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Bowel perforation by lumbar-peritoneal (LP) shunt: A rare complication of neurosurgery

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ABSTRACT

INTRODUCTION: Lumbar-peritoneal (LP) and ventriculo-peritoneal (VP) shunt placement is the treatment of choice for diversion of cerebrospinal fluid (CSF) from the subarachnoid space into the peritoneal cavity. This invasive procedure has been associated with several complications, most commonly infection and obstruction. Perforation of the bowel is an extremely rare complication.

CASE PRESENTATION: We report a case of a 72 old female patient with LP shunt for raised intracranial pressure, who presented with LP shunt catheter protruding from anus. This was due to bowel perforation in the recto-sigmoid junction by the distal tip of lumbar-peritoneal shunt. She was surgically treated with removal of the distal part of the shunt, external drainage of the proximal part and primary closure of the perforation.

DISCUSSION: The mortality after perforation is relatively high, approaching 15–18%, and it is further increased when infection is present up to 22% with central nervous system (CNS) infection such as meningitis, encephalitis, or brain abscesses (Vinchon, 2006) and 33% with intra-abdominal infection.

CONCLUSION: Clinical suspicion of abdominal complications by the LP should be raised when patient with hydrocephalus develops acute abdominal symptoms or infection with unusual positive CSF cultures.

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1. Introduction

Lumbar-peritoneal (LP) and ventriculo-peritoneal (VP) shunt placement is the treatment of choice for diversion of cerebrospinal fluid (CSF) from the subarachnoid space into the peritoneal cavity. In conditions where there is obstruction of CSF absorption or elevated CSF pressure such as hydrocephalus, LP works as an alternative route for removal of excess cerebrospinal fluid. However this invasive procedure has been associated with several complications, most commonly infection and obstruction. Perforation of the bowel is an extremely rare complication occurring in less than 0.1% of cases. Although infrequent, this delayed complication can be fatal if it goes unrecognized. We report a case of a 72 old female patient with LP shunt for raised intracranial pressure, who presented with LP shunt catheter protruding from anus. This was due to bowel perforation in the recto-sigmoid junction by the distal tip of lumbar-peritoneal shunt. She was surgically treated with removal of the distal part of the shunt, external drainage of the proximal part and primary closure of the perforation. The case report has been

the work has been reported in line with the SCARE criteria. [16] Clinical suspicion of abdominal complications by the LP should be raised when patient with hydrocephalus develops acute abdominal symptoms or infection with unusual positive CSF cultures.

2. Case presentation

In our case a 72 year old female patient with LP shunt was admitted in the Neurosurgical department with symptoms of fever (38,6) vomiting and dysphasia. She had her first surgery for extraparenchymal tumor of frontal lobe 8 months ago, which was managed with bilateral craniotomy and total excision of the tumor. The patient had multiple prior admissions in the Neurosurgical department due to bulging, fever and surgical site infection which was managed with opening the wound, evacuating the pus and cleansing the wound. Eventually lumbar drain had been placed because of persistent bulging, recurrent infection and raised intracranial pressure. The Surgical team on duty was called when the doctor in the Neurosurgical Unit noticed an extrusion of a tube through the anus. The patient had fever (38,6) vomiting and dysphasia. On examination, the patient exhibited signs of incipient meningitis with cervical stiffness, mild abdominal pain and GCS: 13. The CT scan showed ventriculomegaly with the lateral ventricles

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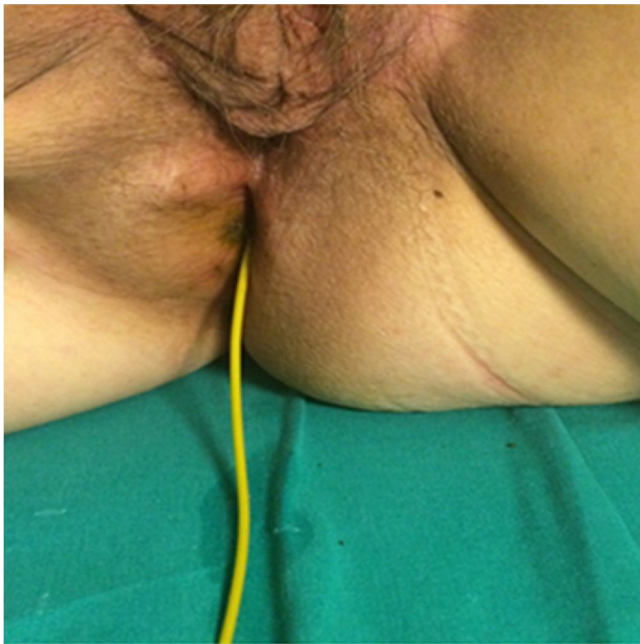


Fig. 1. Extrusion of the VP shunt through the anus.

become dilated and filled with air. Rectal examination revealed the VP shunt catheter protruding for a length of 10 cm from a normal-appearing anus (Fig. 1). An emergent exploratory laparotomy was decided by both the neurosurgery and general surgery team.

In surgery, the catheter was identified in the lateral wall of recto-sigmoid junction. The shunt was removed from the abdomen through the anus whereas the central part was cut and exteriorized at the abdominal wall. The site of the perforation was primary closed with two-layer suture.

The postoperative course was uncomplicated, fever was reduced the first postoperative day, bowel peristalsis was re-established on day 3 and a normal diet was tolerated by the patient on day 4. CSF cultures showed *Citrobacter Freundii*, therefore the ascending infection of VP shunt was implicated for meningitis. After repeated negative CSF cultures the following weeks, the peritoneal part of the LP catheter was placed intra-abdominally, with no complications postoperatively for the following 12 months.

3. Discussion

Cerebrospinal fluid (CSF) diversion devices or shunts have been used successfully and have become the primary therapy for obstruction of CSF absorption or elevated CSF pressure. An implanted shunt creates an alternative route for removal of CSF which is constantly produced within the brain by diverting CSF from the ventricles within the brain or the subarachnoid spaces around the brain and spinal cord to another body region (e.g. peritoneal cavity) where it will be absorbed and restoring the physiological balance between CSF production, flow, and absorption when one or more of these functions has been impaired. Lumbar-peritoneal (LP) shunt is a widely used shunt, where the proximal catheter drains the excess CSF from the lumbar thecal sac and distal catheter is typically placed in the peritoneal cavity [1,2].

In comparison with ventriculo-peritoneal shunts (VP), LP shunts give the advantage of avoidance of brain penetration with the shunt catheter, access to a large CSF space in the thecal sac and the potential of a large amount of CSF drainage [1].

Lumbar-peritoneal shunts can also be placed for management of localized pathology that affects the spinal cord. They have been used to drain and prevent reformation of pseudomeningoceles, or

unwanted collections of CSF [1,2]. Lumbar-peritoneal shunts have also been used to help minimize CSF leaks, either natural or iatrogenic. The principle is to decrease the fluid pressure on the dural defect and thus prevent excessive CSF leakage [3].

LP shunting however has been associated with several complications such as obstruction, migration, malfunction (over drainage, under drainage), subdural hematoma, seizures and infection (ventriculitis, arachnoiditis, meningitis, sepsis) [4–6]. Furthermore abdominal complications have been reported in the literature including peritoneal pseudocysts, lost distal catheters and intestinal volvulus. The clinical presentation of shunt malfunction can be challenging [6,7]. Symptoms can be either absent or present commonly with difficulty walking or gait disturbances, cognitive challenges and dementia, fever or signs of sepsis and redness along the shunt tract [7].

Spontaneous bowel perforation is an extremely rare and potentially fatal complication of LP and VP shunt, occurring anytime, few weeks to several years, after the placement of the shunt device in 0.01% to 0.07% of patients [7,8]. The first case in the literature was reported on 1996 by Wilson [9]. 94 cases of bowel perforation have been reported in the literature where the majority of cases were pediatric patients (0–10 years). In a systematic review of literature composed by A. Hai [10] revealed that the most common primary diagnosis was congenital hydrocephalus (33 patients), infective cause (10 patients) and 5 cases of tumor, normal pressure hydrocephalus respectively.

The causes of this uncommon complication vary and have been suspected to be the sharp end of the VP/LP shunt, the formation of a local inflammatory reaction or fibrosis around the distal catheter resulting in pressure on an area of the bowel, chronic irritation by the shunt, previous adhesions or infections and finally silicone allergy as a foreign body-like reaction [7,11].

The mortality after perforation is relatively high, approaching 15–18%, and it is further increased when infection is present up to 22% with central nervous system (CNS) infection such as meningitis, encephalitis, or brain abscesses [12] and 33% with intra-abdominal infection [13,10].

Treatment of bowel perforation by VP or LP shunt depends on the clinical presentation. Peritonitis, intraperitoneal abscess and sepsis should always be treated with exploratory laparotomy, lavage, primary closure of the bowel wall and removal of the shunt [7,13–15]. External drainage of the proximal part is mandatory for at least 20 days together with antibiotic prophylaxis [7,13]. Once the CSF cultures are repeatedly negative, a new peritoneal shunt catheter can be placed on the opposite site.

In the absence of infection percutaneous or endoscopic removal of the abdominal shunt catheter without surgery has been reported [7,15]. The shunt can be disconnected at the abdominal wall and the distal end can be removed through the rectum by colonoscopy [15].

4. Conclusion

The rare case of shunt perforation in viscera should be considered in patients with hydrocephalus when Gram-negative meningitis or CSF cultures are positive of unusual bacteria such as *Escherichia coli* or when the patient develops abdominal symptoms [7,10].

Conflicts of interest

No conflict of interest.

Sources of funding

No sources of funding.

Ethical approval

Study is exempt from ethical approval in our institution.

Consent

Patient consent given.

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request

Author contribution

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