

Ventriculoperitoneal Shunt Causing Abdominal Recurrent Sepsis

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Abstract

Abdominal complications from ventriculoperitoneal (VP) shunts are broad and may be difficult to recognize. We report a case of recurrent abdominal sepsis in a child with ventriculoperitoneal shunt. Without a clear diagnosis, exploratory laparotomy was performed and perforation of the cecum by the tip of the ventriculoperitoneal catheter, with an extensive chronic inflammatory process surrounding the cecum, was found. Our goal is to raise awareness to the rare abdominal complications of VP shunting such as bowel perforation, aiming for a more diligent diagnosis and proper treatment.

Keywords

Ventriculoperitoneal Shunt Complications, Bowel Perforation, Abdominal Sepsis, Pediatric Neurosurgery, Children

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1. Introduction

Ventriculoperitoneal (VP) shunting is a common intervention in pediatric neurosurgical practice for treatment of hydrocephalus [1-3]. Although shunt dysfunction is frequent with an overall incidence of shunt failure ranging from 40-50% in the first two years after initial insertion [1], potentially life-threatening complications following VP shunt placement are nevertheless uncommon [1-5]. Malfunctions may occur intracranially, along the shunt tract or within the abdomen, understanding the variety of presentations and etiologies is critical for all involved professionals.

While nearly half of the children with a VP shunt will experience a shunt revision at some point in their life [1, 4], abdominal complications of VP shunts are rare, occurring in less than 5% of cases [6]. These complications are broad, potentially severe and usually difficult to recognize [7]. Bowel perforation, a relatively uncommon complication of peritoneal shunts, can present with peritonitis and sepsis, requiring emergent surgery [1, 7, 8].

Shunt failure presentation can take different forms based on age and type of malfunction [9, 10].

Typical signs and symptoms include fontanelle bulging, increased head circumference, irritability, headache, vomiting, altered level of consciousness and fever. Abdominal presentation may range from discomfort to peritonitis, an asymptomatic presentation although possible, is rare [1, 4, 9, 10]. Patient's age at the time of initial shunt insertion and the time interval since prior surgical revision are important predictors of repeated shunt failure [1, 10].

A thorough history and physical examination are crucial in providing initial suspicion and obtaining a correct diagnosis, but medical imaging is a valuable aid, usually confirming the etiology. Still, VP shunt malfunction is missed in up to one third of the patients when considering clinical features alone and "normal" imaging results [4].

This case reports a challenging diagnosis in a 12-year-old girl with recurrent abdominal sepsis of unclear origin and previous history of VP shunt.

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2. Case Report

A 12 year-old girl, with severe cognitive and motor impairment, and panhypopituitarism secondary to partial resection of pilocytic astrocytoma of the optic chiasm, presented at the emergency room with a history of vomiting, abdominal pain and fever. Physical examination revealed abdominal tenderness in the right lower quadrant and general malaise.

A VP shunt was placed at the time of astrocytoma resection (4 years before) and in the past year the patient presented with multiple severe episodes of sepsis of unknown origin. Clinical and imaging findings in previous evaluations were always scarce, with no radiographic evidence of shunt migration or malfunction, and the septic episodes were interpreted as bacterial translocations owing to dysmotility caused by sodium disorders.

At the time of present abdominal complaints, ultrasound imaging (US) suggested inflammatory changes that could relate to appendicitis. Exploratory laparotomy was performed and an extensive inflammatory process surrounding the cecum and the VP shunt was identified. The VP catheter was embedded in the cecal wall, without fluid collection (Fig 1).

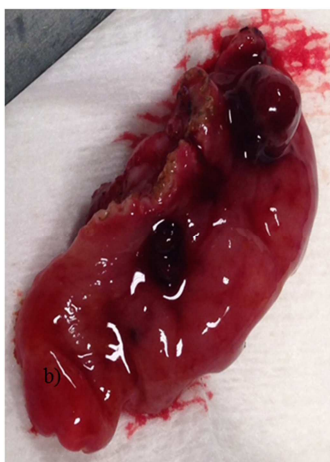
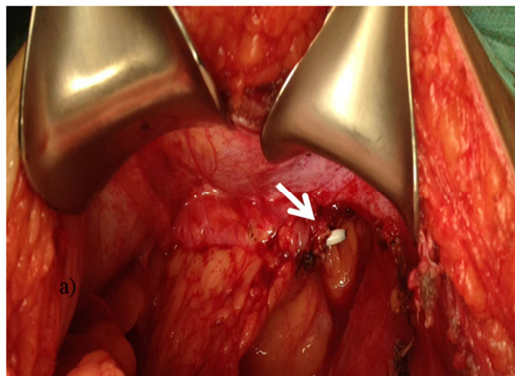


Figure 1. Intraoperative findings: a) ventriculoperitoneal catheter adjacent to the cecum (white arrow) perforating the cecal wall. b) Cecal mucosa showing multiple areas of necrosis.

Partial resection of the cecum and appendectomy were performed. The VP catheter was repositioned in the peritoneal cavity. Pathologic examination of the resected specimen showed perforation of the bowel wall.

Postoperatively an infection of the surgical incision was treated with antibiotics and an external ventricular drain was required after peritoneal pseudocyst development. A new VP shunt was placed after 15 days without complications.

3. Discussion

VP shunt complications are more common in children than in adults [6, 10]. Abdominal complications due to shunting systems can originate solely on the presence of the shunt catheter, the operations required for placement and drainage itself. Most shunt infections produce dysfunction without abdominal complications, spreading only occasionally to the peritoneum and eventually causing peritonitis or focal abscess [11, 12]. Other abdominal complications like adhesions leading to bowel obstruction, volvulus and higher incidence of inguinal hernias and hydroceles have all been reported [13-16].

Acute appendicitis has been reported in association with VP shunts [12, 13] but given its frequency in children a causative relationship is hard to establish. A 30-year review at the Hospital of Sick Children in Toronto, Canada, reports the chances of a child with a VP shunt having appendicitis to be 1 in 750 and the incidence of a child with appendicitis having a VP shunt is 1 in 100 [14].

In our patient, neurologic evaluation was quite challenging given her past medical history, so the high index suspicion of appendicitis not related to shunt catheter was strengthened by the unchanged neurologic function and no signs of VP shunt infection. Patient's previous episodes never reached surgical consultation and were always treated with broad-based antibiotic regimens, postponing the unveiling of the true problem.

Spontaneous bowel perforation from VP shunt distal catheter is rare with an estimated incidence of 0.1% to 0.7% of the shunted patients [7], but represents an event with devastating complications, especially if unrecognized for a significant period of time. In an unwell child, with previous surgical instrumentations and VP catheter, a broader list of differential diagnosis is expected.

Bowel wall erosion seems to be related to inflammation caused by pre-existing shunt infection [7] and can present with an indolent course. In the vast majority of patients this perforation is very small and seals by itself not mandating exploratory laparotomy, which is indicated only in patients with acute abdomen [1, 7]. When it comes to the location, the

large bowel seems to be the most affected [17].

The diagnosis in medically complex, non-verbal children is challenging and may be easily mistaken and delayed by the prompt medical treatment with antibiotics.

Since the clinical presentation is rather nonspecific, there is an increasing dependence upon imaging diagnosis. Ultrasound (US) can usually provide sufficient information on abdominal complications but is more limited in evaluating the shunt itself. Plain radiographic series assess the continuity of the shunt tubing, but computed tomography (CT) with contrast is necessary if assessing patency. CT of the head and abdominal cavity with proper radiation doses provides excellent global evaluation [6].

Our findings in the US and consideration of previous “normal” exams, pointed out in the direction of appendicitis as the likely cause.

Imaging, much alike the art of clinical diagnosis, although very often helpful, has to deal with subtle abnormalities that are difficult to appreciate.

Proper care of acute abdomen of unclear origin and in the presence of VP shunt, relies on surgical exploration for confirmation of diagnosis and treatment.

After cecum resection and appendectomy, and since we only repositioned the catheter, our follow up was complicated with a postoperative incision infection and pseudocyst development. Pseudocyst a well known complication is supposedly due to a chronic low-grade infection, however it is not unusual to find sterile fluid when aspirated [2] Neurosurgical team involvement is desirable as soon as possible, even when the initial clinical presentation doesn't seem related to the presence of the shunting system.

Upon confirmation of abdominal complication, VP shunt exteriorization and broad-based antibiotic therapy represent the standard treatment [6, 7, 12]. Early treatment represents the best improvement in prognosis.

4. Conclusion

Ventriculoperitoneal shunting is a common surgical procedure for the treatment of hydrocephalus in children, with well known associated complications. The diagnosis in these situations can be quite perplexing, posing difficulties that will delay treatment. No matter how long since initial shunt insertion, neurosurgical team should be involved.

Even though late abdominal events are rare, with the improved life expectancy of these children, more complications will be encountered.

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