Granulomatous Conduit for Intrathecal Infusion Of Morphine and Bupivacaine

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Abstract

Intrathecal Drug Delivery Systems (IT-DDS) have gained widespread acceptance as a therapeutic alternative to high dose parenteral opioids for unremitting chronic pain. Granuloma formation has been reported as a side effect in association with the greater use of IT-DDS. Etiological factors include infection, reaction to catheter material, and trauma at the site of implantation. The most widely accepted etiology is the use of intrathecal morphine, with granuloma formation dependent on morphine dosage.

We present a unique case in which a woman with unremitting GI pain and IT-DDS placement developed a granuloma at the hub of the catheter which formed a sealed conduit that re-established drug flow between the pump and catheter.

History: A 38-year-old woman on chronic intrathecal morphine (15 mg/day) and bupivacaine (9 mg/day) therapy for chronic gastrointestinal pain related to Crohn’s disease and diabetic gastroparesis presented to our clinic requesting replacement of her IT-DDS due to low battery life. Her device had been in place for five years and had stopped providing adequate relief for several months. She initially elected not to have the device replaced even though she was advised by a physician that the device was “cracked” and leaking at the connection site between the pump and the proximal catheter.

A few months prior to her next presentation, the device spontaneously began to again provide satisfactory pain relief, although notably her dose was increased from 10.5 to 15 mg/day.

Surgical Findings

A decision was made to replace the device with a more current model because of the near terminal half life and a small drug reservoir.

Significant concretion and granuloma were noted around the fractured hub of the IT-DDS in situ, forming a sealed conduit which allowed drug flow between the pump and the proximal catheter (Figs. 1-2).

A new hub connector was attached to the free end of the spinal catheter and connected to the nozzle of a new pump. The new IT-DDS was programmed to deliver an approximately 10% lower dose than the previous device to avoid an undue escalation of drug.

Postoperative Course: The patient’s pain relief was optimal and she reported no new symptoms. The replacement device continued to perform as expected one year later.

Discussion

Although intrathecal morphine catheter-associated granulomas were first described in the early 1990s, the incidence was not widely known.1 It is now recognized that distal catheter tip lesions may occur in up to 3% of cases, with the majority remaining asymptomatic.4 Similar device-related lesions outside of the spinal canal have been cited, but their incidence is unknown as they were excluded from previous reports.3

These lesions typically arise from the distal tip, consistent with the argument that granuloma formation results from a concentration-dependent inflammatory reaction to the medication itself, rather than subclinical trauma, chronic infection, or silicone hypersensitivity.5 Some authors have suggested an immunological mechanism mediated by lymphocyte μ-opioid receptors to promote increased lymphocyte activity and changes in mast cell activity, although there are significant gaps in the understanding of this process.2,3,5

While the mechanisms related to granuloma formation with morphine IT-DDS remain unclear, some have suggested an association with morphine doses greater than 10 mg/day.5 Lower doses have been implicated when combined with bupivacaine.5 In our case, the dose was approximately 15 mg/day. The infusate in our patient consisted of morphine and bupivacaine. The granuloma formation at the leakage site is consistent with the view that the causal agent of this lesion was infusate rather than trauma, infection, or reaction to the catheter material. To the best of our knowledge, this is the first report of a granuloma encapsulation providing a sealed conduit for drug delivery from an IT-DDS.

References