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A poignant odyssey of migrating distal end of ventriculoperitoneal shunt from inguinal canal to anal canal. An arduous situation

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ABSTRACT

Ventriculoperitoneal (VP) shunt procedure is the most commonly performed and widely accepted treatment method for hydrocephalus of any aetiology. Unfortunately, VP shunt is associated with varying complications beginning right from its ventricular end to the peritoneal end [1]. Here we present a challenging case of migrating distal end of VP shunt with its extrusion through the inguinal region, followed by per anal protrusion in the same patient. Scarcity of literature on sequential dual protrusion of the distal end of VP shunt in the same patient makes it a very uncommon case attracting our attention.

Keywords
hydrocephalous, ventriculoperitoneal (VP) shunt, inguinal shunt protrusion, per anal shunt protrusion, silicon allergy

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INTRODUCTION

Ventriculoperitoneal shunt is the mainstay of treatment for hydrocephalous but the complications rate is very high. After shunt placement, approximately 11-25% patients develop shunt failure within first year [2-5]. The number of shunt revisions and replacements is higher in pediatric patients than the adults [4, 5]. Most common causes of shunt failure are shunt obstructions followed by infection [5, 6] with infections causing early and obstruction/occlusion amounting to late shunt failures [7]. Other common complications include abdominal pseudocyst formation, spontaneous bowel perforation, inguinal hernias, liver abscess [8-10]. Rarer complications are extrusion of peritoneal end into the stomach, gall bladder, vagina, liver, urinary bladder, bowel, colon, diaphragm and scrotum [11, 12]

CASE PRESENTATION

Here is a case of an infant boy who presented to our department of Neurosurgery, super specialty block's outdoor with a large sized head and abnormal body movements. Radiology of head done which was suggestive of hypoxic-ischemic encephalopathy with dilated ventricles and multiple cysts in the brain. He underwent right VP shunt surgery at our center at the age of 2 months. After one month of the surgery he

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developed skin erosions of the abdominal wall over the catheter tract with obstruction of the distal end. Second surgery was done and distal end was revised with placement into the peritoneum via a fresh incision on the abdomen [Fig.1]. Two months later he presented with the distal end catheter tip extruding via the left inguinal region with a clear CSF coming through it (FIG.2a).

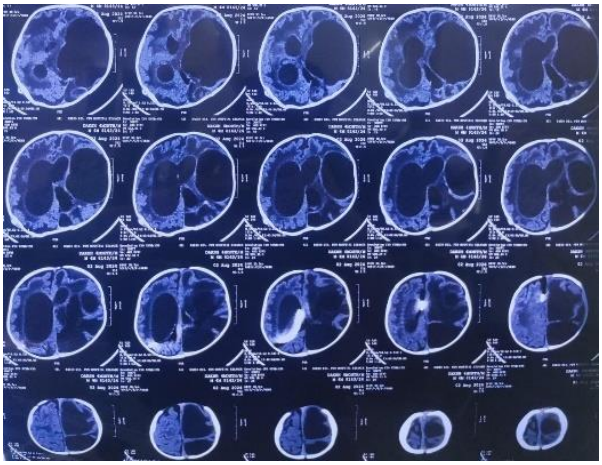

Figure 1. CT scan showing multiple cysts with right VP shunt catheter in right lateral ventricle.

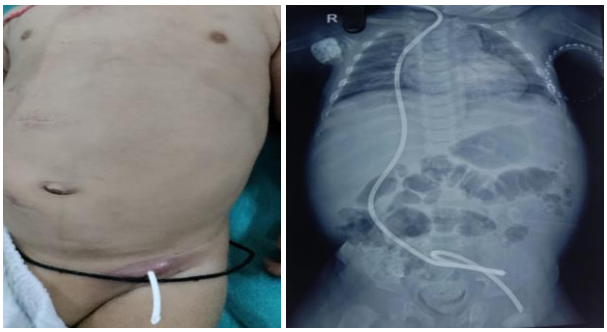

Figure 2. a) Clinical photograph of the same patient with distal end extruding out of the inguinal canal and dribbling of clear CSF. (b) X- ray showing shunt catheter in abdomen with distal end in left inguinal region.

Child was fully conscious but febrile. USG abdomen was done which showed catheter tip passing through left inguinal region with surrounding inflammation and sub-centemetric inguinal lymph nodes suggestive of cellulitis. Erect abdominal X-ray showed shunt tube in the abdominal cavity with distal end in left inguinal region (FIG 2b). CSF study was done and after ruling out the shunt infection third surgery was planned. Clavicular incision was given and distal end (extruded tip from the inguinal region) was pulled down. Left sided VP shunt procedure was performed. Whole assembly of the shunt was changed (Fig.3). Post op event was uneventful and child was discharged in a stable condition. Later after 3 months child presented with fever and extrusion of distal catheter tip per anal (Fig.4).

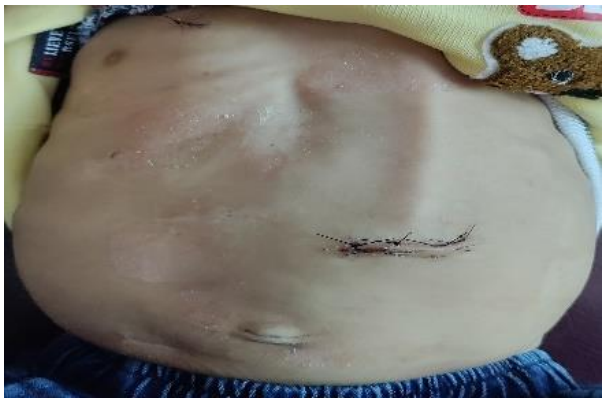

Figure 3. Clinical photograph with multiple healed scars of previous surgery and left abdominal incision of third surgery.

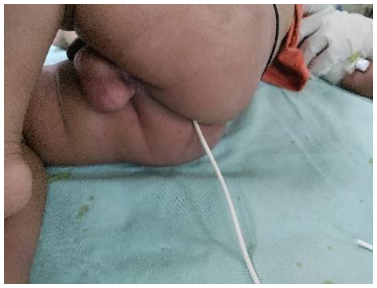

Figure 4. Photograph showing extrusion of distal end of the catheter through anus.

On examination child was conscious but irritable with dribbling of CSF from the extruded part of the VP shunt. There were no signs of meningeal irritation or peritonitis. Child was put on antipyretics and antiepileptics. Plain CT head showed ventricular end in the left lateral ventricle and the associated cyst with no ventriculomegaly on the right side (Fig.5). Child underwent fourth surgery. Skin incision given at the clavicle and shunt tube was divided. Extruded part was gently pulled out through the anus. Ventricular end was exteriorized and CSF was sent for culture and sensitivity. Empirical antibiotics were started. Child improved and after three sterile cultures, exteriorized part was clamped. There were no signs of raised intracranial pressure and anterior

fontanelle was lax. Ventricular end was removed and child was discharged in stable condition with regular follow-up advice.

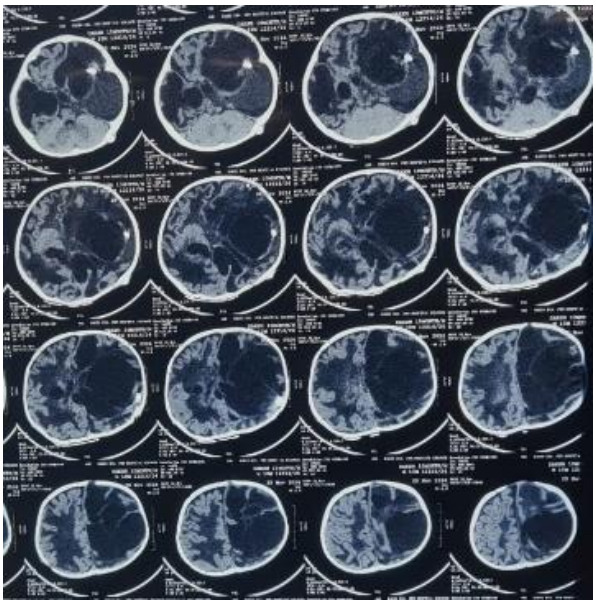

Figure 5. Computed tomography showing ventricular end in left lateral ventricle with no ventriculomegaly on right side.

Discussion

VP shunt surgery just like other operative procedures, is not free from complications. Extrusion of distal end of the catheter is a rare complication. To our knowledge no such case of dual extrusion of the shunt catheter in single patient has been reported till date making this a very unusual presentation. Majority of the cases present months after the surgery and most of the patients are asymptomatic until visualization of the extruded catheter from the skin or the natural orifice. Although the exact pathophysiology behind shunt extrusion is not well-established, but few mechanisms have been proposed [13]. Thin intestinal wall of children, stiff and pointed catheter end, use of trocars by the surgeon, infection, previous surgery and silicon allergy are the factors apart from others that could affect the incidence of shunt extrusion along with other abdominal complications [14, 15].

Wu et al. studied the Office of Statewide Health Planning and Development Database and found highest rate of shunt malfunction in neonates followed by children and then adults [4]. Children with early shunt complication had a greater odds of a subsequent complication[4]. Type of hydrocephalous was found to be the strongest independent risk factor for VPS complication with congenital and obstructive type having more risk than non-communicating type[4] . Low socioeconomic status and male gender were associated with increased risk of complications [4] .

Bowel perforation by the distal catheter tip is rare with a reported incidence of 0.1- 0.7% [16-18] although higher incidence have been reported by some series [19,20]. Majority of the cases of bowel perforation occur in children [17] which may be due to relatively thin bowel wall in infants, especially in children with myelomeningocele in whom bowel innervation may be insufficient [17]. Colon is the most common site of bowel perforation with per anal extrusion of the shunt catheter being the most prevalent symptom [21]. Different hypotheses have been proposed to explain this complication. Catheter stiffness in one of the factors causing perforation. G Muthoni et al. [20] compared the stiffness of three commonly used types of catheter, including Medtronic, Codman bactiseal and Chabra shunt catheters. They studied 197 shunted pediatric patients, out of them 6 patients developed perforation and all of them had Chabra shunts. This led to the conclusion that Chabra shunts to be the most stiff. Later on it was discovered through experiments that Chabra shunt catheters are the least stiff among the three but have the highest frictional force [20]. Distal catheter tends to be entangled in omentum at the site of perforation[22,23]. Increased frictional force of the catheter may promote its entanglement in abdominal tissues predisposing to bowel perforation [20] .

Silicon allergy may cause perforation through bowel as well as abdominal wall and other skin erosions around the catheter [22-24]. Patients with silicon allergy have history of recurrent shunt malfunction due to catheter obstruction. Symptoms resolve completely with replacement of distal catheter with the one made of polyurethane material [22, 24].

The reported incidence of inguinoscrotal complications is around 10-20% [25, 26, 27-29]. Increased intra-abdominal pressure is often implicated as a causative factor for inguinal hernias in patients with hydrocephalous treated with VP shunt [25, 26]. Abnormal neuromuscular function may also be factor responsible for these complications [27].

Conclusion

To summarize, extrusion of distal end of VP shunt is rare. Dual extrusion in single patient is further very unusual and to the best of our knowledge, there is no such case reported in the past. The odyssey of the migrating shunt is very painful both for the patient and the family. Out of the various proposed theories, we couldn't find the exact mechanism for shunt extrusion and its variable presentations. Complications associated with shunt extrusion like meningitis should be addressed promptly to reduce the morbidity and mortality associated with them. More research work is required to find out the factors causing extrusion and explain their unusual and unpredictable presentation among patients. We emphasize on lifelong follow-up and education of the patients/guardians who take care of them regarding the complications. Proper guidelines should be framed to deal with these complications promptly and adequately thereby reducing the associated morbidity and mortality.

Abbreviations

VPS: ventriculoperitoneal shunt,
NCCT: non contrast computed tomography.

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