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MANAGING BACLOFEN PUMP INFECTION WITH AN EXTERNALIZED INTRATHECAL CATHETER: A VIABLE BRIDGING OPTION

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Background: Intrathecal baclofen therapy provides effective relief for severe spasticity, but pump infections pose a critical management challenge. Standard care involves removing both the pump and the catheter, often necessitating rapid transition to oral therapy, which may be poorly tolerated in high-dose or anatomically complex patients.

Case Report: A 47-year-old man with spastic quadriplegic cerebral palsy, prior spinal fusion, and longstanding intrathecal baclofen therapy developed a pump site infection 5 days after pump replacement. The pump was explanted, but the catheter was preserved and externalized under sterile conditions. Continuous intrathecal infusion at 30 µg/hr, with gradual introduction of oral baclofen, maintained neurologic stability without withdrawal. Following a 10-day antibiotic course, the pump was successfully reimplanted using the preserved catheter.

Conclusion: Externalization of an intrathecal catheter can serve as a safe bridging strategy in pump infections, preventing withdrawal and enabling reimplantation in select high-risk patients.

Key words: Infusion pumps, implantable, catheterization, baclofen, infection

BACKGROUND

Intrathecal baclofen (ITB) therapy delivers baclofen directly into the cerebrospinal fluid surrounding the spinal cord. Baclofen is a potent gamma-aminobutyric acid type B (GABA-B) receptor agonist that reduces spasticity by decreasing presynaptic neurotransmitter release, primarily glutamate, through hyperpolarization of motor neurons via increased potassium efflux and decreased calcium influx (1). This targeted intrathecal delivery achieves effective symptom relief at lower systemic doses compared to oral administration, thereby minimizing adverse central nervous system effects such as sedation and confusion (2).

ITB therapy is specifically indicated for severe spasticity or dystonia in patients who either fail to respond adequately to oral medications or experience significant side effects at therapeutic oral dosages. This therapy is frequently used for conditions such as cerebral palsy, multiple sclerosis, spinal cord injury, traumatic brain injury, and stroke (3). Despite its efficacy, ITB therapy carries risks, including pump malfunction, catheter displacement, overdose, and infection. Infection represents one of the most critical complications, occurring most commonly within the first 30 postimplantation days, with an estimated lifetime risk of approximately 6%–8% (4). Because infection can progress rapidly to severe complications such as meningitis, ventriculitis, and systemic sepsis, a prompt infection diagnosis and

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intervention are critical. Additionally, urgent device explantation in order to manage infection can place patients, particularly those receiving high-dose ITB therapy, at considerable risk for acute and severe baclofen withdrawal (5).

Standard clinical practice typically dictates removing both the pump and catheter when there is a confirmed infection (6). However, managing patients dependent on high-dose ITB is particularly challenging, since oral baclofen substitution often proves insufficient and potentially hazardous. Here, we present a unique case of a patient whose postoperative course was complicated by an infection, necessitating baclofen pump explantation. Due to anatomical complexities and significant clinical constraints in transitioning to oral baclofen therapy, the intrathecal catheter was intentionally retained and externalized, which was an approach necessitated by specific clinical circumstances and supported by careful interdisciplinary consideration.

CASE PRESENTATION

A 47-year-old man with a history of spastic quadriplegic cerebral palsy, scoliosis, spinal fusion, recurrent bowel obstructions, and a longstanding ITB pump that had undergone multiple prior revisions was transferred to an academic medical center from an outside hospital due to concern for his infected ITB pump. The patient presented to the outside hospital after his caregiver noticed leakage from the pump site. His most recent pump replacement was 5 days prior to his presentation. A computed tomography image of his abdomen and pelvis revealed a subcutaneous gas collection surrounding the pump, which prompted transfer for neurosurgical evaluation and management.

Upon arrival to our academic medical center, he was hemodynamically stable and afebrile. He denied symptoms of baclofen withdrawal, including headache, visual changes, nausea, vomiting, altered mental status, or new/worsened spasticity. A neurologic exam showed baseline findings of spastic contractures of the bilateral upper extremities and no volitional movement in the bilateral lower extremities. The pump site had mild erythema with serous drainage but no frank purulence. His initial labs showed leukocytosis (white blood count [WBC], 10.3), anemia (hemoglobin [Hgb], 9.3), and elevated inflammatory markers (erythrocyte sedimentation rate [ESR], 120; C-reactive protein [CRP], 6.74). He was admitted to the neurosurgery service. Interdisciplinary consultations with infectious disease, pain management, and critical care were obtained.

When admitted, he underwent surgical explantation of the ITB pump with washout and debridement. Due to technical challenges posed by his prior spinal fusion and scar tissue, the catheter was preserved and externalized under sterile conditions. The catheter was capped and dressed for later attachment to a temporary delivery system. Intraoperative cultures were obtained from the catheter tip and surrounding pocket (Fig. 1). He provided written informed consent for the procedure before the surgery, and Health Insurance Portability and Accountability Act (HIPAA) authorization was obtained.

Postoperatively, the patient was monitored in the neurosurgical intensive care unit for signs of baclofen withdrawal. The patient's home ITB dose of 968.6 μg/d was considered a high-risk dose for acute withdrawal. Due to this high baseline dose and poor conversion equivalency of baclofen, oral baclofen alone was not a viable alternative. ITB administration via the externalized catheter was thus initiated at 30 μg/h (720 μg/d) using an ambulatory drug delivery pump. Oral baclofen 20 mg 3 times a day was concurrently started to support gradual tapering of intrathecal therapy as tolerated. Acetaminophen and fentanyl were used for pain control as needed.

Our patient remained hemodynamically stable, neurologically intact, and free of withdrawal symptoms throughout his hospital stay. The ITB dose was tapered to 25 μg/h (600 μg/d) on hospitalization day 2 and to 20 μg/h (480 μg/d) on hospitalization day 3. He reported a pain score of 0 and consistently reported he had no spasms or irritability, both of which he had reported during a prior baclofen withdrawal episode.

Cultures from the superficial and deep components of the ITB pump pocket were positive for methicillin-resistant Staphylococcus aureus (MRSA) and methicillin-sensitive Staphylococcus aureus (MSSA), respectively. Cultures from the proximal catheter tip were negative, further supporting the decision to preserve the catheter. A cerebrospinal fluid analysis showed < one WBC, glucose 60, protein 18, and no organisms on culture. When admitted, his empiric antibiotics included intravenous vancomycin, ceftazidime, and metronidazole.

ITB remained at 20 μg/h (480 μg/d) with stable oral dosing at 20 mg 3 times a day. Per infectious disease, re-implantation of the ITB pump could be considered following a 10-day course of vancomycin and negative cerebrospinal fluid cultures. By hospitalization day 10,

he remained hemodynamically and neurologically stable without signs of infection. The ITB pump was subsequently replaced on hospitalization day 10 without any complications.

DISCUSSION

Therapy with ITB is a cornerstone for managing severe spasticity since it offers substantial relief to patients for whom traditional oral therapies are insufficient. However, managing ITB pump infections poses significant clinical challenges, especially in patients maintained on high-dose therapy. This case illustrates a unique clinical scenario in which traditional approaches, such as complete removal of the catheter and pump; transitioning solely to oral medications; or immediate catheter replacement, were impractical or unsafe.

In our patient—a young adult man with spastic quadriplegic cerebral palsy, complex spinal anatomy due to prior fusions and extensive soft tissue scarring around the thoracolumbar fusions—significantly elevated the procedural risks of catheter removal or replacement. Compounding these challenges, his history of poor oral baclofen tolerance meant that relying on oral substitution was neither feasible nor safe. Recognizing these hurdles, the decision was made to retain the existing intrathecal catheter by externalizing it under stringent sterile conditions. This allowed us to continue intrathecal baclofen administration. We were able to gradually taper his dose, thereby mitigating withdrawal symptoms and ensuring clinical stability until a new, permanent pump could be implanted.

Previous reports have explored externalized intrathecal catheter strategies, each offering distinct clinical insights (Table 1). For example, a 2019 case series by Hwang et al (7) described 5 patients with an infected or malfunctioning ITB pump who underwent temporary externalization of the catheter or pump to allow for a controlled taper of ITB. In those cases, the goal was to prevent acute withdrawal while transitioning to oral baclofen over a short period of time—typically a few days. The external system was used as a temporary bridge during the taper and was subsequently removed once oral therapy was established. This approach demonstrated that externalized intrathecal systems can be used safely in an acute setting to manage withdrawal risk.

Bellinger et al (8) similarly employed a temporary lumbar catheter to manage withdrawal safely over a 9-day tapering period, supported by concurrent oral medications. Their method underscored the practicality

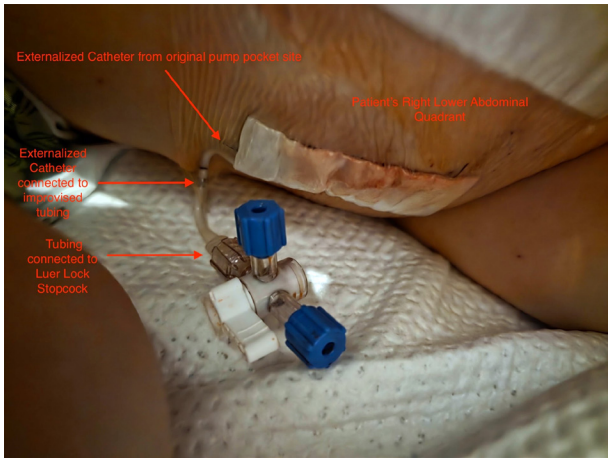

Fig. 1. Externalized intrathecal catheter system. The catheter exits through the original pump pocket site in the patient's right lower abdominal quadrant, connected to improvised tubing and a luer lock stopcock for external access.

of a newly placed catheter for a controlled taper, but did not address scenarios where new catheter placement itself could introduce significant procedural risks, such as anatomical complexity or extensive scarring, as seen in our patient.

A more recent case by Strader and Mutchnick (9) involved externalizing the entire infected pump itself, sterilizing and temporarily using it for continued therapy. This technically creative method not only demonstrated feasibility, but also introduced logistical and sterile management complexities, making it less practical in anatomically or medically complex cases.

Finally, De Larminat et al (10) reported an intriguing case where an externalized port connected to a newly placed intrathecal catheter was used following pump removal due to bacterial meningitis. This report illustrated the successful management of an atypical bacterial pathogen while ensuring continuous baclofen therapy, thereby providing valuable insights into managing infectious complications with a novel approach. However, this case also involved new catheter placement, which is not applicable to our patient because of his anatomical and surgical complexity.

In contrast to prior approaches, the method we used was uniquely tailored to meet the challenges posed by our patient's complex spinal anatomy and medical history. By preserving and externalizing the existing intrathecal catheter, the significant risks associated with reoperation were circumvented, and the pitfalls of abrupt weaning or reliance on poorly tolerated oral

Table 1. Literature review of cases evaluating outcomes of externalized intrathecal baclofen (ITB) delivery.

Study	Setting and Patient Characteristics	Management Strategy	Duration	Reported Outcomes
Hwang et al., 2019 – A novel approach to avoid baclofen withdrawal when faced with infected baclofen pumps	Case series of 147 patients with infected/ malfunctioning ITB pumps.	The existing pump was externalized rather than removed. Baclofen dose was tapered by 20% each day while simultaneously increasing oral baclofen and tizanidine.	Short-term bridge (a few days) until oral medications achieved therapeutic levels; pump removed once taper was complete.	Authors reported that gradual weaning using an externalized pump allowed safe transition to oral therapy without acute withdrawal.
Bellinger et al., 2009 – Prevention of intrathecal baclofen withdrawal syndrome: successful use of a temporary intrathecal catheter	Case report of a 53-year-old patient with paraplegia who developed a baclofen pump site infection.	The infected pump and catheter were removed; a temporary externalized catheter was placed. The ITB infusion was tapered while progressively increasing oral baclofen.	Taper lasted approximately 9 days; the temporary catheter allowed a controlled wean.	This strategy avoided life-threatening withdrawal; the patient tolerated the taper and infection was treated.
Strader & Mutchnick, 2023 – Brief pump externalization without ITB wean to treat a probable pocket infection	20-year-old woman with pump pocket infection post pump revision.	The pump was surgically removed from the pocket but left connected externally, allowing continuous ITB delivery. The pocket was debrided and treated with microbicidal agents.	9 days later a new pump and proximal catheter were implanted.	The patient experienced no interruption of intrathecal therapy, remained infection-free at one-year follow-up and did not require baclofen weaning.
De Larminat et al., 2021 – Streptococcus dysgalactiae-related intrathecal baclofen therapy infection: how to avoid withdrawal?	69-year-old woman with long-standing ITB therapy developed meningitis and pump site infection caused by Streptococcus dysgalactiae.	The infected pump was removed; a new intrathecal catheter was placed immediately and connected to an implanted port; the port allowed continuous baclofen administration via an external pump while antibiotics were administered.	The externalized system provided baclofen during the infection treatment; after curing the infection a new pump was implanted.	Authors concluded that an external pump connected to a port and intrathecal catheter avoided baclofen withdrawal even in the setting of sepsis.

alternatives were avoided. This strategy enabled a carefully controlled taper while preserving continuous intrathecal delivery, ensuring neurologic stability and bridging the patient safely to pump reimplantation. This case extends the precedent set by earlier reports by showing that externalization can serve not only as a temporary bridge for tapering, but also as a sustained therapeutic solution when conventional management is not feasible. This broader application underscores the value of externalized catheter use in select high-risk patients, positioning it as a pragmatic and underutilized tool in the ITB management algorithm.

Despite its evident benefits, externalizing an intrathecal catheter has risks. Chief among these is the increased potential for central nervous system infections due to direct external exposure. Vigilant adherence to sterile techniques, continuous patient monitoring, and strong interdisciplinary collaboration among neurosurgery, infectious disease, critical care, and rehabilitation/ pain medicine teams were essential in managing these risks effectively in our patient. Furthermore, logistical considerations—such as specialized ambulatory infusion systems, trained nursing care, and patient cooperation—are vital components necessary to ensure successful management.

Our patient's case underscores broader clinical implications for managing ITB pump infections. Specifically, it demonstrates that retaining and externalizing an existing intrathecal catheter can serve as a practical and safe bridging therapy when immediate pump replacement is contraindicated, catheter removal poses significant risks, or oral medication substitution proves inadequate. While there are no standardized protocols, this case suggests there is a need to develop institutional guidelines and consensus recommendations. Doing this could potentially improve patient safety and clinical outcomes in complex cases.

CONCLUSION

Our patient's case significantly contributes to the evolving literature advocating for personalized, risk-adaptive management strategies in complex ITB therapy complications. It highlights that externalization of an existing intrathecal catheter, coupled with careful clinical

oversight, is a viable and effective approach in selected patients. This repurposing of the externalized catheter method expands its role from short-term bridging to sustained therapeutic support in patients for whom oral substitution is not viable and catheter replacement poses substantial risk. Such a method deserves broader consideration, especially for patients whose anatomical complexity or medical history precludes conventional management strategies. Ultimately, this individualized approach may provide safer continuity of care, maintain neurologic stability, and improve overall patient outcomes.

Author Contributions

MS: original draft, review, editing; JE: original draft, review, editing; DG: original draft, review, editing; PB: original draft, review, editing; MB: resources, supervision, review, editing); JWC: resources, supervision, review, editing; RR: conceptualization, data curation, funding acquisition, investigation, project administration, resources, supervision, validation, review, editing.

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