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Case Series

Bowel perforation by ventriculoperitoneal shunt: report of three cases

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ABSTRACT

A ventriculoperitoneal (VP) shunt is a connection between the lateral ventricle and the peritoneal cavity. VP shunt surgery is the most commonly performed surgery in the management of hydrocephalus which is due to decreased absorption or increased production of cerebrospinal fluid (CSF). A VP shunt is a CSF diversion device using a tube with pressure-regulating valve that drains CSF from ventricles into the peritoneal cavity where CSF is absorbed and the excess intracranial pressure is relieved. Despite many recent advances in other fields of medicine, shunt related complications are very high. Shunt dysfunction is the most common complication encountered. Even though the incidence of bowel perforation is rare following VP shunt surgery, we observed three cases of spontaneous bowel perforation after the VP shunt surgery over a period of 25 years.

Keywords: Ventriculoperitoneal shunt, Bowel perforation, Cerebrospinal fluid

INTRODUCTION

In the management of hydrocephalus, ventriculo-peritoneal (VP) shunt surgery is most widely used procedure. However, this procedure may lead to several complications such as infection, obstruction, disconnection, migration, ascites or pleural effusion.[1] Adel et al reported a case of spontaneous bowel perforation after VP shunt surgery and reviewed 56 cases by searching PubMed and Scopus databases.[2] This complication may lead to serious life-threatening situation which may require urgent surgery. However, in few cases spontaneous extrusion may occur per anum. We present a case series of three cases of spontaneous bowel perforation following VP shunt surgery.

CASE SERIES

Case 1

A 5-month-old girl known case of congenital hydrocephalus with myelomeningocele underwent VP shunt (medium pressure Chhabra shunt) surgery along with excision of myelomeningocele. She had an uneventful postoperative course and remained asymptomatic for the next 41/2 years. She was brought to the hospital with vomiting, fever and intermittent extrusion of tube since last 15 days. The child was mildly febrile without signs of meningeal irritation or peritonitis. The peritoneal end of the tube was protruding intermittently through the anal orifice and disappearing in colon. The shunt was still functioning. Patient was started intravenous fluids and broad-spectrum antibiotics. Her CT abdomen and pelvis revealed sigmoid perforation (Figure 1) due to VP shunt. At operation, tip of the VP shunt could not be felt on digital examination, therefore the entire shunt was removed without any difficulty by taking a small incision just below the chamber in neck. Cerebrospinal fluid (CSF) biochemical, microscopic analysis and culture revealed no evidence of meningitis. At the end of eight days CT scan of brain revealed dilated ventricles. A left sided VP shunt was done after four weeks and at subsequent follow-up of two years the child is doing well.

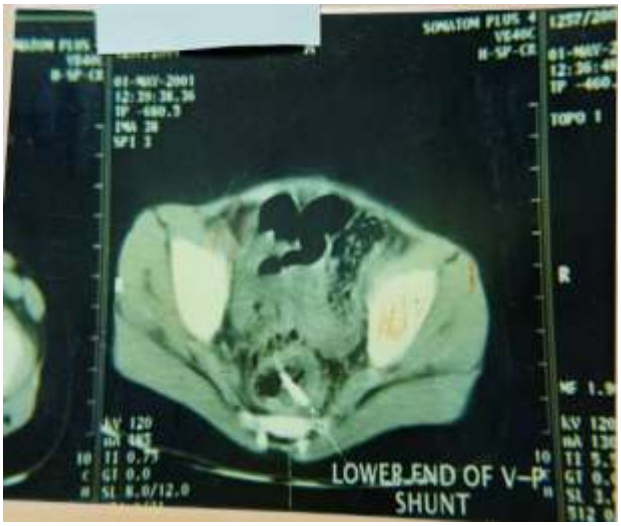

Figure 1: CT pelvis showing lower end of VP shunt in sigmoid colon.

Case 2

An eight-year-old child presented with VP shunt tube coming out of anus since last 12 hours (Figure 2). The patient was diagnosed as a case of tuberculous meningitis and was on anti-Koch's treatment. His VP shunt surgery was done eight months back. On general examination the patient's condition was satisfactory and his vital parameters were normal. The abdominal findings were normal and there was no neurological deficit. The patient's entire VP shunt was removed by taking a small incision just below the chamber in neck and is doing well at 12 months follow-up.

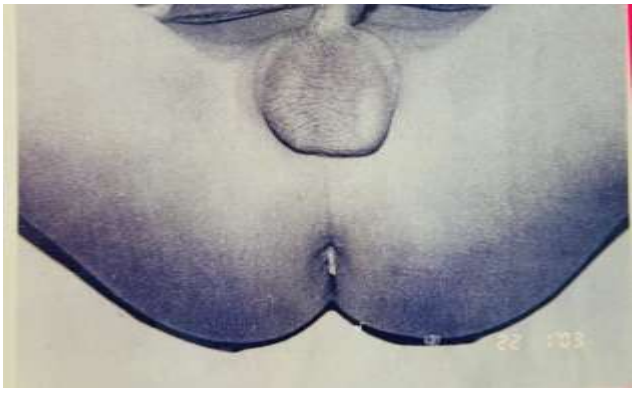

Figure 2: VP shunt protruding through anus.

Case 3

A seven-year-old male child was presented with abdominal pain and vomiting since last 24 hours. His VP shunt surgery was done 12 months back for tuberculous meningitis. On general examination the patient's condition was satisfactory and vital parameters were normal. Plain abdomen radiography revealed peritoneal end of the tube in the pelvis (Figure 3). The next day morning the child passed spontaneously entire VP shunt per anum. The patient was observed for the sign of peritonitis for 48 hours and then subsequently discharged.

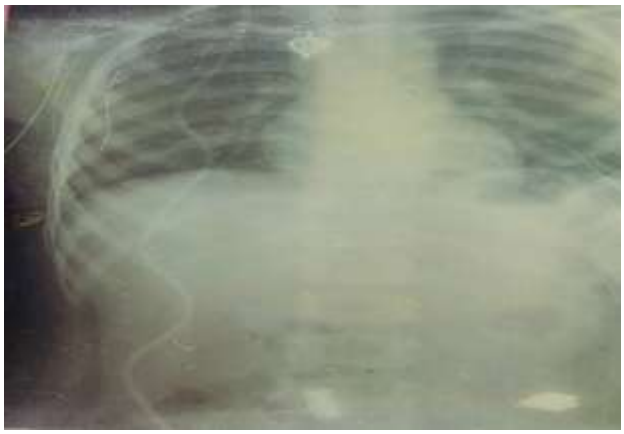

Figure 3: Plain chest and abdominal radiograph showing peritoneal end of VP shunt entering pelvis.

DISCUSSION

Ventriculoperitoneal shunt surgery has been associated with several abdominal complications such as bowel perforation, CSF ascites or pseudocyst, umbilical perforation, migration into scrotum, volvulus, bladder perforation and the extrusion of a peritoneal catheter have been reported through the anus, mouth, umbilicus, healed abdominal wound, vagina and urethra.[1-4]

Shunt migration is defined as the translocation of whole or part of the shunt with or without dysfunction.[5] The time interval between shunt insertion and migration varied from 12 days to 19 years. The migration can occur shortly after shunting within first few days or weeks after surgery. The risk decreases significantly after four years.[2] The abdominal complications are attributed to excess catheter length left in abdomen to decrease the need for shunt revision as the child grows.[4] Young children with previous infection related to shunt, restricted abdominal space, long catheter or weaker bowel wall with strong peristalsis are more susceptible for bowel perforation.[1] A malnourished kid is more vulnerable because there is less subcutaneous fat to hold the tube in place.[6] At present there is no consensus for the standard length of the catheter that should be left in the abdomen.

Colonic perforation of a VP shunt can be diagnosed easily when the tube protrudes through the anus (case 2). A plain abdominal radiograph may reveal peritoneal end of VP shunt tube going beyond the pubic symphysis.[7] In diagnostic dilemma, CT abdomen and pelvis may play an important role (case 1). It may be asymptomatic or present with symptoms and signs of meningitis, peritonitis or pneumocephalous.[1-10] In neurosurgical practise, distal catheter rarely exceeds 120 cm in length and maximum of 35 cm is introduced into the intra-abdominal cavity. Therefore, logically a catheter that protrudes through the anus would have perforation point

in the colon, if it remains connected or near the proximal catheter.[2] It is suggested that malnutrition, prior abdominal surgery and adhesions increase the rate of shunt migration.

The freely moving peritoneal catheter gets adherent to the serosa of a viscous and the bevelled end of tube coupled with continuous water hammer effect of CSF pulsations causes constant friction at the same site of bowel wall and eventually perforates the viscous after the peritoneal tube receives fibrous encasement.[3-4] The catheter migrates with colonic peristalsis and may cause intermittent extrusion of shunt per anum. Brownlee et al observed that the silicon tubing allergy may cause shunt complications including colonic perforation and replacement with a polyurethane system may obviate similar complications.[8] Spillage of bowel contents is not observed due to fibrous encasement of the peritoneal tube in the abdominal cavity.[6] Pulling of the catheter from the anus and administrating antibiotics with clinical observation is generally sufficient unless suspicion of peritonitis is present.[2] The anal protrusion of shunt is an opportunity for early diagnosis of bowel perforation and treatment.

There are several approaches for the management of cases with migrating distal shunt through the anus-[4] Minilaparotomy, exploratory laparotomy with repair of bowel perforation in case of peritonitis. Shunt removal and external ventricular drainage, antibiotics, followed by VP shunt or ventriculoatrial shunt, flexible colonoscopy and removal of shunt with sealing of perforation site using hemoclips.[9]

Migration of the shunt tube into the peritoneal cavity and its eventual extrusion (case 3) may also occur when there insecure anchorage of the ventricular catheter to the pericranium and the catheter migrates by gravity.[3,9] However, Shbani et al reported complex complication following VP shunt placement with two perforations in the jejunum and third perforation in the sigmoid colon which extended into the rectum. The shunt was removed at laparotomy and 30 cm of jejunum was excised with jejuno-jejunal anastomosis and the shunt's entry zone at the sigmoid was closed by sutures.[10]

CONCLUSION

The VP shunt procedure still remains the surgical procedure to treat hydrocephalus at all ages. Bowel perforation and anal shunt migration is a relatively rare complication following VP shunt surgery. It is recommended to conduct regular radiographic imaging in patients with deviation of symptoms. This condition may lead to serious life-threatening complications requiring urgent surgery. However, in few cases spontaneous extrusion of entire VP shunt may occur.

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