
A CASE REPORT OF VP SHUNT COMPLICATION: VP SHUNT PROLAPSE IN HYDROCEPHALUS PATIENT

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ABSTRACT

Ventriculo peritoneal shunt (VPS) surgery is one of the common neurosurgical procedures employed in the management of hydrocephalus. Despite this procedure is quite common, there is a possibility of rare complications, such as the extrusion or prolapse of the VPS’s distal end. This case report reports highlight of VPS distal extrusion as a complication of VPS surgery. A 8-year-old male child, came with the distal end of the tube dangled from his intact abdominal wall with the only symptom was itching in the area where the tube came out. It is known that the patient had undergone VPS surgery 7 months ago due to hydrocephalus. Patient was performed VPS removal and then a new VPS was installed in the same side. The patient’s overall condition progressively improved after three days, and he was permitted to return home.

Keywords: Complication; Extrusion; Hydrocephalus; Prolapse; Ventriculo Peritoneal Shunt

Received: Month Year,

Accepted: Month Year,

Published: Month Year

INTRODUCTION

Ventriculo peritoneal shunt surgery is a standard procedure for managing hydrocephalus, particularly in children. Despite the availability of endoscopic third ventriculostomy (ETV), VPS is still a frequently performed procedure in routine practice (Teegala and Kota, 2012). Complications from this operation are uncommon, but they can still happen (Risfandi et al., 2022). Complications related to VPS are reported in approximately 24%–47% of cases, with abdominal issues occurring in 10%–30% of cases. The most prevalent complication are shunt infections and malfunctions. Migration and extrusion of the VPS’s distal end are comparatively rare events (Chugh et al., 2018). Prior to this case report, there was no available data estimating the incidence and prevalence of VP shunt complications in Indonesia (Ashari et al., 2021). This case report highlights of extrusion

of the distal VPS catheter through the intact abdominal wall.

CASE

Left side VPS surgery was performed in 8-year-old male child, who was diagnosed with hydrocephalus by a local neurosurgeon. Imaging findings showed hydrocephalus (Figure 1). VPS surgery were carried out 7 months before admission using the Medtronic VPS kit burr hole 22 mm with medium pressure. The pump is made from polypropylene (plastic) with a silicone membrane and the catheter tubes are containing barium tantalum to allow X-ray visualization. Unfortunately, a detailed report of the surgical procedure was not available.

Around five months later, child’s parents notice there was redness in the stomach area about 5 cm above where the operation was performed and the child said it felt itchy so he often scratched that area. Within a month, the

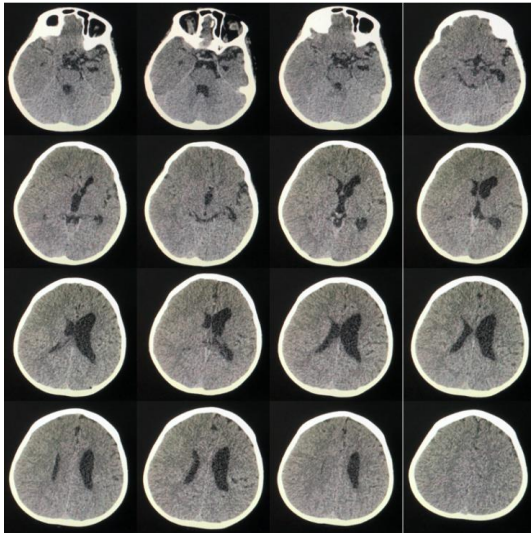


Figure 1. CT-scan non-contrast show hydrocephalus

redness became more prominent and as time went by, the lump burst and the tube was visible protruding. The patient's parents said they only applied anti-itch ointment that she bought at the pharmacy without consulting with a doctor. Without realizing it, the distal tube ended up dangling from the child's stomach. The child was immediately taken to the emergency department. Other complaints such as fever, nausea, vomiting, stomach pain, and diarrhea are denied. This patient had no history of abdominal trauma, anemia, or malignancy prior to the complaint.

Physical diagnose: GCS 15, BP 98/65 mmHg, HR 123, RR 19, T 36.8°C, SpO₂ 98% on room air, BMI 13.9 (normoweight with lower limit percentiles). General survey showed no abnormalities on his physical examination except for the distal VPS that dangles from the intact anterior abdominal wall (left lumbar region) approximately 5 cm above the scar from previous VPS surgery with an erythematous, oval-shaped wound (approximately 3 cm in size) and there is clear CSF leak from the tube (Figure 2). Neurological examination showed physiological reflex normal and no pathological reflexes. In biochemical evaluation showed normal hemoglobin (12.9 g/dL), hematocrit (40%), and erythrocyte (5.4 million/uL), but leukocytosis (16.800/uL) and thrombocytosis (555.000/uL) were found.

The drawback in this case report is that there is no data on overall examination results, whether physical examination of the abdomen, abdominal X-rays, or a history of other disease that are not listed in the patient's medical record. Critical details about the first surgery, including the distal catheter route, operative techniques, and postoperative care, is unknown, since it was done by other neurosurgeon in different hospital.

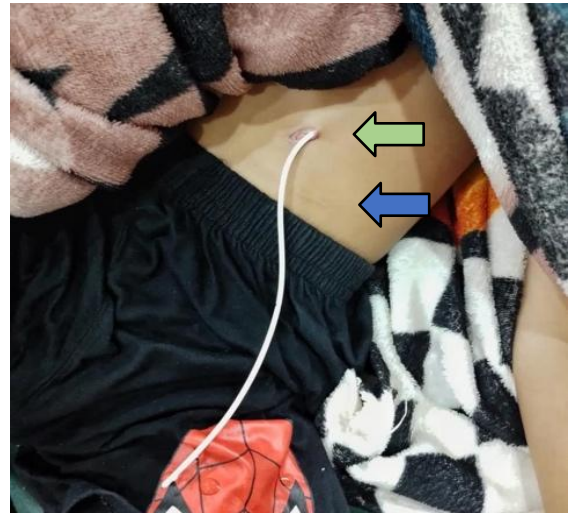


Figure 2. The distal catheter tube hanging out of the intact abdominal wall; the site of extrusion was 5 cm (green arrow) from the previous incision (blue arrow).

Neurosurgeon diagnosed with shunt exposed due to post VPS hydrocephalus, and treated with antibiotic cefotaxime 2x500 mg IV and metronidazole 3x350 mg IV was given before surgical replacement of the shunt.

Two days after admission, he was performed VPS removal by means the extruded VPS is removed by pulling out the dangling end of the distal tube of the peritoneal shunt, then a new VPS was installed at the location of the previous VPS surgery scar but carried out using a different route than before. The VPS used currently is the same as the VPS used previously, that is Medtronic VPS kit burr hole 12 mm with medium pressure (9040 B). The surgery went well and the post-operative course was uneventful. Throughout the hospital stay, prophylactic antibiotic medication was

maintained. The patient's overall condition progressively improved after three days, and he was permitted to return home.

DISCUSSION

Hydrocephalus is common condition among children which can be caused by mechanisms that disrupt the balance of cerebrospinal fluid (CSF) absorption and production, necessitating CSF diversion (Bramall et al., 2022). There is no optimum approach for CSF diversion, yet VPS surgery remains a generally accepted method of controlling hydrocephalus, including infections, cyst formation, bowel perforation, tube migration into various areas such as the pleural cavity, liver, heart, anus, vagina, and abdominal wall. Most of these complications are documented through single case reports (Teegala and Kota, 2012).

Distal VPS extrusion is a serious problem, but the exact cause is still unknown (Allouh et al., 2017). Kanojia et al. found that distal VPS migration and extrusion contribute for around 10% of all VPS complications. Extrusion of the distal VPS might manifest differently in each case. The catheter may penetrate through the gastrointestinal tract to exit either transanally or transorally, or it can pass through hollow viscera (such as the stomach, intestine, heart, and bladder). It can also pass through an intact or potential weakness in the abdominal wall, such as the umbilicus or inguinal canal (Risfandi et al., 2022). As in this patient, the catheter came out and dangled from the intact abdominal wall.

According to Allouh et al., extrusion of the distal VPS through the body wall can be caused by focal wound opening, poor host immunity, patient age, the length of the distal catheter within the peritoneal cavity, improper surgical technique, or ischemic necrosis of the dermis. These factors can also increase the risk catheter extrusion due to adhesions formed from infections. Akyus et al. proposed that the catheter tip sticks to the visceral wall and causes local inflammation that weakens the bowel wall over time, eventually causing the tip to erode into the

lumen. This situation is usually accompanied by continuous pressure from the extruding surface or the viscera against the catheter tip, which makes migration through the abnormal site easier (Chugh et al., 2018).

In children, due to the weaker musculature of the bowel, they are more prone to intestinal perforation (Chugh et al., 2018). For example, the majority of distal VPS migration recorded in the literature have happened during early childhood, possibly because the musculature in the literature have happened during early childhood, possibly because the musculature is still developing at this time, which may make it easier for a catheter to pass through the body wall or viscera (Allouh et al., 2017). As in this patient, VPS installation is carried out in 8-year-old child who may have weak musculature so that it can facilitate catheter extrusion through the viscera or body wall. The The normoweight BMI was found at the 5th percentile according to the CDC (2023) curve in this patient. The normoweight percentile range in children is 5th to <85th, this indicates that in this case the patient is in normoweight category but in the lower limit percentile which is close to the underweight figure. This might be a risk factor for VPS extrusion in this patient.

Thrombocytosis refers to an elevated platelet count often observed in chronic myeloproliferative disease or a as response to infection, inflammation, or hemorrhage (Rokkam et al., 2023). Similarly, leukocytosis typically signifies an underlying inflammatory, infectious, or neoplastic condition (Fellin, 2008). As in this patient, leukocytosis and thrombocytosis were found, which could indicate an infectious or inflammatory process that may be related to the extrusion of the VPS in the patient.

Sridhar et al. suggested that distal VPS extrusion might be related to the stiffness of the type of catheter used. The use of softer and more pliable catheter reduces the incidence of distal VPS extrusion, supporting this notion. Furthermore, longer catheters are more prone to migration and

extrusion compared to shorter ones (Allouh et al., 2017). The higher complication rates are attributed to the sharp tip located at the catheter's distal end (Dağtekin et al., 2011). In this patient case report, a 12 mm burr hole VPS kit is used which is made from polypropylene (plastic) with a silicone membrane containing barium tantalum which is non-kinking so it's more flexible (Medtronic, 2018). In this patient, because the tube used is flexible, this will reduce the incidence of distal VPS extrusion. Unfortunately, there is no detailed data about previous VPS surgical procedures, this makes it quite difficult to identify in terms of surgical technique.

In this case that the distal catheter of a VPS spontaneously and replacement of the entire shunt system are necessary (Allouh et al., 2017). Pus should be drained, if present. If the patient exhibits signs of elevated intracranial pressure, intermittent drainage of CSF may be performed using an external ventricular drain (EVD) or regular taps (Chugh et al., 2018). According to Nicolau et al., when a powerful anaerobic medication like metronidazole is combined with a third-generation cephalosporin that exhibits strong activity against common aerobic organisms associated with intra-abdominal infections, the antibacterial activity is enhanced and the pharmacodynamic profile of both agents is optimized throughout the dosing interval in comparison to conventional single agents. Combinations such as cefotaxime and metronidazole show superior activity against *Escherichia coli* which is a Gram-negative bacteria's that grow optimally under aerobic conditions. As in this case, the patient was treated with antibiotic cefotaxime 2x500 mg IV and metronidazole 3x250 mg IV before performing surgical replacement of the shunt.

Serial CSF sampling is then conducted until two consecutive negative culture results are achieved. Subsequently, insertion of a new shunt system can be undertaken (Allouh et al., 2017). A culture investigation of the CSF was not performed in this patient due to the limited availability of culture facilities in

the hospital, as well as the absence of signs of infection in the patient's catheter (clean CSF). If a culture is performed, the wait for the findings will be relatively long, whereas the patient demands rapid VPS installation.

To avoid spreading infection from the extrusion site, do not pull the distal end towards the proximal end when removing the extruded shunt. A laparotomy is not required to remove the VPS catheter if there is no peritoneal or skin infection. If there is adhesion of the catheter to peritoneal components or if peritonitis is present, laparotomy becomes essential. After completely removing the previous shunt system, a new shunt system can be inserted during the same procedure (Allouh et al., 2017). However, if the shunt tract is contaminated, it is advisable to insert the VPS from the opposite side and administer a course of intravenous antibiotics (Allouh et al., 2017; Chugh et al., 2018).

Preventive strategies, such as secure catheter fixation and patient education on early complication signs, should be discussed to enhance clinical value. To prevent distal catheter migration in ventriculoperitoneal (VP) shunts, consider these evidence-based strategies. Use neuronavigation for precise proximal catheter placement. This minimizes misalignment and stress on the system. Employ laparoscopic techniques for accurate placement of the distal catheter, such as the perihepatic (falciform ligament) approach, which stabilizes the catheter and reduces migration rates (Isaacs et al., 2021).

Shunt infection prevention protocols: implement protocols to reduce infection, as infections can contribute to mechanical complications. Combining these approaches has significantly reduced catheter-related complication in clinical studies (Isaacs et al., 2021).

As in this case, there is a limitation namely that there is no data on overall examination results for physical examination of the stomach and abdominal x-ray, so it cannot evaluate the abdominal condition in

detail, whether the catheter from the VPS causes microperforations in the organs in the abdomen or whether the catheter has migrated to other organs. The patient's VPS was removed without laparotomy, and a new VPS was installed at the site of the previous VPS surgery scar but carried out using a different route. The route used for the subcutaneous tunnel was more lateral (± 2 cm) than before, but the proximal and distal catheter positions remain the same. This was performed to the basis that the distal VPS extrusion was not located in the previous VPS surgical wound.

CONCLUSION

VPS surgery is associated with various complications, especially in the abdominal area, one of which is migration and extrusion of the distal end of the VPS. Risk factors in this case could be young age and poor immunity due to the patient's BMI being close to underweight. Removal of the old VPS and reinstallation of the new VPS must be performed with a negative CSF culture before the VPS is reinstalled. In this case, due to limited hospital facilities and the absence of signs of infection in the CSF (clear CSF), this examination was not carried out. VPS was reinstalled on the same side as before, this was because the VPS extrusion was not located in the previous VPS surgical wound, the only difference was that the catheter tube insertion route was located in the previous VPS surgical wound

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