Case Report

Pseudomonas aeruginosa infection in an intrathecal baclofen pump: successful treatment with adjunct intra-reservoir gentamicin

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Objective: To describe the use of intra-reservoir gentamicin for the treatment of a *Pseudomonas aeruginosa* infected baclofen pump.

Setting: Regional Spinal Injuries Centre, Hexham, Northumberland, England.

Subject: Male patient aged 32 years with progressive multiple sclerosis and severe bilateral spasticity.

Results: Intra-reservoir gentamicin proved successful in treating infection with *Pseudomonas aeruginosa*.

Conclusion: Intra-reservoir gentamicin may be successful in treating pump infection with *Pseudomonas aeruginosa* without the need for pump removal.

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Introduction

Intrathecal baclofen is the most effective treatment of spinal spasticity unresponsive to oral drugs.¹ Fortunately infection is an unusual complication in baclofen pumps. Modern pumps have bacterial filters in place which usually prevent overwhelming intrathecal infection, however bacterial filters would not last indefinitely in the presence of a heavy bacterial load. In the event of pump infection particularly with gram negative bacteria, such as *Pseudomonas aeruginosa*, removal and replacement would be the first option. This case highlights the use of intra-reservoir gentamicin to achieve sterilisation of the infected pump system in a patient in whom removal of the pump and replacement with a new system was not a feasible option.

Case report

A 32-year-old man with a 7 year history of secondary progressive multiple sclerosis had implantation of an Infusaid baclofen pump Model 400 in April 1996 to help control severe bilateral spasticity and painful spasms. He had no other medical problems apart from congenital ichthyosis with

persistent scaly skin liable to break down which was persistently colonised with *Pseudomonas aeruginosa*. He was very thin with spastic paraparesis, severe ataxia of the upper limbs and bilateral optic atrophy. He was wheelchair bound and totally dependent on carers at home for self care and activities of daily living. Intrathecal baclofen was successful in controlling the spasticity but the only complication had been recurrent penetration of the pump through the abdominal wall. The pump was repositioned twice within 5 months of implantation. In September 1996, he was admitted to hospital as the pump had again penetrated through the skin. He also had an infected back wound at the site of the catheter insertion. A wound swab from the back grew *Pseudomonas aeruginosa* and *Enterococcus faecalis*. The baclofen pump system was removed and he was changed temporarily to oral baclofen, although this was not as effective. With appropriate treatment the wound healed and the organisms were eradicated.

In December 1996, another pump was implanted and intrathecal baclofen was successfully recommenced. In January 1997, during a scheduled pump refill, aspiration and culture of residual baclofen from the reservoir yielded *Pseudomonas aeruginosa* in direct culture. Further aspiration and culture of reservoir washout fluid confirmed the persistence of *Pseudomonas aeruginosa* (sensitive to gentamicin, ceftazidime

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Table 1 Management of infected baclofen pumps—previous reports

Reference	Isolate	No. of patients	Management
Penn <i>et al</i> ⁴	<i>Klebsiella pneumonia</i>	1	Removal of implant and antibiotics*
	'Pocket infection'	1	
	<i>Pseudomonas paucimobilis</i>	4	Gentamicin intrareservoir*
	(contaminated baclofen vials)		
Hankey <i>et al</i> ⁵	<i>Staphylococcus epidermidis</i>	3	Removal of implant
Bennet <i>et al</i> ⁶	<i>Staphylococcus epidermidis</i>	1	Intravenous flucloxacillin plus rifampicin and intrareservoir vancomycin
Samuel <i>et al</i> ²	<i>Staphylococcus aureus</i>	1	Intravenous flucloxacillin plus fucidin and intrareservoir gentamicin
Khorasani and Peruzzi ⁷	<i>Staphylococcus aureus</i>	1	Removal of implant and antibiotics* IV antibiotics*
Armstrong <i>et al</i> ⁸	Meningitis	2	
	Pocket infection	3	
	(Isolates not reported)		

*Details of antibiotic usage not given

and piperacillin; resistant to ciprofloxacin). However, he had no signs of meningism or other signs of clinical infection. Because of the extreme difficulty in being able to resite the pump in this patient and because of the possibility of pump blockage and *Pseudomonas aeruginosa* meningitis developing, it was decided to attempt sterilisation of the pump system without removal. The pump was emptied of baclofen and refilled with 18 ml gentamicin at a concentration of 1 mg per ml. The system was programmed to run by simple continuous infusion at a slow rate ie 50 µg per day for 3 weeks. Although pharmaceutical data suggests that gentamicin is stable it was decided to refill the pump approximately every 4 days as there was a possibility that bacteria would start to grow in the fluid if resistant strains developed. The concentration of gentamicin was as described by Samuel *et al*² and as a total dose of 18 mg was the normal dose (10–20 mg) which can be safely used intrathecally. In addition he also received intravenous ceftazidime 2 g 8-hourly for 2 weeks and oral baclofen. Further sampling of the fluid from the pump did not grow *Pseudomonas aeruginosa*. Intrathecal baclofen was then recommenced. Cultures of residual baclofen remained sterile until 18 months later, when there was very scanty growth of *Pseudomonas aeruginosa* with a similar sensitivity profile in the original isolate (ie sensitive to ceftazidime, piperacillin, intermediate to gentamicin and resistant to ciprofloxacin). Although the possibility of skin contamination was raised it was decided to retreat early to avoid the possibility of heavy colonisation of the pump which had previously occurred. Baclofen was as previously aspirated from the pump and replaced by 18 mg of gentamicin at a concentration of 1 mg/ml. The pump rate was set as previously and the gentamicin replaced every 4–5 days. Three weeks treatment was given. The *Pseudomonas aeruginosa* was again successfully eradicated. We continue to follow up his course while on the intrathecal baclofen.

Discussion

Meningitis is a rare but potentially fatal complication of infection in an intrathecal baclofen pump and modern pumps contain a bacterial filter to help prevent this complication. Although this patient did not present with meningitis, it was felt that persistent colonisation by *Pseudomonas* in the system would eventually lead to non functioning of the bacterial filter and potentially disastrous consequences with an overwhelming *Pseudomonas* meningitis. The standard recommended treatment of gram negative colonisation of ventriculoperitoneal shunts is removal of the shunt and adjunct antibiotics treatment.³ In this patient it was felt that removal of the pump would not be an easy option, as it would be difficult to resite due to an extremely thin abdominal wall and heavy skin colonisation with *Pseudomonas*. We therefore chose to instill gentamicin into the reservoir in combination with intravenous ceftazidime. The second isolation of *Pseudomonas aeruginosa* from the baclofen pump was possibly due to contamination from the skin when baclofen was aspirated. However, there was no doubt that on the first occasion the *Pseudomonas aeruginosa* was repeatedly isolated and was certainly heavily colonising the line.

There are a few reports in the literature on the management of infected baclofen pumps.^{2,4–8} In 1992 Penn on reviewing the use of intrathecal baclofen in 66 patients reported that two had developed clinical infections, one with a *Klebsiella pneumoniae* meningitis and another with a pocket infection.⁴ In addition 19 patients had received a batch of baclofen contaminated with *Pseudomonas paucimobilis*, and in four of these patients this was treated with injection of gentamicin into the reservoir. There have also been four previous case reports of *Staphylococcus* meningitis complicating intrathecal baclofen pump infection (Table 1). In the early report of Hankey *et al* patients were managed by pump removal.⁵ Later reports

described the use of intra-reservoir antibiotics with or without pump removal.^{2,6,7}

In our centre, refill of baclofen pumps is always performed in the Day Theatre under aseptic conditions. Fifteen patients are currently receiving intrathecal baclofen because of spasticity from spinal cord dysfunction from spinal cord injury and multiple sclerosis and have been treated for between 3 and 60 months. To date, no other patient has had any infective complications. This patient's skin problem and the recurrent penetration of the pump through the abdominal wall undoubtedly contributed to the development of infection in the pump. Skin necrosis or breakdown is reported to be rare in Infusaid pumps.⁹ It is important when considering patients for intrathecal baclofen to be aware that very thin individuals with thin anterior abdominal walls may be prone to wound dehiscence. Although we are not aware of any published guidelines on the treatment of infections complicating intrathecal baclofen pumps we would suggest that removal of the pump should normally be considered with reimplantation on an uninfected site. However, we feel that in patients for whom removal of the pump may not be possible the instillation of appropriate antibiotics into the reservoir may allow the pump to be used without the risk of meningitis, and allow the patient to continue to derive benefit from an effective treatment.

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