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Prolonged Diabetes Insipidus Subsequent to an Episode of Chemical Meningitis

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Chemical meningitis is a syndrome characterized by onset of fever, severe headache, nuchal rigidity, nausea and vomiting, prostration and, in florid cases, coma up to 24 h.[1,2] During the acute phase, the cerebrospinal fluid (CSF), although under normal pressure, is opalescent with increased protein and pleocytosis. The CSF glucose level is normal and CSF cultures are negative. Prior case reports indicate that patients improve markedly within 3–4 days and that all neurologic abnormalities disappear by the 7th day with no sequellae.[1,2]

We recently encountered a patient who developed chemical meningitis several hours after administration of a spinal anesthetic. Although the overall clinical course was typical, diabetes insipidus appeared on the second day. This persisted for 3 months and necessitated self-administration of nasal vasopressin acetate twice daily.

REPORT OF A CASE

A 21-year-old man was admitted for elective repair of a urethral stricture resulting from a motor vehicle accident 9 months previously. Although there was no head injury or concussion, he sustained a compound fracture of the pelvis and rupture of the membranous urethra, and had previously undergone an open reconstructive procedure as well as several endoscopic urethral resections. All of these procedures were performed without complications under general or spinal anesthesia. On this admission, the patient was otherwise well with no systemic abnormalities. All laboratory values were within normal limits. A spinal anesthetic was proposed and accepted by the patient.

The patient, height 178 cm and weight 70.5 kg, was premedicated with 5 mg morphine and 50 mg hydroxyzine, im, leaving him lucid and cooperative. He was placed in the lateral decubitus position and a disposable spinal anesthesia set, well within the expiration date, was used. His back was prepared with providone-iodine solution. As 1% tetracaine and 10% dextrose were being drawn in the disposable syringe, the resident inadvertantly pierced her thumb with the 20-gauge needle attached to the syringe, necessitating a change of gloves and disposal of the tetracaine-dextrose mixture, the syringe, and the needle. These were replaced by sterile ampules of 1% tetracaine and 10% dextrose, a disposable 18-gauge needle, and a sterile reusable 5-cc glass syringe. The new ampules, syringe, and 18-G needle were opened aseptically and placed on the original spinal tray. A solution containing 1.5 cc of 1% tetracaine, (*i.e.*, 15 mg) and an equal volume of 10% dextrose was drawn up in the glass syringe.

The paper drape then was placed over the patient's back and the L3–4 interspace infiltrated with 1% lidocaine. The 18-g introducer from the set was seated in the ligaments and the accompanying 25-g spinal needle inserted through the introducer. On second insertion, clear CSF with free-flow in all four quadrants was obtained without pain or paresthesias. The glass syringe was attached and its contents injected slowly into the spinal canal. The patient then was turned supine and after 1–2 min placed in the dorsal lithotomy position. A sensory level of T-8, bilaterally, was achieved within 3–4 minutes. Vital signs were unchanged from preoperative values. Over the next 15 min, the sensory level rose to T-4 bilaterally with stable blood pressure. A single 400-μg dose of atropine was administered iv when the patient's heart rate decreased from 70 to 44 beats/min, promptly increasing to 60 beats/min, where it remained for the duration of the 40-min surgical procedure, which proceeded without incident. Cefalothin, 1 g, was given iv shortly before the end of the procedure.

On admission to the recovery room, vital signs, including body temperature, were normal. Sensory level was T-7 bilaterally and complete motor block of both legs was present. Two hours later, the patient began to complain of severe frontal headache accompanied by nausea and vomiting and an oral temperature of 39.4° C. Five hours later, although sensory and motor block had disappeared, the patient was drowsy, disoriented, and diaphoretic, with persistent rectal temperatures of 39–40° C. His mental status continued to decline and a neurology consult was obtained. The patient was somnolent, but followed commands and appeared fully oriented when stimulated. Toes were down-going bilaterally. Computerized tomography (CT) scan was normal with no evidence of a subarachnoid hemorrhage or other intracerebral lesion. Lumbar puncture revealed a CSF opening pressure of 442 mm H_2O. The CSF was viscous, with an opalescent hue. An aliquot was sent for stat bacterial culture, but no organisms were seen on Gram's stain. A presumptive diagnosis of meningitis of uncertain etiology was made. The patient was given empiric iv antibiotic therapy and transferred to the medical intensive care unit (MICU) where he had roving, disconjugate eye movements and bilateral horizontal nystagmus. The fundi could not be visualized. Severe nuchal rigidity accompanied by meningismus was present. Sensation and motor power were normal.

On the 1st postoperative day, the patient became afebrile and less somnolent. By the 2nd postoperative day, his headache began to resolve and he was much improved clinically. That evening, however, his urine output increased to 800 cc/h. Urine specific gravity was 1.000 with an osmolality of 74 mOsm/l. Simultaneous serum osmolality was 291 mOsm/l. Five units of antidiuretic hormone (ADH) were given im with prompt correction of the diuresis, and the diagnosis of diabetes insipidus was made.

Cultures of the patient's spinal fluid remained negative. The antibiotic regimen of penicillin, gentamycin, moxalactam, and nafcillin was tapered and discontinued by the 4th postoperative day. A repeat lumbar puncture was performed on that day, showing a closing pressure

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of 220 mm H_2O. The CSF was clear and colorless with a glucose of 56 mg/dl, and protein of 35 mg/dl. There were 110 white blood cells per mm^3. Differential cell count revealed 31 polymorphonuclears, 45 lymphocytes, 20 monocytes, and 4 eosinophils.

The patient remained afebrile and was discharged from the MICU on the 6th postoperative day. Because his diabetes insipidus persisted, a regimen of intranasal vasopressin at a dose of 0.5 ml (5 μg) bid was initiated. He was instructed regarding administration of this medication, advised to obtain daily weights and to avoid overhydration, and discharged from the hospital on the 12th postoperative day.

Approximately 2 months later, the patient was readmitted to the hospital for a repeat urethrotomy. He still required vasopressin but had no other neurologic residua. General anesthesia was given without any complication. The patient was last seen in the endocrine clinic 3 months after the initial episode. His diabetes insipidus persisted for 3 months, requiring continued vasopressin administration, and then resolved spontaneously.

Discussion

On reviewing our procedures, we learned that the reusable glass syringes being supplied at the time were washed with detergent and rinsed with tap water, then packaged and autoclaved. Although we were unable to find which brand of detergent was used, we did establish that the syringes were mechanically cleaned with a bottle brush that lay on the countertop with exposure to a variety of laundry detergents and soaps. The use of detergents to wash reusable equipment, followed by poor rinsing technique (*i.e.*, use of contaminated brushes and tap water rather than distilled) is a common theme in previous reports of this syndrome.[1,2] Accordingly, we think that the glass syringe was responsible. It is unlikely that the new drug ampuls, which were gas-sterilized, or the disposable 18-g needle were responsible for the meningitis and, hence, the entire stock of reusable glass syringes was discarded.

The classic features of chemical meningitis seen in our case are the sudden onset of fever and meningismus, the cloudy, opalescent CSF, the prompt improvement in 48–72 h, and the consistently negative CSF cultures. In addition, chemical meningitis, as opposed to other forms of aseptic meningitis, has a clear and unequivocal association with chemicals or drugs toxic to the CNS. Other reported causes of chemical meningitis have included metrizamide myelography,[3] oral trimethoprim, sulfamethoxazole,[4] and a variety of antiinflammatory agents.[5–7] According to prior clinical reports, the signs and symptoms of chemical meningitis invariably abate completely by one week after onset, with no sequellae.[1,2] Our patient, however, developed markedly prolonged diabetes insipidus, which has never before been reported in association with chemical meningitis. We hypothesize that this arose as a consequence of his chemical meningitis, which resulted in a critical reduction in the number of functional supraoptic neurons.[8,9] This may have resulted, in turn, from a combination of cerebral edema, meningeal inflammation, and direct toxicity from unidentified substances putatively originating from the detergent-washed glass syringe.[1,2]

In summary, this is the first reported case of a prolonged neuroendocrine abnormality following an acute bout of chemical meningitis attributable to spinal anesthesia. Thus, the common belief that chemical meningitis invariably resolves rapidly and without sequellae must be revised.

References

1. Austin DA, Sokolowski JW: Postlumbar puncture chemical meningitis. NY State J Med 2444–2445, 1968
2. Gibbons RB: Chemical meningitis following spinal anesthesia. JAMA 210:900–902, 1969
3. Hurd RE, Sieger BE: Chemical meningitis secondary to metrizamide myelography. Spine 7:82–84, 1982
4. Kremer I, Rits R, Brunner F: Aseptic meningitis as an adverse effect of co-trimoxazole (letter). N Engl J Med 308:1481, 1983
5. Ruppert GB, Arth WF: Tolmetin-induced aseptic meningitis. JAMA 245:67, 1981
6. von Reyn CF: Recurrent aseptic meningitis due to sulinac. Ann Intern Med 99:343–344, 1983
7. Peck MG, Joyner PU: Ibuprofen-associated aseptic meningitis. Clin Pharmacol 6:561–565, 1982
8. Streten DHP, Moses AM, Miller M: Disorders of the neurohypophysis, Harrision's Principles of Internal Medicine. Edited by Thorn GW, Adams RD, Braunwald E, Isselbacher K, Petersdorf RG. New York, McGraw-Hill, 1977, pp 491–501
9. Cusick JF, Hagen TC, Findling JW: Inappropriate secretion of antidiuretic hormone after transsphenoidal surgery for pituitary tumors. New Engl J Med 311:36–38, 1984