td>
<td>Local anaesthetic</td>
<td>5 days</td>
<td>28 days</td>
<td>Staphylococcus aureus</td>
<td>Paraplegia, urinary retention</td>
<td></td>
</tr>
<tr>
<td>Present report</td>
<td>Lumbar</td>
<td>Caesarean section</td>
<td>Local anaesthetic</td>
<td>50 h</td>
<td>5 days</td>
<td>Staphylococcus aureus</td>
<td>Full recovery</td>
<td></td>
</tr>
</tbody>
</table>
not necessary. The site of insertion of catheters does appear to be significant; of the 16 reported cases, seven (44%) involved thoracic catheters, six (38%) involved lumbar catheters, and one case (6%) involved cervical extradural catheterization; the site of catheterization was not specified in two cases (table I). This indicates a disproportionately high involvement of thoracic catheters, considering that in most practices lumbar placement is far more frequent than thoracic. It may reflect the relative difficulty locating the thoracic extradural space compared with the lumbar space [30]. Insertions that are difficult are more likely to be traumatic, and may result in a greater incidence of extradural hematoma, which could then act as a nidus for infection [2, 20, 24]. Breaks in aseptic technique may also be more likely when insertion is difficult.

In our patient, the source and route of infection remain unclear. Full aseptic precautions were taken during catheter insertion and the infecting organism was not isolated from the anaesthetist. Extradural analogies were delivered in the ward by intermittent bolus doses, rather than by continuous infusion, through a closed delivery system as has been recommended [31,32]. However, all drugs were believed sterile, were freshly drawn from single-use ampoules and injected using sterile, single-use syringes attached directly to a bacterial filter. Extradural insertion in this patient was difficult, involving multiple needle insertions, which may have made contamination during insertion more likely or may have predisposed to extradural hematoma formation. Although the *Staphylococcus aureus* grown from the pustular lesion on the patient's back was not phage-typed, it is likely to be the same as that isolated from the blood and abscess; the pustule may have been the result of concurrent infection, or the source of spread to the extradural space. Spread may have occurred haematogenously, blood cultures having been positive, or by direct spread along the catheter or needle track.

The most common causative organism in extradural abscess unrelated to anaesthesia is *Staphylococcus aureus* [3, 28, 33-35], although recent reviews suggest the spectrum of causative organisms is broadening [28, 35]. *Staphylococcus aureus* has also been the commonest infecting organism in catheter-associated cases, identified in nine (82%) of 11 cases in which an organism was isolated, with *Staphylococcus epidermidis* identified in two (18%) (table I).

The clinical features of extradural abscess were described by Rankin and Flothow in 1946 [36] and by Heusner in 1948 [37]. Four stages are described: spinal ache, nerve root pain, weakness and paralysis. Associated findings may include fever, leucocytosis, increased erythrocyte sedimentation rate, alterations in reflexes, neck stiffness and headache [28, 34]. Positive blood cultures correlating with culture results from the abscess are found in about 25% of cases [28]. The cerebrospinal fluid is almost always abnormal [33], but lumbar puncture carries the risk of neurological deterioration if performed below a complete spinal block [38], and meningitis may follow if the needle traverses the abscess [34].

Extradural abscess may have a highly variable presentation which can make diagnosis difficult [33]. A review of 29 non-catheter-related cases found all patients had spinal pain at presentation, but only 69% had a new neurological deficit and only 62% had an increased temperature [35]. Conversely, in one case which followed extradural catheterization, the patient presented with sensory deficit and paralysis in the absence of pain [5]. In our patient, there was a significant delay in diagnosis, owing to the initial lack of localizing neurological signs. Symptoms in catheter-associated cases have occurred at varying times after placement of the catheter, ranging from 72 h to 5 months. Delayed presentation may make diagnosis difficult. One patient developed symptoms of spinal cord compression 20 days after removal of an extradural catheter and only had a diagnosis of extradural abscess made after laminectomy had been performed [14]. Patients with extradural catheters inserted for treatment of chronic pain may also present diagnostic problems. In these patients, the development of pain from the abscess may be difficult to separate from the patient's chronic condition [8].

The mainstay of diagnosis of extradural abscess lies in radiological imaging [34], with myelography currently being the main diagnostic tool [28, 33, 35]. Several reports have shown the usefulness of magnetic resonance imaging (MRI), which eliminates the need for dural puncture [39-41], and has been used successfully in a patient allergic to contrast material [42]. However, MRI cannot distinguish between frank pus and granulation tissue [34] and may not diagnose the extent or presence of an abscess in patients with associated meningitis [41]. Computed tomography (CT) has also proven useful [43] and may be combined with myelography. However, definitive diagnosis may not be possible with CT alone [40]; in one report, the initial CT was positive in only three of nine patients with a subsequently proven diagnosis of extradural abscess [33].

The management of extradural abscess consists of early diagnosis, surgical exploration and drainage, and appropriate antibiotics [33, 34, 37, 44]. There have been reports of patients managed successfully without surgery [13, 33, 43, 45-47], but medical management carries a significant risk and non-operative treatment should be considered only for patients with a very high operative risk [34]. Outcome is related to the duration of time the abscess has been present, and the degree of neurological impairment, at the time of definitive surgical treatment [28, 33, 44]. Delay in diagnosis and treatment may result in permanent neurological damage [37, 48]. Of the 16 catheter-related cases, 14 underwent surgery and one patient in whom an early diagnosis was made was managed successfully with antibiotics [12]. Management not specified in one case. Outcome was reported in 15 cases of which seven (47%) had a full or near full recovery and eight (53%) had a persistent neurological deficit, ranging from mild sensory impairment to paraplegia and urinary retention (table I).

Many reported cases of extradural abscess
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associated with extradural anaesthesia have had identifiable risk factors such as diabetes [7], chronic renal failure [7], cancer [11, 12], steroid administration [13, 14, 16, 17], herpes zoster [13] and rheumatoid arthritis [14] that may have predisposed to susceptibility to infection [49-51]. The obstetric patient is usually young, healthy and without these risk factors. Nonetheless, there has been an increasing trend towards extradural anaesthesia and analgesia in obstetrics and in other specialties, and the practice of placing catheters in the extradural space for management of acute, chronic and post-operative pain is becoming increasingly popular. Fifty percent of all cases of extradural abscess complicating extradural catheterization have been reported in the past 5 years: it appears this rare complication is becoming more common. Therefore, it is essential that the anaesthetist is meticulous in ensuring a strict aseptic technique, taking particular care when placing catheters in the thoracic space or in the debilitated or immunocompromised patient. All medical staff should be aware of the possibility of this complication. Early diagnosis of extradural abscess will be facilitated by a high index of suspicion. It should be considered in any patient who has had an extradural catheter in situ and demonstrates systemic signs of infection or significant back pain. The occurrence of radicular pain, weakness, paralysis or bladder dysfunction are indications for immediate neurosurgical referral and specialized investigations.

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