CASE REPORT

Colonic perforation by an intrathecal baclofen pump catheter causing delayed *Escherichia coli* meningitisOliver Patrick Devine,¹ Andrew Christopher Harborne,² William B Lo,² Rupert Price³

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SUMMARY

Intrathecal baclofen (ITB) delivery via an implanted pump is frequently used for the treatment of spasticity. This is an effective and safe neurosurgical and pharmacological intervention associated with an improvement in patient quality of life. There is, however, a risk of device-related infection. We present a patient with pump-site infection and *Escherichia coli* meningitis secondary to transcolonic perforation of an intrathecal baclofen pump catheter. While this is rare, we review the intraoperative precautions and best practices that should be taken to prevent and manage this unusual complication.

BACKGROUND

Intrathecal baclofen (ITB) delivery via an implanted pump is an effective and generally safe treatment modality for the management of spasticity of various causes, including cerebral palsy and multiple sclerosis.¹ This contrasts with the limitation of oral baclofen treatment, namely systemic side effects including central nervous system depression and the related high clinical inefficacy of 25%–35%.² The clinical benefit and improvement in quality of life resulting from ITB are well documented.³

During placement of an intrathecal pump, two incisions are made: (1) a low lumbar incision at L4/5 – for the insertion of intrathecal catheter and (2) a superficial abdominal paramedian or lateral incision – for the placement of the pump device. Using a tunnelling device, the proximal extrathecal catheter is passed through the subcutaneous adipose tissue of the flank between the two incision sites. As with any implantable device there is a risk of device-related infection. The most common causative organism for wound infection is *Staphylococcus epidermidis* and coagulase-negative *Staphylococci*.⁴ Infection not treated promptly and effectively can become difficult to eradicate and spread along the catheter into the cerebrospinal fluid (CSF) space, leading to meningitis. Depending on the site and extent of the infection, antibiotic therapy should be commenced and pump and catheter removal may be warranted.

While pump-site infection rates have been reported to be approximately 1%,⁵ there are no previous reports of baclofen pump infection caused by *Escherichia coli*. Here we report a patient with a recurrent suppurative pump-site infection and meningitis secondary to *E. coli*, as a result of a transcolonic misplacement of the proximal catheter.

CASE PRESENTATION

The patient is a 54-year-old woman with a long-standing history of relapsing-remitting multiple sclerosis with spasticity refractory to medical management. She became wheelchair users by 46 years of age. Following a successful trial of ITB, she underwent insertion of a right-sided ITB pump at this neurosurgery unit.⁶ Shortly after this surgery, the consultant neurosurgeon responsible for her case suddenly passed away.

Two weeks postoperatively, the patient was admitted under the care of her neurorehabilitation team in a different hospital with a severe headache, nausea and vomiting. On examination, there was purulent discharge from the transverse lumbar wound. She was afebrile, with a neutrophilia of 10.4×10^9 cells/L and C reactive protein (CRP) of 131 mg/L. Ultrasound scan of the lumbar region identified a deep collection. Oral clarithromycin was commenced empirically. The following day, the patient underwent wound debridement and re-suturing. Culture of the pus confirmed Gram-negative bacilli and anaerobes, and thus clarithromycin was switched to a 10-day course of meropenem, metronidazole and aztreonam, to which the wound and the CRP improved to 24.5 mg/L. The patient was discharged.

Five days later, the infection deteriorated, with purulent discharge from the wound. The CRP rose to 137.2 mg/L. The empirical aztreonam and metronidazole were switched to a 14-day course of co-amoxiclav following microbiological sensitivity testing. The wound then continued to heal well. Over the following 6 months, the patient's condition was stable. Six months after the second postoperative infection, she was readmitted for a third recurrence of infection. This was treated with co-amoxiclav as described previously. Unsurprisingly, she continued to have a periodic low-grade fever for the following 4 months. The patient had a long-term urinary catheter, and during this period had multiple *E. coli* urinary tract infections (UTIs) which were interpreted as the cause of these fevers.

TREATMENT

Eventually, she was referred to our unit with acute meningitic symptoms and pump-site discomfort associated with purulent discharge from the original lumbar incision site. CSF culture from lumbar puncture identified *E. coli*. We started a course of meropenem followed by vancomycin.

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Figure 1 Axial CT demonstrating the catheter traversing the ascending colon (arrow head) and peritoneal and retroperitoneal space (arrow). There is no catheter disconnection or fracture and no intra-abdominal collection. There is no catheter present in the lateral abdominal subcutaneous tissue, where it ought to be situated (*).

Owing to the identification of *E. coli* in the CSF, an abdominal CT scan was ordered. It was at this point that we discovered a CT scan performed shortly after placement and ordered by the original, sadly now deceased, surgeon. This CT showed the catheter passing through the retroperitoneal space posterolaterally, through the right renal capsule into the peritoneal cavity, traversing the ascending colon and entering the anterior abdominal subcutaneous tissue towards the pump (figure 1). There was no catheter disconnection or obvious fracture and no intra-abdominal collection. In the first CT scan, the catheter passed straight through the ascending colon, but in the repeat scan it was coiled within the lumen of the bowel, raising some concerns about whether it would be feasible to just pull it out along the tract.

The ITB delivery system was removed in a joint procedure by the Neurosurgery and General Surgery teams. The possibility that a full laparotomy and large bowel resection might be required for catheter removal was discussed with the patient, but in the event a laparoscopic procedure was sufficient. In the prone position, the intrathecal portion of the catheter was retrieved and cut-off and the securing flange to the muscle removed. The proximal catheter was sliding freely in and out of the retroperitoneal defect, through which some yellow fluid was leaking. The lumbar wound was packed with 50% hydrogen peroxide soaked gauzes before temporary closure. The patient was repositioned to supine. The old abdominal incision was opened. Exploratory laparoscopy identified two intraperitoneal fistulae containing the catheter: (1) connecting the right anterior inner abdominal wall to the anterior aspect of the ascending colon and (2) connecting the posterior aspect of the ascending colon and the posterior peritoneal wall. The remaining catheter was removed without difficulty by gentle traction from the pump site. The fistulae were divided and closed with an endoscopic stapler. The patient was repositioned prone and the lumbar wound was closed in layers.

OUTCOME AND FOLLOW-UP

Following the removal of the ITB system, the patient was started on oral baclofen. Metronidazole was added to the existing antibiotic regimen. The wounds healed and the recurrent coliform UTIs ceased. Five months later, a new ITB system was implanted with no subsequent complications.

DISCUSSION

Implanted devices carry a risk of infection.⁴ Most infections are secondary to skin contaminants at the time of insertion,⁴ thus they usually occur within 2 months of surgery and the most common organism is *S. epidermidis* and other coagulase-negative *Staphylococci*.⁴ Removal of the device is often required for definitive treatment of the infection.⁴ In a recent study of 1534 children undergoing ITB pump insertion, antibiotic prophylaxis without prolonged postoperative antibiotic for >24 hours carried a 20% 6-month surgical complication/infection rate, significantly lower than 27% when antibiotic prophylaxis was missed.⁷

This is a rare case of iatrogenic recurrent wound infection and *E. coli* meningitis secondary to a misplaced catheter of an ITB system through the viscera. While pump infection and malpositioning of the catheter have been described before, this is the first case of the catheter traversing the bowel causing meningitis. The Gram-negative culture suggested that the infection was secondary to alimentary contamination. The early onset of the first infection suggested the catheter was malpositioned at the time of the first surgery as opposed to migration. As the patient was transferred to another hospital shortly after her surgery, the requesting surgeon died shortly after performing the surgery, and the Neurosurgery unit was in the process of moving into new hospital facilities at the time, the results of the immediate postoperative CT were never seen. On review by us at the time of her final presentation, instead of staying within the subcutaneous layer, the tunnelling device entered the peritoneal cavity,

Learning points

- ▶ While the reported complication is rare, intraoperative precautions should be taken to minimise the risk and are part of normal neurosurgical training in most developed nations:
 - The patient is placed in the decubitus position. Before tunnelling, the malleable metallic tunnelling device should be shaped to the curvature of the patient's flank.
 - During tunnelling from the anterior–posterior direction, when the tip of the tunnelling device reaches the most lateral point of the shunt tract, it is turned 180° as the tunnelling continues in the posterior abdominal subcutaneous layer. The shaping of the tunneller and the manoeuvre keep it in the abdominal wall.
 - During tunnelling, the depth of the tip of the tunneller is estimated and maintained by inspection and palpation over the flank.
- ▶ It is common practice in the UK for intrathecal baclofen pumps to be fitted in tertiary neurosurgical units with postoperative follow-up care delivered by neurorehabilitation colleagues. This may mean that readmission takes place at another hospital site entirely, handled by a non-surgical team. This case underscores the importance of continuity of care between neurosurgical and neurorehabilitation teams, particularly when they are geographically separated. Clinicians caring for patients with intrathecal devices should have a low threshold to investigate with abdominal CT if the patient presents with an unusual clinical pattern or microbiology culture yielding uncommon organisms. Robust guidelines for such collaboration between neurosurgery and neurorehabilitation could facilitate earlier investigation, detection of the problems such as those detailed here and prompt earlier referral to a surgical team for review and removal of the device.

penetrated the colon and exited the peritoneum on the opposite wall. Therefore, the two lumbar wound infections in the first postoperative month were likely due to the direct contamination from bowel content spread by the tunnelling device. The formation of the intraperitoneal fistulae prevented subsequent peritonitis when we removed the device, but could have provided a conduit for spread of bacteria along the external catheter wall, which may explain the delayed meningitis 13 months postoperatively and the repeated coliform UTIs during the intervening period. Only one other case of colon penetration has been reported.⁸ A 54-year-old woman with spasticity secondary to multiple sclerosis had an ITB pump inserted but developed worsening symptoms within 4 months postoperatively. An elective colonoscopy identified the intrathecal catheter loop and so reason for neurological deterioration was failure of ITB delivery. It was likely that a similar complication to the current case occurred at the time of tunnelling. Following the surgery, the intrathecal catheter migrated into the colon as it was not secured.

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