
CLINICAL REPORT

Meningismus Associated with Malpositioned Intraspinal Catheter for Drug Delivery

Bryan C. Hoelzer, MD*; Sarah L. Knievel, MD*; Whitney B. Michiels, BS[†]; Gail L. McGlothlen, RN-BC, MS, CNS[†]; Eric J. Grigsby, MD[†]

**Mayo Clinic College of Medicine, Rochester, Minnesota;* [†]*SpectrumCare Pain Treatment Center, Napa, California, U.S.A.*

■ Abstract

Background: Implanted delivery systems for intrathecal drug administration have become more common in the management of nonmalignant pain. Many postprocedural complications have been described in the literature including infection and headache provoked by position changes. Determining the etiology of a postimplant headache is important particularly when considering the possibility of a life-threatening infection.

Case Report: We present a patient who underwent placement of an implantable drug delivery system (IDDS) for intractable abdominal pain that developed positional headaches, and significant neck and back pain. Attempted cerebrospinal fluid aspiration reproduced her symptoms and imaging revealed a malpositioned intraspinal catheter tip approximated to the meninges. Revision of the system completely relieved her symptoms.

Conclusion: Meningismus from malpositioned catheters is a rare complication that can mimic meningitis but should be considered in the differential for postimplant headaches. Given the increased use of IDDS, it is important to recognize and evaluate postimplant complication and treat it appropri-

ately. We discuss this case report and appropriate work-up and differential diagnosis for meningismus following implant. ■

Key Words: implantable drug delivery system (IDDS) complications, meningismus, postdural puncture headache (PDPHA)

INTRODUCTION

Implantable drug delivery system (IDDS), consisting of a subcutaneous programmable pump connected to a subarachnoid catheter for continuous intraspinal medication delivery, is a well-accepted treatment for number of painful conditions.¹⁻⁴ This treatment modality is generally accepted as safe; however, potential complications include postdural puncture headaches (PDPHA), persistent cerebrospinal fluid (CSF) leak, catheter infection, tip migration, pump malfunction, and catheter tip granuloma. Given the increase in IDDS use over the past 25 years, it is imperative that clinicians are skilled in recognizing and treating these potential complications.¹ We report a case of persistent cervical spine pain and postural headache during the early postimplant period secondary to a rare and possibly under-recognized etiology.

CASE REPORT

Our patient was a 33-year-old female with a history of chronic abdominal pain secondary to a softball injury to

Address correspondence and reprint requests to: Bryan Hoelzer, MD, Mayo Clinic College of Medicine, 200 First Street SW, Rochester, MN 55905, U.S.A. E-mail: hoelzer.bryan@mayo.edu.

Submitted: September 30, 2009; Revision accepted: May 11, 2010
DOI: 10.1111/j.1533-2500.2010.00405.x

© 2010 The Authors

Pain Practice © 2010 World Institute of Pain, 1530-7085/11/\$15.00
Pain Practice, Volume 11, Issue 1, 2011 103-106

the right lower quadrant. It initially caused a hematoma but after the resolution of the injury, the patient still had severe abdominal pain that limited her ability to work and ride her motorcycle. Past medical history was significant for Crohn's disease but subsequent medical work-up after the injury did not reveal an underlying diagnosis for her persistent pain. Initial treatments included high-dose gabapentin, desipramine, valdecoxib, hydrocodone/paracetamol (Vicodin, Abbot Laboratories, Abbott Park, IL, U.S.A.), and baclofen without relief. Thus, the patient was referred to our pain practice approximately 1 year after her injury. She was complaining of pain levels in the moderate to severe range, sleep impairment, and inability to work. Additional evaluation included a lumbar magnetic resonance imaging (MRI), which was negative. A perimuscular field block and spinal cord stimulation trial did not improve her symptoms. Thus, she was prescribed oral opioids that did help her pain, but the side effects of somnolence and fatigue limited their usage. Given this, the patient underwent a trial of single-shot intrathecal preservative-free morphine sulphate using a 24-gauge needle at the L1-2 level (previous MRI imaging showed the conus at the T12-L1 junction) that provided a greater than 50% improvement in her pain without the disabling side effects. After careful patient education, the decision was made to proceed with IDDS placement.

Implantation of a Medtronic Sychromed (Medtronic Inc., Minneapolis, MN, U.S.A.) pump and catheter was performed approximately 3 weeks following her trial in the operating room of the local hospital. The patient was placed in the right lateral decubitus position, prepped, and draped appropriately. A lumbar paramedian incision was made for the catheter insertion to the left of the midline at the L3-4 interspace and the catheter tip was advanced to T11-12 interspace. The pump was placed in the left lower quadrant of the abdomen. The pump reservoir was filled with preservative-free morphine sulfate 10 mg/cc and based on the patient's dose of oral opioids was started at a rate of 0.5 mg per day. The patient was observed in the hospital to be certain there were no adverse reactions to the intrathecal infusion. She was stable and pain was improved over 50% of her baseline, thus, she was dismissed from the hospital the next day.

The patient was followed at the clinic weekly and at 1 week postimplant, the patient reported mild incisional pain, was afebrile, and neurologically intact. At 2 weeks postimplant follow-up, she complained of a postural headache, neck pain, and plugged ears. Neurologic

exam remained stable and there was no evidence for ongoing infection. She was treated conservatively for a presumed PDPHA with rest, caffeinated fluids, abdominal binder, analgesics, and scheduled follow-up.

Four weeks postimplant, her postural headache had worsened and started interfering with her ability to work or perform activities of daily living. Given her persistent symptoms and lack of infectious signs, an epidural blood patch (EBP) was scheduled at the outpatient surgery center for a presumed PDPHA the following day. The patient presented to the appointment with new complaints of cervical spasm, axial thoracic spine pain, limited active range of motion of the neck, and chills without fever. Surprisingly, the postural component of her headache had improved. On exam, abdominal and lumbar incisions were well healed without sign of infection. Although she had evidence of nuchal rigidity, her neurologic exam was normal. Fluoroscopic examination of the implanted system confirmed the pump was in the appropriate position and orientation. The catheter was connected appropriately and appeared to enter the spinal canal at L3-4 with the tip slightly to the right of the midline at the T11-12 interspace. Because of the progression of her symptoms, meningitis was considered and the EBP was not performed.

The side port was then accessed aseptically using a 25-gauge noncoring needle for the purpose of cerebral spinal fluid sampling. However, as efforts were made to withdraw CSF, the production of negative pressure on the catheter resulted in exquisite worsening of her typical cervical spine pain and headache. Aspiration was attempted 3 times with each attempt resulting in temporary exacerbation of her symptoms. Given this, and the concern for infection, CSF was instead obtained from a direct lumbar puncture and was sent for gram stain, cell count, protein, and glucose. Two mL of iopamidol material (Isovue, Bracco Diagnostic, Inc., Princeton, NJ, U.S.A.) was injected via the side port, which demonstrated an apparent intrathecal spread. The pump was reprogrammed to clear the catheter of iopamidol material and resume the morphine sulfate infusion at 0.5 mg per day.

From there, the patient was sent to the hospital for lab testing including a complete blood count and MRI of the thoracic spine. The CSF was clear with elevated protein, 20 white blood cell count, normal glucose, and negative gram stain and culture. The complete blood cell count showed normal white blood count. The MRI of the thoracic spine demonstrated the catheter tip malpositioned ventral to the intrathecal sac (Figures 1 and 2).



Figure 1. A T2-weighted magnetic resonance imaging with axial view of the thoracolumbar spine. Note the catheter tip migrating ventral to the intrathecal sac.



Figure 2. A T2-weighted magnetic resonance imaging with sagittal view of the thoracolumbar spine. The catheter courses along the ventral intrathecal space before migrating extradurally.

Given the ventral catheter placement and patient's symptom reproduction with attempted catheter aspiration, it was considered the position of the catheter was responsible for causing meningeal irritation.

The patient underwent a catheter revision including removal of the current catheter. Removal of the initial catheter resulted in prompt resolution of her symptoms. A new one was advanced under fluoroscopic guidance to the midpoint of the T12 vertebral body followed by painless aspiration of the catheter via the side port. The patient tolerated the procedure well and after administration of intravenous (IV) antibiotics, the patient was dismissed home in stable condition.

DISCUSSION

Complications of implanted intraspinal drug delivery systems can occur ranging from PDPHA, persistent CSF leak, catheter infection, tip migration, pump malfunction, and catheter tip granuloma. One of the most common complications of catheter insertion is PDPHA,⁵ which is thought to be a result of CSF leakage through the dural defect from needle penetration through the dural sheath.⁶ Symptoms are described as headache provoked by position changes and may be severe and incapacitating.⁷ The overall reported incidence of PDPHA is 1% to 30% but 15% of the reported PDPHAs following implantation may last for weeks if not months.^{7,8} Usually, the headaches will resolve with conservative treatment consisting of rest, caffeine, and abdominal binder, but if symptoms are recalcitrant to treatment, interventional therapies include an EBP.⁹ In our case, a postural headache was the initial complaint during the post-op period. As the headache did not readily improve with medical management, an EBP was considered until the patient presented with a change in her clinical symptoms and experienced meningismus with intraspinal catheter aspiration. At that point, it was unlikely that her symptoms were from a PDPHA and instead there was a concern for a possible infection. Another possible diagnosis would have been aseptic meningitis.

Device-related infection is the most common serious adverse event associated with IDDS with reported overall infection rate of 5%.⁵ As a result, most infections and explantations occur within 2 to 3 months of implantation.⁵ Clinical signs of an intrathecal infection include stiff neck, fever, vomiting, nausea, and headache. If these symptoms occur, prompt hospitalization with IV antibiotics is required. The meningismus and nuchal rigidity experienced by our patient suggested an infection; however, work-up did not reveal bacteriological or hematological evidence of infection.

When attempts were made to obtain CSF through the port for the purpose of laboratory analysis, our patient experienced significant worsening of her meningismus.

A possible mechanism could be direct irritation of the meninges given the proximity of the catheter tip to the ventral meninges (as visualized later on MRI) and the worsening of her symptoms with the creation of negative pressure when attempting to aspirate. Included in the noninfectious differential for meningismus is aseptic meningitis, chemical meningitis, or catheter tip inflammatory masses.¹⁰

Although rare, an inflammatory mass at the catheter tip can produce local pain as well as loss of analgesia and neurologic deficits including bowel and bladder dysfunction. Inflammatory masses are more often associated with high-dose opioids¹¹ and have been reported to occur in as few as 27 days postimplant.¹² Suspicion for an inflammatory mass was low in our patient; however, literature notes that MRI is the most sensitive modality for evaluation of catheter tip complications and spinal-cord changes.¹³ Thus, advanced imaging was obtained that demonstrated the malpositioned catheter tip that was not evident with fluoroscopy. After infection was ruled out, revision of the system and retraction of the catheter resolved her symptoms supporting the mechanism of direct irritation of the meninges with the catheter tip.

CONCLUSION

Although rare, meningeal irritation from the catheter tip status post-IDDS implant should be considered in the differential diagnosis for headache and neck pain without signs of infection in the postimplant period. This case report demonstrates the value of clinical expertise when evaluating and managing patients with implanted medical devices.

REFERENCES

1. Smith HS, Deer TR, Staats PS, Singh V, Sehgal N, Cordner H. Intrathecal drug delivery. *Pain Physician*. 2008;11:S89-S104.
2. Smith TJ, Staats PS, Deer T, et al. Randomized clinical trial of an implantable drug delivery system compared with

comprehensive medical management for refractory cancer pain: impact on pain, drug-related toxicity, and survival. *J Clin Oncol*. 2002;20:4040-4049.

3. Smith TJ, Swainey C, Coyne PJ. Pain management, including intrathecal pumps. *Curr Oncol Rep*. 2004;6:291-296.

4. Stearns L, Boortz-Marx R, Du Pen S, et al. Intrathecal drug delivery for the management of cancer pain: a multidisciplinary consensus of best clinical practices. *J Support Oncol*. 2005;3:399-408.

5. Follett KA, Boortz-Marx RL, Drake JM, et al. Prevention and management of intrathecal drug delivery and spinal cord stimulation system infections. *Anesthesiology*. 2004;100:1582-1594.

6. Ho KY, Gan TJ. Management of persistent post-dural puncture headache after repeated epidural blood patch. *Acta Anaesthesiol Scand*. 2007;51:633-636.

7. Naumann C, Erdine S, Koulousakis A, Buyten J, Schuchard M. Drug adverse events and system complications of intrathecal opioid delivery for pain: origins, detection, manifestations, and management. *Neuromodulation*. 1999;2:92-107.

8. Krames ES. Intraspinal opioid therapy for chronic nonmalignant pain: current practice and clinical guidelines. *J Pain Symptom Manage*. 1996;11:333-352.

9. Hardy PA. Extradural blood patch of a cerebrospinal fluid cutaneous fistula in the presence of an intrathecal drug delivery system. *Anesthesiology*. 1994;81:1299-1300.

10. De Marcaida JA. Disorders that mimic central nervous system infections. *Neurol Clin*. 1999;17:901-941.

11. Ko VM, Ferrante FM. New onset lumbar radicular pain after implantation of an intrathecal drug delivery system: imaging catheter migration. *Reg Anesth Pain Med*. 2006;31:363-367.

12. Deer T, Krames ES, Hassenbusch S, et al. Management of intrathecal catheter-tip inflammatory masses: an updated 2007 consensus statement from an expert panel. *Neuromodulation*. 2008;11:77-91.

13. Deer T, Krames ES, Hassenbusch SJ, et al. Polyanalgesic Consensus Conference 2007: recommendations for the management of pain by intrathecal (intraspinal) drug delivery: report of an interdisciplinary expert panel. *Neuromodulation*. 2007;10:300-329.