

## Case Report

**Intrathecal baclofen pump infection treated by adjunct intrareservoir teicoplanin instillation**

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**Abstract**

**Background:** The delivery of intrathecal baclofen via pumps is gaining increasing use in the management of intractable spasticity. One of the rare but devastating complications of this method is infection. In the majority of cases, removal of the device is required, despite appropriate intravenous antibiotic therapy. We report a case that highlights the use of intrareservoir teicoplanin to achieve sterilization of the infected pump system in a patient in whom removal of the pump was not an easy option.

**Case Description:** We describe our experience on a patient with cerebral palsy in whom *Staphylococcus epidermidis* pump infection developed due to contamination of the infusion reservoir during refilling procedure, which was successfully sterilized *in situ* by the combined use of systemic antibiotics and intrareservoir coadministration of baclofen with teicoplanin. The infection was eradicated and baclofen therapy was continued uninterrupted.

**Conclusions:** Removal of intrathecal baclofen pump is not necessary as the first measure in cases with mild clinical symptomatology. In view of the fact that pumps for intrathecal drug delivery are very costly, salvage of the device may be attempted in selected cases, although it is not generally recommended. Combined infusion of baclofen and an antibiotic through the pump makes it possible to maintain treatment for spasticity, sterilize the pump reservoir and flow tubes, and effectively treat infections that develop during the use of these systems.

**Key Words:** Infection, intrathecal baclofen pump, intrathecal teicoplanin

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**Quick Response Code:****INTRODUCTION**

Nowadays, intrathecal baclofen (ITB) administration is a widely accepted safe and effective therapy for the treatment of intractable spasticity, and its clinical efficacy has been demonstrated by several studies. ITB pumps are commonly used for the treatment of spasticity in numerous pathological processes, including spinal cord injury, multiple sclerosis, cerebral palsy, traumatic brain injury, dystonia, and stroke, particularly for patients who are unresponsive to

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conservative pharmacotherapy or experience intolerable side effects at therapeutic doses of oral baclofen.<sup>[1-5,15-17,21,22,24-26,28]</sup>

Even though technological advances have improved the efficacy and safety of this procedure, various complications related to these drug delivery systems have been described, which are usually related to catheter malfunction or pump–catheter connection problems.<sup>[4,9,12,18,29,30]</sup> One of the serious but devastating complications of this neuromodulation technique is pump infection which may result in significant rates of morbidity and mortality.<sup>[4,6,8,10,18-20,29]</sup> Infection usually occurs either from direct microbial inoculation during implantation or the refill procedure of the pump with drug, or as a result of hematogenous contamination of the device. Although modern pumps have bacterial retentive filters which usually prevent overwhelming intrathecal infections,<sup>[4,8,11]</sup> bacterial filters would not last indefinitely in the presence of a heavy bacterial load. Treatment of these infections, according to traditional worldwide practice, requires removal of the device and appropriate antibiotic therapy.<sup>[4,7,8,10,14,29]</sup> In such cases, at least two additional operations are required, one for pump removal and a second one for the replacement of the pump after the infection has been eradicated. The entire procedure leads to increased morbidity, hospitalization, and cost. Furthermore, the patient has to discontinue ITB administration for a considerable period of time.

This article reports our experience in the treatment of an ITB programmable pump infection from *Staphylococcus epidermidis* due to contamination of the infusion pump reservoir during refilling procedure in a patient with cerebral palsy. We discuss our strategy and relevant considerations in the successful management of this complication without removal of the device via continuous intrareservoir teicoplanin administration together with baclofen.

## CASE DESCRIPTION

A 34-year-old man with a medical history of cerebral palsy and spastic quadriparesis underwent an ITB Prometra programmable 20 ml pump (Flowonix Medical Inc., New Jersey, USA) implantation for spasticity refractory to high doses oral baclofen 2 years ago. ITB therapy resulted in a progressive improvement in patient's spasticity, functional capacity, daily activity, and social interactions, with a reduction in his previous disability. Three weeks ago, he had a routine refill procedure of the intrathecal pump programmed to deliver baclofen at a dose of 250 µg/day to control his spasticity.

He was admitted suffering from a pyrexia and headache, however, he had no other symptoms. On examination, he had a temperature of 38.5°C, but was not clinically toxic. He was alert, cooperative, and obeyed commands. He

had no meningism and no obvious source of infection. A chest radiograph was normal. Empirical treatment with intravenous vancomycin (500 mg/6 h) and cefotaxime (1 g/12 h) was started, however, the next day vancomycin was switched to teicoplanin (400 mg/12 h) due to a “red man syndrome” onset. Microscopy and culture of the urine and three sets of blood cultures were negative. Specimens obtained by aspiration from the residual baclofen-containing reservoir and the side port of the cerebrospinal fluid (CSF) confirmed the presence of a *S. epidermidis* infection with high sensitivity to above antibiotics. Other CSF parameters included an elevated protein and white blood cell count. Patient's clinical condition was such that immediate removal of the device was not considered mandatory.

However, despite receiving high doses antibiotics treatment, the patient remained febrile over the next few days but still without meningism. Further aspiration and CSF culture from the access port confirmed the persistence of the *S. epidermidis*.

As the patient was unwilling to undergo surgery to replace the pump if the present one had to be removed, an attempt was made to sterilize the pump while *in situ*. Therefore, consent was obtained from both the patient and his family to maintain the implanted drug delivery system and administer a baclofen/teicoplanin solution intrathecally by using the pump that was already in place. After emptying of the reservoir and the catheter from baclofen independently, the pump was aseptically refilled with a 20-ml solution prepared containing 10 mg baclofen (5 ml), 800 mg teicoplanin (6 ml), and 9 ml normal saline. This provided a final concentration of 500 µg/ml baclofen and 40 mg/ml teicoplanin. The pump was programmed to run by simple continuous infusion at a rate of 0.5 ml of solution daily, which provided 250 µg of baclofen and 20 mg of teicoplanin intrathecally every 24 hours. Although pharmaceutical data suggests that teicoplanin is stable,<sup>[31]</sup> it was decided to empty and refill the pump every 4 days as there was a possibility that bacteria would start to grow in the solution if resistant strains developed.

Five days after initiation of baclofen/teicoplanin infusion, the patient became afebrile. In CSF collected from the access port, white blood cell (WBC) and protein counts were shown to have fallen significantly. On the 11<sup>th</sup> day of intrathecal coadministration of baclofen and teicoplanin, the cultures of CSF via catheter access port and of the residual fluid in the reservoir became sterile. The intravenous administration of teicoplanin and cefotaxime were discontinued, and a regimen of 600 mg rifampin administered orally per day was initiated to augment the intrathecal teicoplanin therapy, which was continued for 9 more days. The patient was treated with oral rifampin for the next month.

At the time of writing this study, our patient is still well 1 year after completion of therapy, without new clinical or laboratory signs of recurrence of infection, showing a good therapeutic reduction in his spasticity.

## DISCUSSION

Intrathecal pumps infections are rare, mostly occurring during the first weeks following implantation, and present with fever, nuchal rigidity, and changes in the level of consciousness. The diagnosis is confirmed by positive bacterial CSF cultures, and removal of all implanted hardware and appropriate antibiotics treatment is usually necessary, especially in severe cases.<sup>[8-10,14]</sup> However, the sudden discontinuation of intrathecal baclofen in such patients may have significant adverse effects, particularly if the daily dose of baclofen is high.

Success rates with intravenous antibiotic agents for the treatment of pump infection have been low because of the difficulty achieving therapeutic concentrations in the CSF; therefore, intrathecal administration of antibiotic drugs is often required to eradicate the pathogen.<sup>[6,8,10,19]</sup> Moreover, the optimal treatment would be the intrathecal coadministration of antibiotic agents and baclofen for continuation of the control of spasticity. A search of the literature revealed six studies of infection treated successfully without removal of the intrathecal pump, although neither featured coadministration of baclofen and teicoplanin [Table 1].<sup>[6,11,13,23,27,32]</sup>

To the best of our knowledge, this is the first reported case in the literature of intrathecal coadministration of baclofen and teicoplanin to successfully treat pump infection without removal of the pump or discontinuation of intrathecal baclofen. Our patient's infection, introduced during the refill procedure, was mild at presentation, and continuous infusion of baclofen with antibiotic simultaneously appeared to be the most logical treatment alternative, even though there was no information available on physical or chemical compatibility of baclofen with teicoplanin.

The total duration of intrathecal teicoplanin therapy in this patient was 3 weeks, which may have been longer

than required. However, because of the possibility of an incompatibility between baclofen and teicoplanin, we believed that such a long duration therapy with teicoplanin was justified for our patient. This case report is illustrative of the safety and usefulness of long-term intrathecally administered teicoplanin.

## CONCLUSIONS

The fact of considering a salvage therapy for infected ITB pumps has always been a subject of concern. Intrathecal pumps differ from other artificial implants in that direct instillation of antibiotics into the reservoir allows the antibiotic to reach the site of an infection. Thus intrareservoir antibiotics may be used to sterilize the interior of the pump, whereas systemic antibiotics combat the meningitis; therefore, an initial attempt could be made for conservative management.

This case shows another important aspect in the management of ITB pumps. The source of the infection in our patient had been probably the refill procedure 3 weeks preadmission since both aspirations from the refill port of baclofen and from the side port of CSF proved positive for *S. epidermidis*. Thus, a strict and meticulous asepsis during transdermal refilling is always crucial to maintain internal sterility of the system; ITB devices should be refilled as aseptically and infrequently as possible to reduce the opportunity of introducing contaminants.

Our experience indicates that, in selected patients with mild clinical symptomatology, if the treatment is offered promptly, it is possible to treat infection while maintaining treatment for spasticity control without removing the ITB device. In addition, health care insurers will not be asked to cover the increased costs for this type of therapy. Although in some countries the replacement of an expensive device may not be of immediate big concern, increasing medical costs in general are impacting negatively the health care systems, necessitating ultimately global cost containment measures and policies. A proposal of other alternatives, before removal of the pump, should be taken into account to save such a high costly device.

**Table 1: Management of infected ITB pumps with intrareservoir antibiotic instillation without implant removal – previous reports**

Reference	No. of patients	Isolate	Intrareservoir antibiotic used	Outcome
Bennett <i>et al.</i> <sup>[6]</sup>	1	<i>Staphylococcus epidermidis</i>	Vancomycin	Successfully treated
Galloway and Falope <sup>[11]</sup>	1	<i>Pseudomonas aeruginosa</i>	Gentamicin	Successfully treated
Gordo <i>et al.</i> <sup>[13]</sup>	1	<i>Staphylococcus epidermidis</i>	Vancomycin	Successfully treated
Penn <i>et al.</i> <sup>[23]</sup>	4	<i>Pseudomonas paucimobilis</i>	Gentamicin	Successfully treated
Samuel <i>et al.</i> <sup>[27]</sup>	1	<i>Staphylococcus aureus</i>	Gentamicin	Successfully treated
Zed <i>et al.</i> <sup>[32]</sup>	1	<i>Staphylococcus epidermidis</i>	Vancomycin	Successfully treated

ITB: Intrathecal baclofen

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## Conflicts of interest

There are no conflicts of interest.

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