Subcutaneous Migration of Distal Ventriculoperitoneal Shunt Catheter in Morbidly Obese Patients: Two Case reports

Sara Aljohani (1), **Khalid Mahrous** (2), **Ahmed AlJohani** (3), **Luma Qutub** (3), **Layan Kutub** (4), **Raghad Alhajrasi** (1), **Hussam Kutub** (5), **Abdulrahman Mohammed AlAhmadi** (2)

(1) College of Medicine, King Saud Bin Abdulaziz University for Health Sciences, Jeddah, SA
(2) College of Medicine, Taibah University, Madinah, SA
(3) College of Medicine, Batterjee Medical College, Jeddah, SA
(4$ College of Medicine, Fakeeh College for medical science, Jeddah, SA
(5) Department of Neurosurgery, King Abdulaziz Medical City, Jeddah, SA

Corresponding Author:
Hussam Kutub M.D.,
Department of Neurosurgery,
King Abdulaziz Medical City, Jeddah, SA.
Email: hussamkutub@yahoo.com

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Abstract

Background: VP shunt failure due to distal catheter migration is an uncommon complication mainly associated with increased intra-abdominal pressure related to obesity.

Observations: We report two cases of morbidly obese patients who presented with recurrent distal catheter migration and pseudocyst formation in the subcutaneous space less than a month following VP shunt placement for the management of hydrocephalus.

Conclusion: Special attention must be given when placing a VP shunt in morbidly obese patients. There are various methods to prevent tube migration in such patients, like using a longer catheter tube, tight closure of the peritoneum while placing the catheter between the fat and abdominal muscles, using a hernia patch, and using laparoscopic techniques. We advocate for using different surgical procedures in obese patients prophylactically to avoid VP shunt failure and distal tube migration in patients with associated risk factors.

Keywords: Shunt Complication, Subcutaneous Migration, Ventriculoperitoneal Shunt, Obesity

Introduction

Introduction: Ventriculoperitoneal shunt (VP) is a standard procedure in neurosurgery [1]. It is considered superior management for hydrocephalus [2]. Hydrocephalus is defined as active distension of the brain's ventricular system resulting from impaired CSF flow [3]. The VP shunt placement complications include malfunction of the shunt, perforation caused by the shunt, and shunt infection. One of the complications of VP shunt is recurrent migration of the distal tube and coiling under the skin [4] or other anatomical cavities such as the thoracic wall or subgaleal space [1]; this prevents the proper drainage of the CSF to the abdominal peritoneal cavity [4]. The cause is still not understood, but there are risk factors that contribute to migration, such as vigorous head movement leading to dragging of VP shunt from the peritoneal cavity to the proximal subcutaneous area, scalp and skin movability, increased intraabdominal pressure, and using hydrogel covered catheter leading to low friction and sliding [1, 5]. This report describes two cases of recurrent migrations of VP shunt in obese patients.

Case Presentation 1

Case 1: 76 year old female known case of hypertension and diabetes on metformin with a body mass index (BMI) of 42.89. Complaining of headache for the last 5 years, progressive in nature and intensity with occasional dizzy spells, not associated with vomiting, loss of consciousness, seizures, bladder incontinence, memory loss, or gait disturbance. On examination she was neurologically intact. MRI of the brain showed intraventricular ependymoma, in addition to mild to moderate supratentorial hydrocephalus; thus, A VP shunt was placed with a right parietal approach. A transverse abdominal incision was made above and lateral to the umbilicus followed by dissection of subcutaneous fat. Then, the posterior rectus sheath was pulled up, the facia was incised, and a 30 cm peritoneal catheter was inserted into the peritoneal cavity and connected with the proximal catheter. The patient tolerated the procedure well with no complications. On the 6th post-operative day, the patient presented to the emergency department complaining of dizziness for 2 days associated with severe vomiting and vague abdominal pain. Imaging studies revealed displacement and looping of distal catheter forming a cyst within the abdominal wall (Figure 1,2). Thus, revision of the distal peritoneal catheter was done, and the tube was found looped around within the fat layer of the abdominal wall causing a seroma. Distal catheter patency was tested and found to be functioning well. The tube was placed back into the abdomen. Upon closure it was hitched to the fat and sutured from the outside to the rectus sheath to prevent further dislodgement. Post-operative imaging revealed the catheter was in place at the level of the right iliac fossa. The patient's symptoms improved and she was discharged clinically and vitally stable.

Figure 1: Abdominal x-ray (supine): shows the distal catheter tube coiled at the right side of the abdomen. Multiple surgical clips noted in the upper pelvis related to the previous surgery.

Figure 2: Abdominal CT with contrast: sagittal view shows misplaced distal tip of the VP shunt, with surrounding fluid collection at the anterior abdominal wall.

Case Presentation 2

A 43-year-old female known case of left Petroclival meningioma with a BMI of 46.05. She presented to the clinic with a 10 day history of headache, nausea, and vomiting without blurred vision or decreased level of consciousness. She was found to have obstructive hydrocephalus secondary to meningioma. Subsequently, a right VP shunt was placed, and post-operative recovery was uneventful. On the 10th day, she presented to the ED complaining of unsteady gait, alternate weakness of upper limbs, and numbness of the right side of her face. Imaging studies revealed cavernous thrombosis and she was started on warfarin. A VP shunt x-ray showed right sided parietal VP shunt with the tip located in the abdomen with no area of kinking or cut off (Figure 3). Two weeks later, the patient came to the clinic with a large abdominal swelling under the incision measuring 15 cm x 15 cm. Abdominal CT reported a shunt displacement into the subcutaneous tissue and a large CSF pseudocyst (Figure 4). Thus, shunt revision was done for peritoneal catheter repositioning and CSF-collection drainage. Afterward, the patient presented to the ED on the 19th day post 1st revision complaining of right upper anterior abdominal wall swelling at the site of the scar from the previous surgery with the size of 8x8 cm. She had no symptoms of increased intracranial pressure and a CT abdomen showed distal catheter outside the abdominal cavity (Figure 5). Hence, a second shunt revision was done for evacuation of the abdominal pseudocyst. The distal catheter was removed, and 80 cm peritoneal catheter was placed under the abdominal fat and inserted into the peritoneum. The shunt worked well, and the patient was discharged.

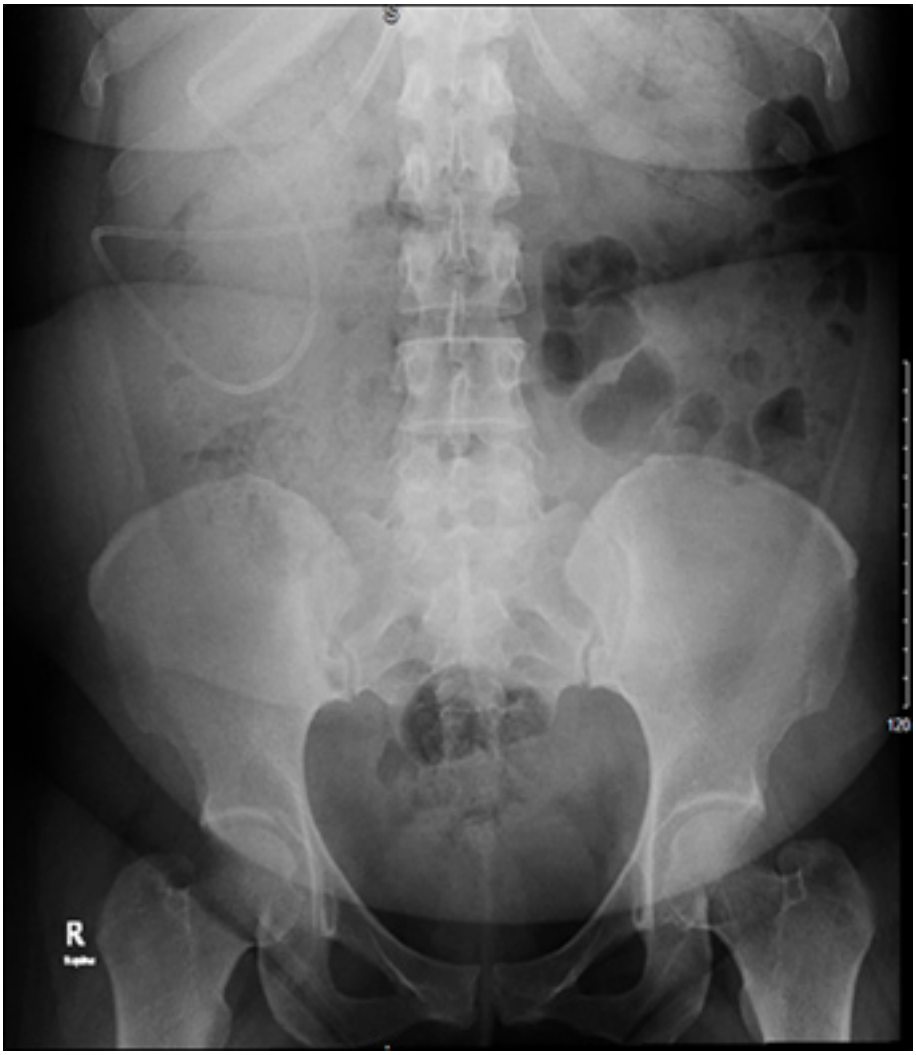
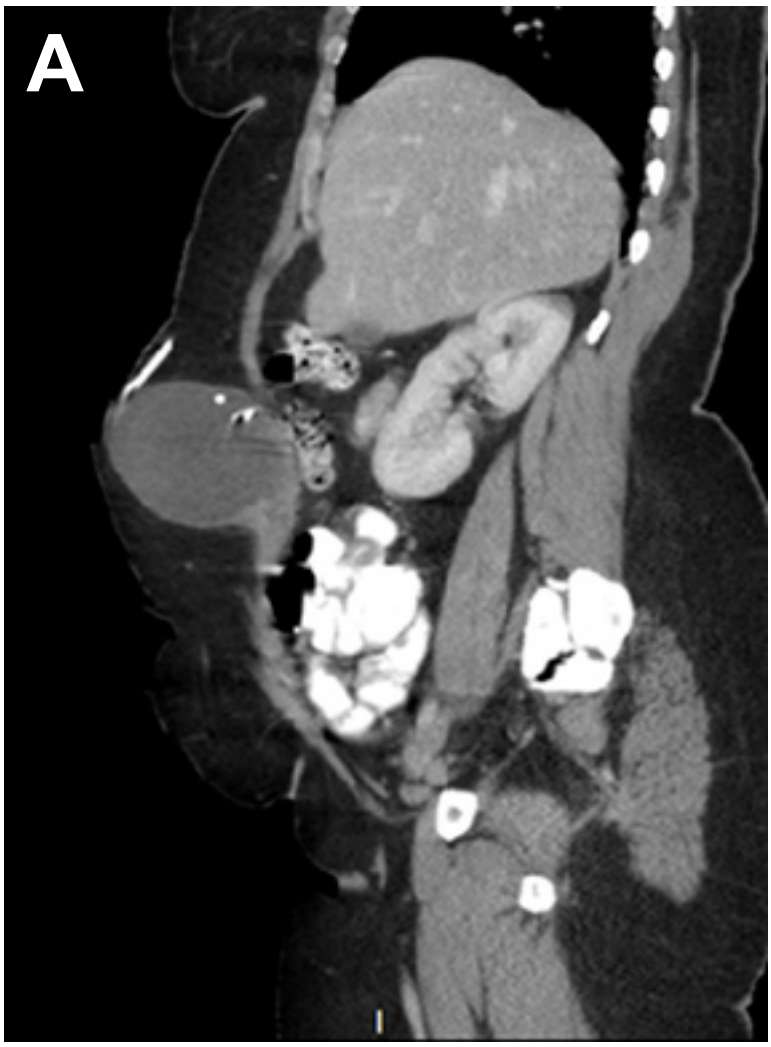


Figure 3: Abdominal X-ray: shows distal catheter tip in the abdomen. Image of rectum represents constipation.

Figure 4: Abdominal CT with contrast: shows The VP shunt terminating in the subcutaneous tissue with a large CSF pseudocyst



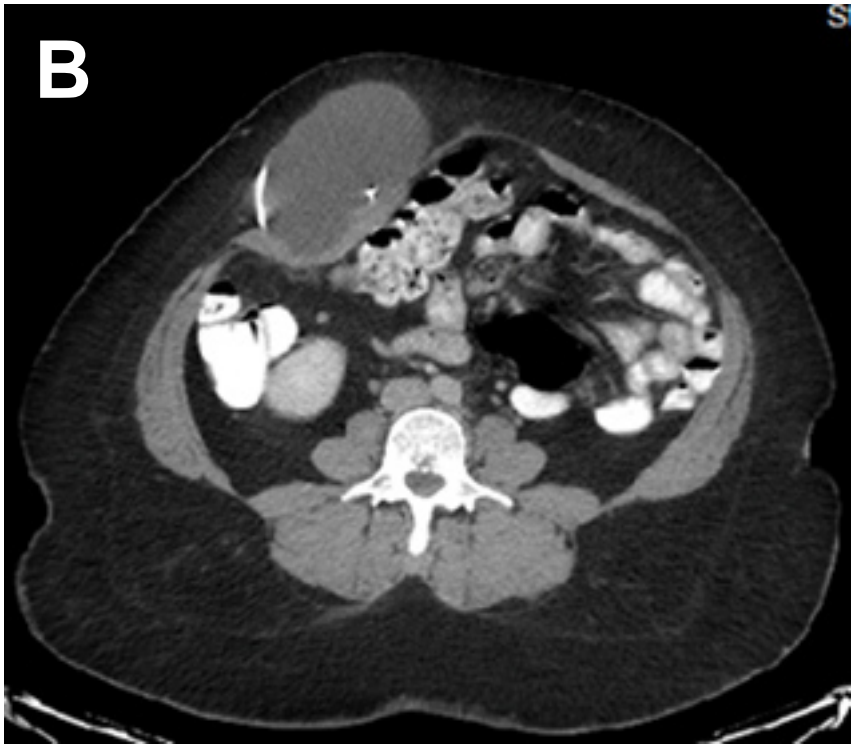


Figure 5: Abdominal CT with contrast shows the distal tip of the VP shunt is terminating in the subcutaneous tissue of the mid abdomen forming a large CSF collection with no intra-abdominal extension. Axial view of the abdomen (A) Sagittal view (B) show the tip of the catheter at the right anterior abdomen with a large pseudocyst that formed at the tip of the catheter and measures 9.6 x 5.6 cm.

Discussion

Literature review: Migration of a ventriculoperitoneal shunt catheter is an uncommon complication with no known cause; however, several theories are speculated. The most accepted theory attributes increased intra-abdominal pressure to distal catheter migration via gradually pushing out the catheter through the peritoneum and into the subcutaneous space [6]. Morbid obesity is a known cause of increased intra-abdominal pressure leading to catheter retraction into the subcutaneous tissue and pseudocyst formation. Several reports describe the association between obesity and shunt migration [1,5-10]. In addition to obesity, Lee C et al. described a case of VP shunt migration probably due to increased intra-abdominal pressure because of chronic bowel distention [4]. Another mechanism, reported by Nakahara et al., suggests that catheter migration could be due to abdominal fat pad shift that drags the tube upward when going from sitting to standing position [5].

Multiple reports described surgical techniques to prevent this complication [6,8,10]. Many advocated for using laparoscopic procedures to place the distal catheter because it decreases complications and lowers the rate of future revisions [8,10]. Morrison et al. reported successful use of a hernia patch to anchor the catheter, thereby increasing friction and reducing catheter sliding into the subcutaneous tissue [6]. Moreover, Nagasaka et al. explained that careful placement of the distal catheter between the subcutaneous fat and abdominal muscles with tight closure of the peritoneum is sufficient to prevent migration [1]. Another method reported by Couldwell WT et al., detailed inserting an extended length tubing (120cm) for children to avoid needing future lengthening procedures as they grow. The authors stated no increase in complications and explained that the extra length could theoretically decrease the possibility of pseudocyst formation because the catheter would be moving freely within the peritoneum [11].

Observations: In the first case we placed the catheter between the abdominal fat and muscle layers in addition to suturing the tube to the rectus sheath muscle from the outside, anchoring it to the abdominal wall, while, in the second case, we described using a longer distal catheter tube to overcome the effect of fat pad shifting and dragging of the catheter. Follow-up with both our patients revealed that the techniques we used were sufficient in maintaining the catheter in place, and likely prevented further migration.

Conclusion: VP shunt failure due to distal catheter migration is an uncommon complication mainly associated with increased intra-abdominal pressure related to obesity. The present cases suggest that we need to implement extra precautions when performing a VP shunt placement for obese patients to prevent unnecessary revisions. However, more studies need to be conducted to evaluate the best method to prevent distal catheter migration in obese patients undergoing VP shunt placement.

Disclosures:
None of the authors have perceived conflict of interest related to the manuscript or its subject matter.

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