Case Report

Meningitis due to intra-abdominal cerebrospinal fluid fistula following gunshot wound successfully treated with antibiotics and blood patch: A case report and literature review

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ABSTRACT

Background: Penetrating spinal cord injury (PSCI) represents an average of 5.5% of all SCIs among civilians in the United States. The formation of a cerebrospinal fluid (CSF) fistula following PSCI occurs in approximately 9% of cases. Intra-abdominal CSF fistulae are rarely reported.

Case Description: We present the case of a 28-year-old Caucasian female who suffered a single gunshot wound to the abdomen with a missile fragment lodged within the left L2 pedicle and transverse process without obvious canal compromise. The patient developed bacterial meningitis 13 days after the initial injury, treated with IV antibiotics. CT myelogram demonstrated intra-abdominal ventral CSF fistula from the left L2–L3 neuroforamen. The patient was successfully treated with fluoroscopy-guided dorsal autologous blood patch graft.

Conclusion: This case highlights a rare complication of PSCI successfully managed with the use of a blood patch graft.

Keywords: Cerebrospinal fluid fistula, Epidural blood patch, Meningitis, Spinal gunshot wound, Trauma

INTRODUCTION

Penetrating spinal cord injury (PSCI) represents an average of 5.5% of all SCIs among civilians in the United States. The incidence of cerebrospinal fluid (CSF) fistula from PSCI is not well described, but appears to be higher in cases of trauma than in spontaneous or postsurgical cases. Of these fistulae, central nervous system (CNS) infections may occur more frequently with concomitant intra-abdominal injuries. The literature on the treatment of traumatic CSF fistulae of the spine is lacking; however, various treatment modalities have been described, including epidural blood patch graft.
CASE REPORT

We present the case of a 28-year-old Caucasian female who sustained a single abdominal gunshot wound (GSW). She underwent emergent laparotomy where a proximal jejunum perforation was discovered and repaired. Postoperative computed tomography (CT) imaging showed bullet fragments in and adjacent to the left L2 pedicle, without obvious spinal canal compromise [Figure 1]. Her postoperative course was complicated by the discovery of a left ureteral injury requiring placement of nephrostomy tube and intra-abdominal drains by urology. She was discharged postinjury day 8.

The patient then returned to the emergency department at our center postinjury day 13 with headache, photophobia, and nausea. On examination, she was found to be febrile to 38.6 Celsius, lethargic with meningismus, but fully oriented with an otherwise nonfocal neurologic examination. Contrast CT of the abdomen was unremarkable. CSF studies were obtained through lumbar puncture which revealed cloudy CSF with elevated nucleated cells (7925 cells/μL) and red blood cells (168 cells/μL), low glucose (<5 mg/dL), and elevated CSF protein (318 mg/dL) suggestive of bacterial meningitis. Gram stain revealed >25 polymorphonuclear cells per low-power field, but revealed no organisms, and aerobic and anaerobic culture did not identify causal organisms. Her intra-abdominal drain contents were sampled and negative for β2-transferrin. A pyelogram revealed a persistent ureteral leak, for which the patient received a ureteral stent. Empiric IV antibiotic therapy with vancomycin, cefepime, and metronidazole was initiated for the treatment of meningitis and sustained for 14 days. A lumbar CT myelogram was obtained, revealing an area of contrast leakage ventrally into the retroperitoneum in the area of the left L2–L3 neuroforamen without myelographic block [Figure 2]. Given these findings, the patient underwent fluoroscopy-guided dorsal epidural autologous blood patch graft placement at the L2–L3 level [Figure 3]. After the blood patch, the patient's meningitis subsequently resolved. There was no clinical evidence of additional CSF leakage or intracranial hypotension, and the patient was discharged from the hospital 2 weeks after blood patch placement.

DISCUSSION

Within the United States, PSCI represents 5.5% of all SCIs among civilians. Among PSCI in the United States, the described incidence of firearm-associated injuries is high, with 92–98% of cases attributed to firearms. The most commonly affected regions of the spine are the thoracic and lumbar spine, which have similar injury incidence, followed less commonly by the cervical and sacroccygeal spine. Due to the abdomen and pelvis being common regions of firearm injuries, the incidence of concomitant abdominal or pelvic organ injury is high, with studies estimating abdominal viscus injury occurring in 57–69% of cases. In the case of PSCI associated with abdominal viscus injury, the risk of CNS infection has been variably reported. Lin et al. recorded no cases of CNS infection among 29 patients suffering...
Intra-abdominal CSF fistula secondary to projectile missile injury represents an uncommon manifestation of penetrating vertebral column injuries. Such fistulae are associated with higher rates of meningitis or other nervous system infections. Various treatment modalities have been described; however, there are no guidelines for the treatment of these fistulae. In our case, the patient presented with a single projectile missile wound to the abdomen with an involvement of the left L2 pedicle and L2–L3 neuroforamen. Our patient presented in a slightly delayed fashion with meningitis, and intraperitoneal CSF fistula was confirmed on CT myelogram. She was treated with empiric antibiotic therapy and dorsal epidural blood patch grafting, with resolution of meningitis and without development of intracranial hypotension symptoms. Our case demonstrates the successful treatment of this rare clinical entity with a minimally invasive approach.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent.
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Nil.

Conflicts of interest
There are no conflicts of interest.

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