Case Report

A rare case of ventriculoperitoneal shunt knot causing intestinal obstruction in an adult

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ABSTRACT

Despite high incidence of complications, Ventriculoperitoneal shunting for hydrocephalus is the cornerstone and the most common neurosurgical procedure. Ventriculoperitoneal shunt knot causing intestinal obstruction is an extremely rare complication needing surgical intervention. A 19 years old male with history of VP shunting in infancy for hydrocephalus with no history of any revision surgery presented in emergency with pain abdomen and multiple episodes of vomiting for 2 days. X ray showed dilated bowel loops with a coiled up VP shunt in the abdomen. Exploratory laparotomy showed multiple dilated bowel loops with a loop of VP shunt around ileal segment with dense fibrotic adhesions causing obstruction. Extensive adhesiolysis was done. Procedure underwent uneventful. Patient recovered swiftly in postoperative period and is currently asymptomatic after 6 months of surgery.

Improved surgery skills and shunt design have prevented much of the morbidity of VP shunting. Most of the cases reported earlier were paediatric patients with history of repetitive handling of catheter. We believe this to be the first case of intestinal obstruction by a VPS knot in an adult with no history of manipulation after primary surgery. Due to low incidence it is difficult to clinically suspect such an extremely rare complication. Therefore, an awareness of VP shunt related complications in adult is essential.

Keywords: Adult, Intestinal obstruction, VP shunt, VPS knot

INTRODUCTION

Ventriculoperitoneal shunt (VPS) insertion is the most commonly done neurosurgical procedure worldwide and remains a cornerstone for management of hydrocephalus.¹ Each year, about 36,000 shunt related surgeries are performed in United States. Meticulous operative technique and improved shunt design have prevented much of the morbidity of the procedure in recent years.² 1 year complication rate of 28% has been reported in literature despite major advances in the procedure.³ The most common complications associated with the procedure include infections (caused by *Staphylococcus Epidermis*), shunt malfunctions

(obstruction or disconnection of the catheter) and failure of the valve mechanism of the shunt (leading to over and under-drainage of the ventricle). The common abdominal complications of VP shunt insertion include cerebrospinal fluid (CSF) ascitis, loculated cysts, hydrocele, infection, shunt extrusion, shunt migration, CSF leaks, viscous perforations, and extrusion of the catheter from the anus.^{4,5} Small-bowel obstruction caused by a spontaneous ventriculoperitoneal shunt knot is a severe and extremely rare complication which frequent leads to laparotomy with or without bowel resection.⁶

Only 15 cases of intraperitoneal knot formation causing intestinal obstruction to have been described. So here

authors present a case of a 19-year-old male who developed small bowel obstruction as a consequence of his Ventriculoperitoneal shunt inserted in infancy, admitted at a tertiary care teaching hospital in Uttarakhand, India

CASE REPORT

A 19 year old male was brought to emergency with pain in lower abdomen from 2 days associated with multiple episodes of non bilious and non projectile vomiting from 2 days. There was no history of malena, hematemesis, trauma and fever. There was no history of any similar complaints in the past. The patient has a history of obstructive hydrocephalus in his infancy for which patient underwent insertion of a VP shunt. General physical examination was normal.

On examination abdomen was soft, mild distension was present, there was mild generalized tenderness all over the abdomen but there was no guarding, rigidity, no palpable mass/ lump, no organomegaly, there was no shifting dullness, hernia sites were intact. No neurophysical deficit was detected during the primary assessment. On routine haematological and biochemistry investigations leucocytosis was seen with lymphocytic predominance. X-ray abdomen was done which showed dilated bowel loops with fecal matter and a coiled up VP shunt in the abdomen (Figure 1).

Figure 1: X-ray abdomen showing coiled up VP shunt with dilated bowel loops.

A provisional diagnosis of sub-acute intestinal obstruction was made. Initially managed with bowel rest and IV fluids later on planned for surgical procedure in view of no improvement by conservative management.

A neurosurgical consultation was done, and patient was then taken for operative procedure. Exploratory Laparotomy was done which showed minimal ascitic fluid in abdominal cavity. Dilated small bowel loops were seen along with multiple interbowel adhesions. On further exploration and removal of superficial bowel adhesions VP shunt catheter abdominal end was seen to form a loop around small bowel with dense fibrotic adhesions consistent with intestinal obstruction (Figure 2 and 3).

Figure 2: Adherent VP shunt around bowel loops.

Figure 3: VP shunt coiling around bowel loops, VPS knot.

Extensive adhesiolysis was done and shunt was dissected free from the bowel loops. A retrocaecal appendix was also found to be oedematous and appendectomy was also done which later on histopathology confirmed resolving phase of acute appendicitis.

Shunt function was checked on table and shunt was repositioned in abdominal cavity (Figure 4). NG tube was put in the anticipation that ileus would develop.

Postoperative period was uneventful, and patient was discharged on a normal diet after 1 week of surgery. Patient is currently in follow up and is currently asymptomatic after 6 months of surgery.

Figure 4: VP shunt separated from bowel loops and placed in abdomen.

DISCUSSION

VP shunt placement is the most accepted procedure in a case of hydrocephalus in infancy. Intra-abdominal complications are reported in 5-47% patients undergoing the procedure.⁴ Knot formation on the peritoneal catheter is one of the extremely rare complications of VP shunt insertion.⁷ Till date, there are a limited number of case reports available and only 15 cases of intraperitoneal knot formation with intestinal obstruction have been described in literature.⁸ The time interval from shunt placement to development of features of intestinal obstruction varied widely. Most of the times mechanical obstruction occurred during removal of the abdominal end of the catheter as a loop of the shunt tightened around the bowel loop.^{2,6} Experiments have shown that when the two ends of a catheter are fixed and moved in opposite directions there are chances of knot formation in the catheter but due to extreme slippery nature of peritoneum the chances of intrabdominal knotting are rare.⁷ Only one study in the available literature report a case of VP shunt inserted in a paediatric patient where knot formation presented in adult age with small bowel obstruction.¹ That too had multiple shunt revisions for recurrent hydrocephalus. So, authors believe this to be the first case of intestinal obstruction by a VPS knot in an adult with no history of manipulation after primary surgery which happened in infancy period.

Factors such as properties of shunt material used, and operative technique of the surgeon have been proposed to be the cause of intrabdominal shunts related complications.⁹ De Aquino et al, identified that the strong fibrotic reaction surrounding the shunt is the main

reason but what type of inflammatory mediators involved in this mechanism is not clear and it is still not proven that why this reaction is person specific.¹⁰ Also the mechanism of spontaneous knotting of the peritoneal catheter remains a matter of speculation. It has been hypothesized in previous literature that smaller diameter, longer catheter length, greater elasticity and crowded intrabdominal space are potential risk factors for spontaneous formation of knot in the peritoneal catheter.^{11,12} Though it is not proven consideration of these factors may help to reduce the intrabdominal complications in future. A novel approach for reducing intrabdominal complications by placing the VP shunt catheter distal end in the sub hepatic space is described by Pandey et al, and it was found that there was a significant lower rate of complications in the sub hepatic cohort.¹³ This technique would likely prevent intra-abdominal complications in a patient of VP shunt and might be a routine technique in future.

CONCLUSION

This case report clearly describes that there should always be suspicion when a patient presents no matter how earlier there is an insertion of prosthetic material in the body. Recognition is difficult because of the extremely low incidence of such a complication but these are serious complications that all neurosurgeons should bear in mind. Therefore, a perception of VP shunt related complications in adult is essential.

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