

Case Report

Rare complication of ventriculoperitoneal shunt: Catheter protrusion to subcutaneous tissue – Case report

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Abstract

Background: Ventriculoperitoneal (VP) shunt is a day-to-day procedure performed by a neurosurgeon. The most frequent associated complications are obstructive and infectious. Although rare, there are well-reported complications related to the poor positioning of the distal catheter, with perforation of organs and tissues. Still rarer are the complications related to the migration of this catheter.

Case Description: We describe an atypical case of VP shunt postoperative by normal pressure hydrocephalus. After well-documented proper positioning of the distal catheter into the intraperitoneal cavity, it protruded into the subcutaneous space. Even on a new documented satisfactory abdominal tomography, this catheter migrated back again to the subcutaneous tissue.

Conclusion: We did not find plausible explanation for this rare event.

Key Words: Catheters, cerebrospinal fluid shunts, normal pressure hydrocephalus, postoperative complications, surgically-created structures, ventriculoperitoneal shunt

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INTRODUCTION

Placement of a ventriculoperitoneal (VP) shunt is the most common treatment for hydrocephalus.^[6] It is a routine, common, and effective procedure in Neurosurgery.^[2] Complications of VP shunts may occur anywhere along their course from the cerebral ventricle to the peritoneal cavity.^[6] Valvular dysfunction secondary to the obstruction of proximal catheter is relatively frequent in the emergency room. However, non-infectious obstruction of distal catheter is exceptional.^[9] Rare complications such as migration of the peritoneal catheter into the stomach, liver, gallbladder, vagina, scrotum, bladder, bowel, colon, pulmonary artery, diaphragm, cardiac ventricle, cervical area, umbilicus, rectum, anus, and mouth have been described in the literature. We

report a case of a male patient with normal pressure hydrocephalus (NPH) submitted to VP shunt. The distal catheter protruded from the intraperitoneal cavity and lodged in the subcutaneous tissue, leading to collection of cerebrospinal fluid (CSF). The same thing occurred after another surgery for catheter repositioning. During both times, control computed tomography (CT) scans

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had recorded proper positioning of all shunt systems. This unusual complication is extremely uncommon. According to our records, there is no case cited in the past.

CASE REPORT

A male patient, 63-year-old, with no known comorbidities and a cocaine user, presented with over 1 year of classic triad of dementia, urinary incontinence, and ataxia march. The diagnosis of NPH was confirmed by CT scan, with Evans index of 0.62, as shown in Figure 1. Therapeutic test (tap test) was positive for improvement of symptoms after 50 mL drain of CSF by lumbar puncture. He was submitted to ventriculoperitoneal shunt uneventfully. In our hospital, we routinely perform CT scans of the skull and abdomen as postoperative control, and both showed the entire system to be positioned properly [Figures 2 and 3]. However, on the second postoperative day, the patient presented with clinical worsening, with recurrence of early symptoms, and an abdominal collection was identified by superficial palpation. New

abdomen CT identified the distal catheter protruding from the peritoneal cavity and housed beneath the subcutaneous tissue, producing a collection of CSF, as shown in Figure 4. During further surgery to reposition the catheter, it was identified immediately below the skin after the incision, and no other pathological findings were noteworthy [Figures 5 and 6]. The shunt was otherwise functioning, however, there was a subcutaneous collection filled with a turbid CSF. New control CT showed the catheter well positioned in the peritoneal cavity [Figure 7] and the patient symptoms improved. However, again 2 days after the last surgery, a superficial collection in the abdomen was identified, similar to the previous event. Another CT scan suggested the same event, with prolapsed and allocated catheter in abdominal subcutaneous and a collection of CSF, as illustrated in Figure 8. New surgical repositioning of the entire DVP system was performed uneventfully, with appropriate control scans [Figures 9 and 10].

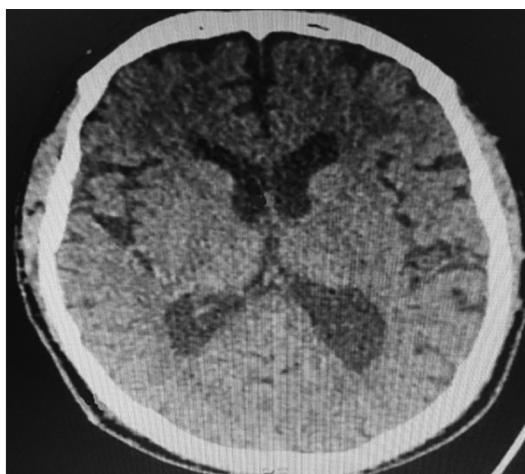


Figure 1: Computed tomography scan showing Evans index of 0.62, confirming the diagnosis of normal pressure hydrocephalus

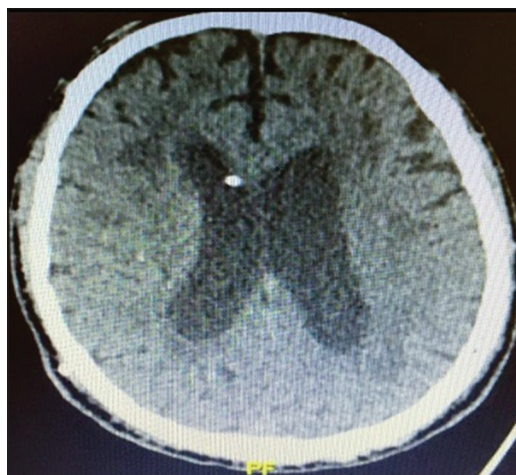


Figure 2: Computed tomography scan after ventriculoperitoneal shunt with the catheter well positioned in the anterior horn of the right lateral ventricle



Figure 3: Abdomen tomography after ventriculoperitoneal shunt with the catheter well positioned in the peritoneal cavity

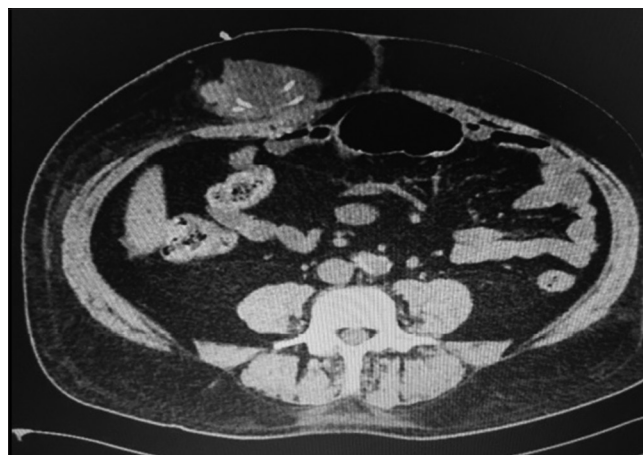


Figure 4: Abdomen tomography two days later, with the catheter lodged in the subcutaneous tissue, and cerebrospinal fluid collection in the same space

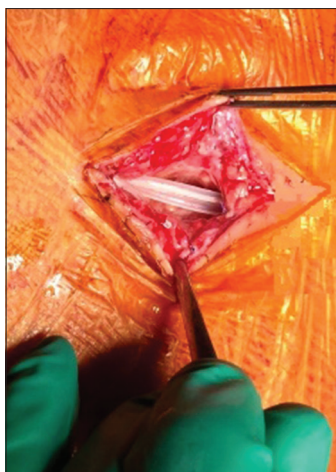


Figure 5: Aspect of coiling of the distal catheter after opening the abdominal incision



Figure 6: Distal catheter functioning wrapped in the subcutaneous space resulting in collection of cerebrospinal fluid

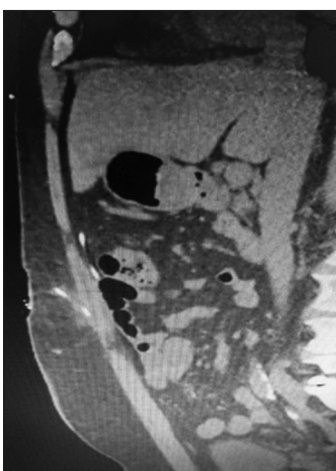


Figure 7: Abdomen tomography after repositioning of the distal catheter spread into the peritoneal cavity with no other complications

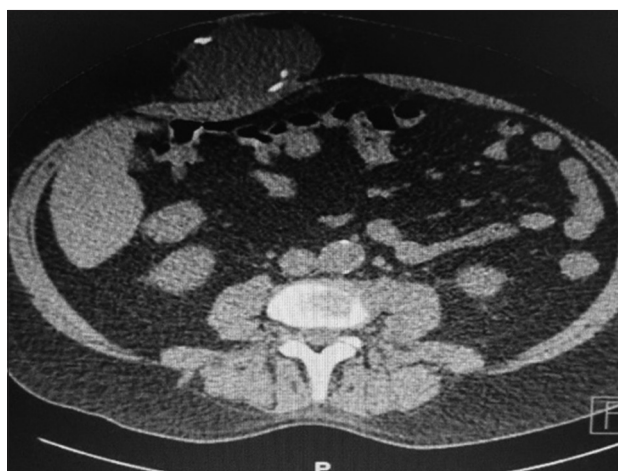


Figure 8: Abdominal tomography 2 days after the second surgery demonstrating new protrusion of the catheter from the peritoneal cavity into the subcutaneous space

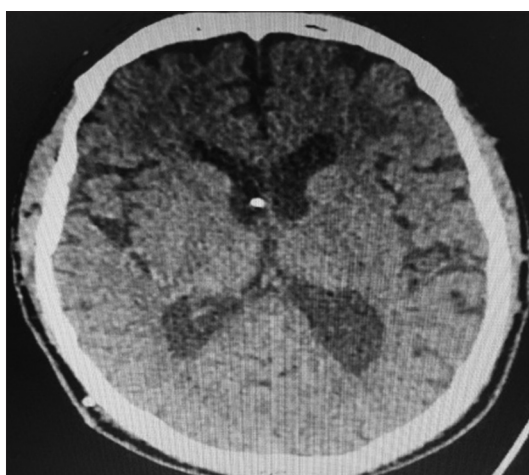


Figure 9: Final control CT scan, with the ventricular catheter in the proper position



Figure 10: Final control abdomen tomography, with the peritoneal catheter in proper position

The patient was discharged on the fifth postoperative day of the second surgical shunt revision. No further problems were noted during regular follow-ups at the outpatient office, with significant clinical improvement in gait and bladder control, although with no marked cognitive improvement. CT scan showed reduction of brain ventricles globally. He had clean and dry operative wounds, functioning valve to palpation; and the abdomen flat, flaccid, and not painful on palpation.

DISCUSSION

Infectious and obstructive are the most frequent complications after shunt surgery.^[1,8] Other types are less common, and eventually occur due to technical errors during brain ventricular puncture, opening the intraperitoneal cavity and the catheter tunneling between the two points.

There are several cases reports of distal catheter migration to cardiac ventricle.^[2] The hypothesis is an incidental perforation of internal jugular vein during tunnelization, added to negative inspiratory pressure and orthograde, as well as slow blood flow that may draw the catheter proximally through vein and eventually to the heart or even to the pulmonary artery.^[2,4,6,8] These could be resolved with a pericardial window by cardiac surgeons^[4] by an endovascular approach, either guided by fluoroscopy through the internal jugular vein, or via femoral and inferior vena cava.^[2,6]

Other documented complication of VP drainage is effusion of CSF through pleura (hydrothorax), peritoneum (ascite) and peritoneum-vaginal processus (hydrocele),^[7,9] all for absorption issues and normally in children.

In a large series of 1585 VP shunts, only 0.7% developed large abdominal cysts, and the associated causes were infection, particularly by *Staphylococcus epidermidis* and multiple-shunt revisions. Simple parentesis and replacement of the shunt usually are sufficient treatment for this complication, if infection is not present.^[5]

Our case had a complication not as serious as the aforementioned because there was no perforation of the hollow viscus or penetration of involved organs, and there was no infection. Nevertheless, the involved mechanisms with twice protrusion of distal catheter are not easily explicated.

One revision in 2013 of 12 cases of upward VP catheter migration postulated the following hypothesis.^[1] (1) Reabsorption of subgaleal fluid may generate negative pressure, dragging the distal tubing proximally; (2) “Windlass effect,” with some granulation tissue or valve placed below the scalp, which acts as an anchoring point, and the patient’s repeated head motion allows

the distal tubing to be pulled in a proximal direction; (3) Increased abdominal pressure during Valsalva maneuver may act as a pushing force for distal tubing to migrate upward; (4) The memory of devices placed in packaging allows the tubing to recoil, as explained by the “memory phenomenon;”^[3] (5) Unishunt catheters with a spring coil mechanism and no interposed valves or flushing devices are more frequently involved in migration. Shunt migration depends on various factors such as the type of catheter and reservoir used (for example, shunt migration in children is more frequent). None of the migration hypotheses are clearly defined but many similar cases include the “windlass effect.”^[1]

One of these cases was a child with proximal migration of the VP catheter and extrusion of the ventricular catheter. This resulted in the entire VP shunt along with the shunt chamber lying in a subgaleal pocket in the occipital region in a tightly coiled manner. This coiling was very similar in appearance to that of the pre-insertion shunt in the packaging when it was supplied; hence, it was postulated that the migration was secondary to retained “memory” of the shunt tubing.^[3]

Regardless of what mechanism was involved in the case of our patient, we did not find any cases in the literature with the occurrence of two consecutive extrusions of distal catheter. Further, we did not find references about protrusion only for abdominal subcutaneous space. We noted that in both instances there were imaging studies documenting the good positioning of the entire system previously.

CONCLUSIONS

We emphasize the importance of careful and proper placement of the distal catheter during the tunneling procedure to prevent complications, as well as the importance of carrying out control tests to document the satisfactory placement of the entire shunt system.

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Conflicts of interest

There are no conflicts of interest.

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Commentary

The natural history of a surgical complication has always been a puzzle. We surgeons tend to believe that the complication is the derailment of a neat set of events, and when it happens, we search for the culprit.

Following this logic, "Rare complication of ventriculo peritoneal shunt: catheter protrusion to subcutaneous tissue-Case report" can be read as an improper closure of the peritoneal wall, or an increase in abdominal pressure that perhaps was combined with a minimally imperfect stitching of the wound. If so, a heartfelt praise for the authors honesty would be enough.

However, I propose that complications reports should be read assuming, without reservations, that those directly involved in the surgical procedure performed it up to the more stringent standard. Hence, there is no smoking gun in anybody hands. And this seems to be the conclusion of the authors unless until they retract and state that *careful and proper placement of the distal catheter during the tunneling procedure to prevent complications, as well as the importance of carrying out control tests to document the satisfactory placement of the entire shunt system*. But, I ask, do we not do it all the time? Did they not do it the first time? Of course they did it, of course we all do

it in every case. And still the events recur. To the authors of the paper it happened twice on the same patient. And I feel it is a disservice to what nature is trying to tell us to treat this report as the report of a complication. The epistemological question of the complication is, has the complication a different set of rules? Philosophy is the process of interrogating nature, with surgical complications we surgeons interrogate ourselves.

Descartes stated that a stopped watch had a different ontology than a working one. Perhaps we could borrow the analogy and apply it to the surgical complications, certainly not to those were an egregious mistake was committed (those are rarely if ever reported) but those as the one reported here that lead us to pause and ponder the phenomenon as an independent entity not necessarily a continuum from the original procedure.

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