

Case Report


Emergent Intrathecal Baclofen Withdrawal After Pseudomeningocele Aspiration

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Intrathecal baclofen (ITB) infusion has become a common treatment for severe spasticity. Many complications of these drug delivery systems have been reported such as those related to improper dosing, mechanical failure of the implanted pump or catheter, or post-operative wound issues. We report a case of ITB withdrawal after pseudomeningocele aspiration. A 21 year-old male with spastic quadriparesis due to traumatic brain injury (TBI) presented with a pseudomeningocele surrounding an ITB pump (215 mcg/day, continuous) implanted in the abdomen. The pseudomeningocele was percutaneously aspirated and approximately 15 hours later the patient developed signs and symptoms of acute baclofen withdrawal. As a result, the patient underwent an exploration of the ITB infusion system with an intraoperative epidural blood patch. The symptoms of ITB withdrawal improved over the next 18 hours. The subcutaneous cerebrospinal fluid (CSF) collection partially recurred 48 hours later, but this resolved after a second epidural blood patch. The case illustrates a unique presentation of a serious complication of ITB infusion. This underscores that timely diagnosis and treatment of acute baclofen withdrawal is key to optimal outcomes.

Key words: Intrathecal baclofen, baclofen withdrawal, intrathecal baclofen pump complications, pseudomeningocele, cerebrospinal fluid leak, case report

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Intrathecal baclofen (ITB) is a common modality employed in the management of severe spasticity when oral medications and botulinum toxin injections are not sufficiently therapeutic or cause unacceptable side effects (1-9). Historically, oral baclofen has been used to treat spasticity; however, intrathecal administration of baclofen delivers a significantly higher drug concentration to the spinal cord, the area of therapeutic action of the drug. There is also a 4 to one post-infusion drug concentration gradient from the caudal to the rostral aspect of the spinal cord. This gradient focuses the beneficial effect at the spinal level and reduces the unwanted cranial side effects (10).

The most common indications for ITB therapy include cerebral palsy, traumatic brain injury, spinal cord injury, diffuse anoxic brain injury, multiple sclerosis, stroke, and dystonia (4,7,11-16). ITB therapy has been shown to improve quality of life and optimize daily care, as well as be cost effective (17-20).

ITB therapy, however, is not without risk (18). Complications can be varied, but can be categorized as relating to dosing, mechanical failure of catheter or pump, or wound issues such as infection (5,9,11,21,22). In particular, any complication resulting in abrupt cessation of ITB delivery may result in a severe baclofen withdrawal syndrome, which can be life threatening

(9,11,18,21). As a result, recognition of ITB withdrawal is an important component of managing patients with ITB delivery systems (9).

In this study, we present a case of a young patient with an ITB pump complicated by acute baclofen withdrawal after pseudomeningocele aspiration.

CASE REPORT

History

The patient is a 21-year-old man who suffered a severe traumatic brain injury (TBI) due to a motorcycle accident. This left him with severe spastic quadripareisis. A bolus trial of 50 mcg of ITB provided excellent relief of his spasticity and improvement in his dysautonomia. Based on this, he underwent implantation of an intrathecal catheter (model 8731 SC, Medtronic Neurological, Minneapolis, MN) and subcutaneous programmable pump (215 mcg/day, continuous, Synchromed II,

Medtronic Neurological, Minneapolis, MN). The patient was placed under general anesthesia and access to the cerebrospinal fluid (CSF) was obtained in a single pass. A catheter was placed via a standard oblique trajectory from a fascial entry point over the right L3 pedicle to a puncture of the thecal sac in the midline at the L1-2 interspace. The catheter tip was positioned at approximately the T4 level (Fig. 1). To complete the case, each layer (deep dermal, dermal, and subcutaneous) was brought together with absorbable sutures. The skin was closed with interrupted vertical mattress 3.0 nylons. No intraoperative complications were noted, and no sign of leak was noted at the time of closure.

The patient did well post-operatively, and he was discharged back to inpatient rehabilitation on post-operative day (POD) #1. He was seen again on POD #8. At that time there was a small soft subcutaneous collection at the abdominal site, but none at the lumbar wound site. He had been in an abdominal binder

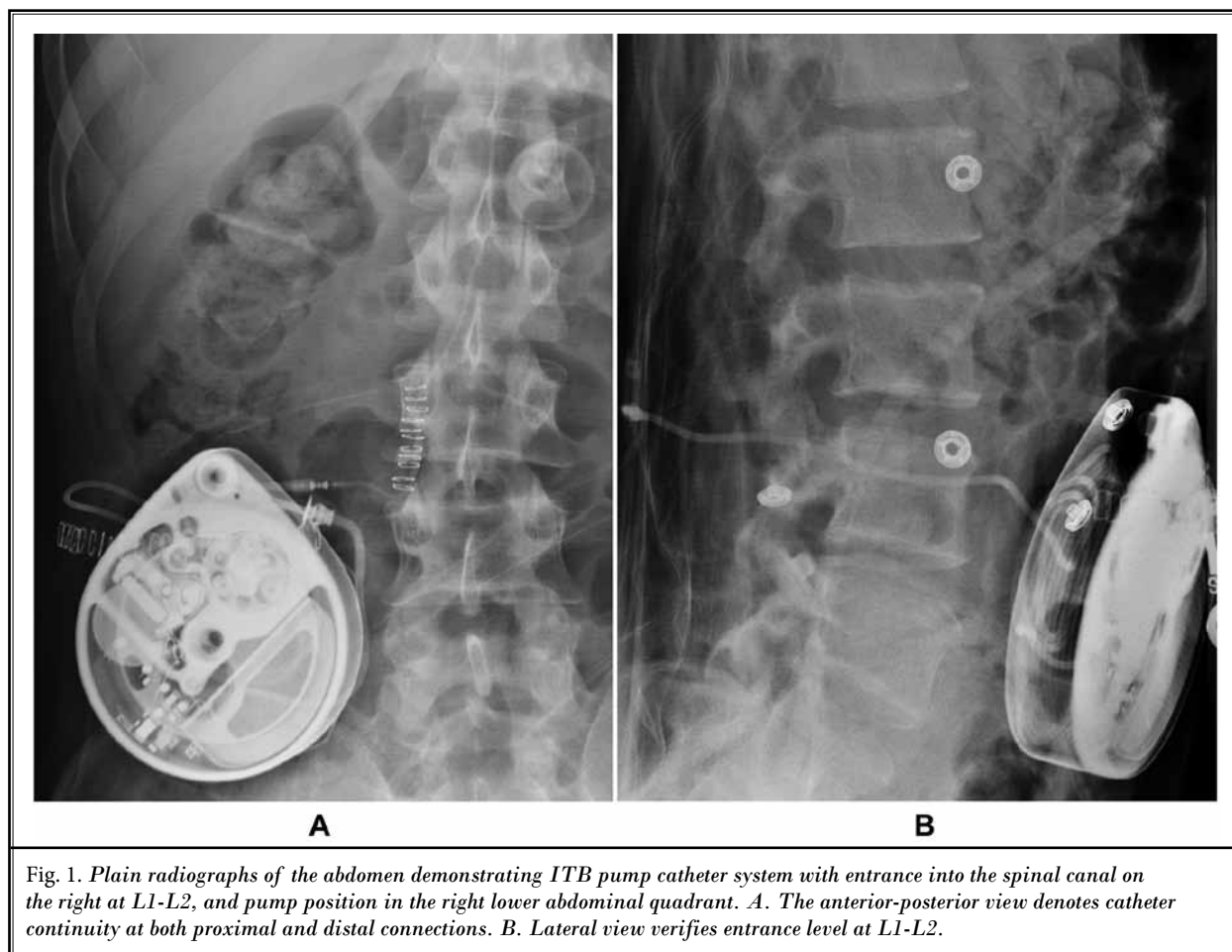


Fig. 1. Plain radiographs of the abdomen demonstrating ITB pump catheter system with entrance into the spinal canal on the right at L1-L2, and pump position in the right lower abdominal quadrant. A. The anterior-posterior view denotes catheter continuity at both proximal and distal connections. B. Lateral view verifies entrance level at L1-L2.

since surgery. The staples were removed on POD #10, still with no sign of leak at the lumbar wound. The following day, clear fluid was noted to leak from the abdominal wound and the patient was transferred that night to the emergency room (ER) for evaluation. In the ER, it was noted that there was a large tense, fluid collection around the pump. Radiographs of the abdomen were obtained which revealed the catheter system to be in continuity. The fluid collection was sterilely aspirated at the bedside, removing 80 mL of clear fluid (sent for cell count, gram stain, and culture). The lateral margin of the wound was oversewn with 3-0 nylon, and the patient was sent back to rehabilitation in an abdominal binder.

The following day, POD #12, he was noted to have increased muscular spasms and mild tachycardia, both of which were unresponsive to morphine. Later in the day, he also developed a temperature of 104°F, tachycardia in the 140s, and tachypnea of 20 – 30 breaths per minute, in addition to severe twitching, diaphoresis, and further increased spasticity. He returned to the ER at that time. The subcutaneous collection at the abdominal site had not only recurred since the aspiration the previous evening, but it exceeded the prior collection in size. Given that his presentation was consistent with acute ITB withdrawal, he was taken emergently to the operating room for exploration and possible revision of the catheter system. The patient was placed in a lateral decubitus position on a beanbag. When the abdominal incision was opened, clear fluid was noted to surround the pump without evidence of infection. There was an obvious flow of fluid into the abdominal site around the catheter where it entered the abdominal wound from its subcutaneous tunnel around the flank. After opening the back incision, clear fluid was seen to egress around the entrance site of the catheter into the fascia. A 2-0 silk suture was used in a purse-string fashion to fasten the soft tissue firmly around the exiting catheter without obstructing CSF flow. Good spontaneous flow of CSF was visualized throughout the entire catheter system prior to closing the incisions. Under fluoroscopic guidance and using the loss of resistance to air technique, a 22G spinal needle was placed into the epidural space at L2-3 and 20 mL of autologous blood was infused in a cranial direction. Upon completion of the case, the wound was closed in typical fashion, bringing together 3 layers with absorbable sutures (deep, dermal, and subcutaneous), and the skin was closed with interrupted vertical mattress 3.0 nylons. Two post-operative baclofen boluses were administered through the func-

tioning catheter system to overcome the ITB deficit. The patient was admitted to the ICU for monitoring and flat bed rest for 24 hours. The following day, the patient's fever resolved, the spasms improved, and his vitals stabilized. On POD #2 following the revision, the subcutaneous fluid collection was noted to partially recur. A second blood patch was performed, this time with 30 mL of autologous blood. The small recurrent collection resolved within 24 hours after this and no further issues were noted.

From the patient's original admission, the specter of meningitis was raised and subsequently evaluated. We found no clinical evidence of infection. The patient did not have clinical evidence of meningismus at any time. All procedures were undertaken in a sterile fashion. CSF and subcutaneous fluid were sent for infectious workup, as well as CBC with differential, ESR/CRP, and blood cultures, and were all found to be negative. As such, only standard 24-hour antibiotics were used upon presentation, and the patient never developed any infectious issues throughout his course.

DISCUSSION

ITB is widely used for treating severe spasticity, resulting in significant increases in these patients' overall ease of care and quality of life (3,4,8,12,18,20,23-25). ITB therapy has shown to be efficacious by numerous studies; however, this therapy carries certain risks (5,9,11,21). Approximately 20 – 30% of patients with implanted pumps experience a complication (5,9,24-27). Complications are varied, but can be trichotomized as relating to dosing (overdose or withdrawal), mechanical failure of catheter or pump (malfunction, leaks), or infection (wound, hardware, and meningitis) (5,9,11,21,22). The most frequent complications are infections, CSF leaks, and catheter malfunctions (22-24,28). Rarely, either baclofen withdrawal or overdose can also occur (11,21,29,30). For patients physiologically dependent on ITB for spasticity control, sudden disruption of ITB delivery can precipitate acute ITB withdrawal syndrome, a potentially life-threatening complication (5,7,11,18,21,27,29-37). In a review of the literature, Watve et al (38) observed that ITB withdrawal is frequently due to catheter dysfunction and often occurs close to a patient's scheduled pump refill date. The syndrome of ITB withdrawal is characterized by reflex spasticity, hyperthermia, autonomic dysregulation, pruritus, seizures, central nervous system (CNS) depression, with eventual progression to rhabdomyolysis, disseminated intravascular coagulation, and

multisystem organ failure (11,21,30,31,33,35-37). When baclofen delivery by any route of administration is stopped, withdrawal may begin within the first 3 days, initially presenting with severe rebound hyperspasticity and pruritic symptoms (31,37-41). These symptoms are likely due to a sudden removal of baclofen-mediated GABAB inhibitory tone in the CNS (37-39). Severe withdrawal may present with broader, systemic symptoms mimicking other disseminated neurological syndromes such as autonomic dysreflexia, post-anesthetic malignant hyperthermia, and neuroleptic malignant syndrome (37-40). Salazar and Eiland (40) reported a case of ITB withdrawal with features resembling serotonin syndrome (SS). Clinical suspicion for withdrawal was indicated due to the presence of an ITB pump that was due for refill, and because clinical history revealed no serotonergic medications (40).

The ITB withdrawal syndrome is often refractory to oral baclofen therapy alone, and in rare situations can last for weeks (11,21). Definitive treatment of acute ITB withdrawal is restoration of intrathecal baclofen infusion (38). Severe cases of withdrawal may require adjuvant treatment with benzodiazepines as their activity at GABA_A receptors bypasses baclofen regulation of GABA_B, providing supportive autonomic regulation (39). Given the similarities to SS, Meythaler et al (41) initiated a case series using the potent anti-serotonergic drug cyproheptadine to improve symptoms of acute ITB withdrawal. While promising results have been reported (37,41) evidence for use of anti-serotonergics remains limited (38).

The frequency of ITB pump complications resulting from surgical technique is not known. Awaad et al (9) reviewed their own complications from baclofen pump implantations and found that over a 4 year period they performed 33 additional revision surgeries on half the patients studied (22/44). Of the 22 patients requiring revision surgery, only one patient had an occult CSF leak that resulted in an abdominal fluid collection. A pump injection study revealed a catheter leak at the pump connector site, which was revised. He continued to have an abdominal fluid collection, even with negative dye studies, and eventually he was taken back to place an entirely new catheter which solved the problem (9).

Haranhalli and colleagues (5) reported implanting 87 ITB pumps over a 10-year period at their institution. Just over 17% of their patients had complications, representing 25 complications in 13 patients. They found that the first complication occurred around 2 years from the first surgery. Five patients had a subcutaneous

fluid collection, only one of which required surgical correction, the rest were treated with abdominal binders. In the case requiring surgical correction, a recurrent pseudomeningocele was related to an increased CSF pressure and moderate hydrocephalus. They theorized that early CSF diversion could have eliminated the need for further surgeries (5).

One of the most common complications of ITB pump implantations is a spinal fluid leak resulting in spinal headache (3,5,9,27,37). For this straightforward complication, an epidural blood patch can be utilized (42). For refractory cases of spinal headache, a lumbar drain can also be inserted for CSF diversion (43). The most invasive approach for repair is an open laminectomy and primary dural closure (43). In our case there was no initial CSF leak noted at the time of closure and even 10 days postoperatively no CSF was noted at the lumbar surgical site, a result of pseudomeningocele formation. In the case of laminectomy or discectomy pseudomeningocele formation rates can range from 0.7 – 2.0% (43). In the case of minimally invasive spinal surgery such as ITB catheter placement, the rate of pseudomeningocele appears to be lower (5,9).

Vender et al (22) draw an important distinction between adult and pediatric populations with regards to CSF complications. They found that wound-related complications were almost twice as prevalent in children (46%) than in adults (25%) (22). The varied complications in children included infections, CSF fistulae, pseudomeningoceles, wound dehiscence, and granuloma formation, whereas adult complications were primarily infections. In their case series, pseudomeningoceles were related to CSF leakage at the catheter insertion site (22), without mechanical malfunction of the catheter itself. They note that children are more susceptible to pseudomeningocele formation secondary to decreased amount of muscle and soft tissue to resist formation or to protect against wound breakdown (22). In 2 pediatric patients without implanted catheters, Fridley et al (44) demonstrate that symptomatic pseudomeningocele aspiration can be augmented with placement of an epidural blood patch to address the causative CSF leak. Their technique is ultrasound guided giving the benefit of noninvasive evaluation of the pseudomeningocele, but does not allow for direct inspection of the pump and catheter as was required in our case.

Meticulous care must be applied to the implantation of ITB pumps and associated catheters. We routinely placed a purse-string, non-absorbable sutures around the catheter exiting from the fascia (45). However, in

this case that suture prevented CSF flow through the catheter and was removed at the time of pump implant. With the suture removed, CSF flowed through the catheter implantation site down the catheter track and into the abdomen. As published in prior case reports, a prophylactic epidural blood patch can also be considered in the instance of a CSF leak (42,44,46,47), but this method will not allow direct visualization of a pump system.

In this case of severe ITB withdrawal it was imperative to determine whether the system was functioning and confirm that the leak was not the result of a fracture in the catheter. Therefore the decision to surgically explore the ITB system was made. A new purse-string suture was placed at the time of revision, a method that has been reported for repairing a CSF leak around an intrathecal catheter (45,48). If there is intra-operative concern for leakage of CSF around the catheter, we recommend careful inspection while the anesthetic team induces a valsalva maneuver to induce intra-abdominal pressures of 40 cm water for 15 - 30 seconds. If a leak is visualized, we recommend verifying that the retention suture around the catheter is properly fastened (45).

This is the first reported case of iatrogenic baclofen withdrawal secondary to pseudomeningocele aspiration of which the authors are aware. We hypothesize that the patient developed a CSF fistula around the catheter, which extended to the pump pocket in the abdomen. Much of the ITB was shunted from the thecal sac

into the subcutaneous pseudomeningocele. Combined with the known vertical concentration gradient for ITB, the shunting likely led to a significant loss of drug outside the thecal sac. However, because the initial collection developed over several days, the loss of ITB was gradual. Moreover, the collection likely provided some backpressure against further loss of CSF and ITB. Once the pseudomeningocele was aspirated (~80 mL of fluid), the result was an immediate evacuation of both CSF and ITB, leading to acute baclofen withdrawal. Sealing the CSF fistula with both a new purse string and blood patch stanching the extra-thecal flow of CSF and improved the patient's symptoms. Importantly, this case highlights that severe ITB withdrawal can develop within days of the initial delivery of ITB.

CONCLUSION

While ITB pumps are efficacious for patients with severe spasticity, they are not without risk. The diagnosis and treatment of ITB withdrawal is vital to the health of patients who have implanted pumps. This case highlights the importance of recognizing potential baclofen stores that can precipitate ITB withdrawal when drained or aspirated. Treatment of ITB withdrawal may require surgical intervention, including binders, blood patches, catheter revision, and placement of a purse-string suture. Furthermore, when the cause of ITB delivery failure cannot be easily ascertained, urgent surgical exploration is indicated.

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