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Unusual presentation of a common neurosurgical shunt procedure in an adult patient

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Abstract

Ventriculoperitoneal shunt surgery is one of the treatments of hydrocephalus. It involves placing a shunt from the cerebral ventricles to the peritoneum serving as a drainage point. Infection and catheter blockage are some of the possible complications resulting from this procedure. In some cases, other incidents such as peritoneal shunt migration have also been described. Here, we present the case of a 73-year-old male patient treated with ventriculoperitoneal shunt for a normal pressure hydrocephalus. After an initial blockage of the ventricular catheter, a revision surgery was performed with only mild improvement of his neurological symptoms. A repeat shunt series X-ray showed a migration of the distal catheter into the scrotum through an inguinal hernia. He was successfully treated with a laparoscopic repair of the inguinal hernia and repositioning of the distal catheter into the peritoneal cavity. Scrotal migration and hydrocele are unusual presentations and complications of ventriculoperitoneal shunts. Close follow-up of patients with a ventriculoperitoneal shunt should be performed if they experience worsening of their neurological symptoms. Shunt integrity should be assessed and any complications should be managed.

Keywords

Ventriculoperitoneal shunt complications, peritoneal shunt migration, hydrocephalus

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Introduction

Ventriculoperitoneal (VP) shunt insertion is a common neurosurgical intervention mandatory for the management of hydrocephalus and post subarachnoid hemorrhage.[1] The most frequently reported complications include infection, obstruction of the proximal ventricular or distal peritoneal catheters, formation of an abdominal pseudocyst and subdural hematoma formation due to over drainage.[1,2]

Migration of the peritoneal shunt into the rectum, the vagina, the bladder and the gallbladder has been reported.[3–5] However, there are very few reported cases of the distal peritoneal catheter migrating into the scrotum through an inguinal hernia in adult patients.[6–8] This later complication is more frequently seen in pediatric patients due to the patency of the processus vaginalis.[5,7,8]

However, it is thought that 15%–30% of adult patients still have an unobliterated processus vaginalis.[8] Moreover, hydrocephalus being a common pathology encountered in neurosurgery,[9] it is important to raise awareness about the possible scrotal migration of VP shunt and provide solutions on how to manage this presentation.

The SCARE criteria[10] were followed during the article preparation.

Case presentation

History: We present a 73-year-old patient presenting with a 2-year history of progressive gait difficulties, impaired short-term memory and loss of bladder control. He had a 3-month

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Figure 1. Post-operative shunt series showing correct positioning of peritoneal catheter. The arrows show the catheter trajectory.

history of increased frequency of urinary incontinence. He has a past medical history of hypertension, dyslipidemia and anxiety. The patient was not known to have any past medical history of hernias nor any prior abdominal and genitourinary surgery. He is retired and lives with his partner and has become progressively dependent on her for his daily needs. A cerebral magnetic resonance showed moderate ventriculomegaly. His initial MoCA (Montreal Cognitive Assessment)[11] score was 21. An objective assessment by the physical therapist revealed an improvement of the Berg Balance Score,[12] improving from 36 to 42/56 immediately after a lumbar puncture and drainage of his cerebrospinal fluid (CSF) were performed. The initial opening pressure was 13 mm H_2O. However, the improvement was short-lived, as it returned back to 37/56 the very next day. The diagnosis of idiopathic normal pressure hydrocephalus was thus retained.

As such, he was treated successfully with a VP shunt, with the placement of a CSF medium pressure control flow valve from Medtronic. The peritoneal end catheter was placed by performing a 1-in transverse incision in the right upper quadrant. Post-operative routine head computed tomography (CT) scan and shunt series X-rays showed the correct position of the ventricular and peritoneal catheters (Figure 1). After an initial improvement of his gait, evidence of regression was observed 3 weeks after first surgery. We performed a bedside valve testing of the fixed medium pressure valve. At first, we pumped the shunt reservoir. There was no obstruction of the distal flow. However, the valve refill was extremely slow. This testing of his valve revealed a possible proximal valve dysfunction.

Prior to revision surgery, a CT scan of the brain was ordered to determine whether or not the proximal ventricle catheter was adequately well-positioned. A revision surgery was thus performed, with replacement of the ventricular catheter with a programmable valve. There was no obstruction of the distal catheter, as this was tested intraoperatively, with no increased resistance noted in the distal tube pressure. Since the distal tube was not revised in the initial revision surgery, it was not repositioned. The patient started complaining of an enlarged scrotum on post-operative day 2 of the revision surgery which corresponds to post-operative day 23 of initial surgery. Scrotum examination was negative for transillumination of the scrotal sac. However, the distal tubing was palpable on physical examination. On repeat shunt series X-ray (Figure 2), there was a migration of the peritoneal catheter into the scrotum. Physical examination was consistent with the presence of an inguinal hernia and a hydrocele.

Surgical Intervention: He underwent a laparoscopic repair of the inguinal hernia and repositioning of the distal catheter into the peritoneum by the general surgery team. According to the general surgeon's operative note, the deep external inguinal orifice was closed with a mesh while the processus vaginalis was closed with a V-Loc suture. After surgery, the patient experienced an improvement in his gait and cognition and was discharged to a rehabilitation center. His follow-up MoCA test 6 months later, tested by geriatricians, improved to 27/30. Post-operative imaging showed proper proximal and distal tube position (Supplementary Figures 1 and 2).

Discussion

VP shunt surgery is one of the treatments of hydrocephalus which involves placing a shunt from the cerebral ventricles to the peritoneum serving as a drainage point.[2] Scrotal migration through the inguinal canal is a rare but possible complication of VP shunt in adults and it has been described in some cases throughout the literature.[6–8] It is believed that scrotal migration of VP shunt occurs mostly in children due to the patency of the processus vaginalis combined with smaller peritoneal cavity.[8,13] However, in some adult patients, this structure remains open therefore increasing their chances of VP shunt migration through the inguinal canal.[7,8] Other explanations such as intestinal peristalsis have being proposed in the literature as a risk factor for catheter migration.[14,15] However, to our knowledge, no article has reported a catheter migration into the scrotal sac caused by intestinal peristalsis.

Our patient was managed surgically by laparoscopic repositioning of the distal catheter into the peritoneum, as well as the repair of the inguinal hernia and closure of the processus vaginalis. A systematic review published by

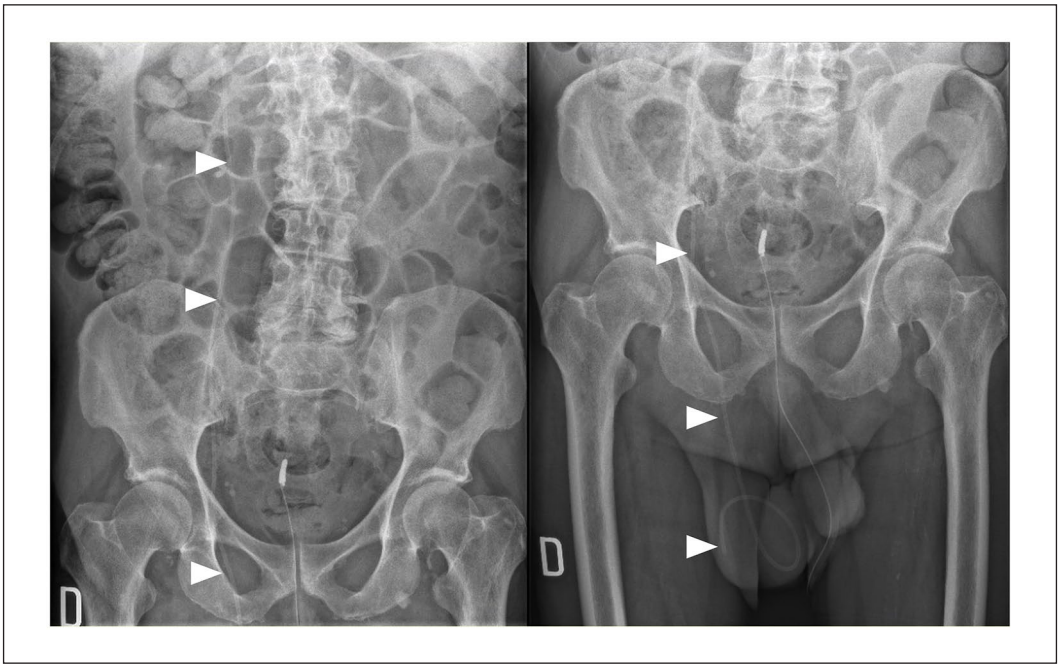

Figure 2. Shunt series showing the migration of the peritoneal catheter into the scrotal sac on the right side. The arrows show the catheter trajectory.

Hauser et al.[16] in 2021 described management options for 48 scrotal migration of VP shunts. They proposed based on current literature three management solutions. First, catheter can be manually repositioned by pushing on the hernia while gently pulling on the scrotal sac.[16] Second, patients can undergo laparoscopic repositioning of the catheter and inguinal incision.[16] Finally, it is possible for the surgery team to trim the distal end of the catheter during surgery as reported by some authors.[8,16]

Hydrocephalus is a very common neurosurgical pathology encountered by most neurosurgeons and it is seen on an elective and even emergency basis.[9] As such, it is important to be aware of the most common complications and even the unusual ones. Furthermore, it is essential to be able to share these unusual complications seen in common pathologies and how to manage them.

Hence, when faced with a scrotal migration VP shunt catheter, it is advised to reposition the VP shunt and obliterate the processus vaginalis as a means of preventing future incidents.[17]

We learned from this case that one may consider ordering a shunt series imaging prior to any revision surgery even though physical examination shows no obstruction of the distal end catheter. Indeed, if any abnormalities were present, we would have been able to act upon them sooner.

Conclusion

This case highlights the importance of close follow-ups of patient with VP shunt due to the possible complications that may arise. The aim of this article is to raise awareness among physicians about these complications and how to deal with them. Therefore, we recommend that clinicians and patients closely monitor their neurological symptoms and report any unusual event. Those changes in patients' well-being might represent a VP shunt dysfunction. If so, shunt integrity should be assessed and any complications should be managed.

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Author contributions

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The author(s) declared no potential conflicts of interest with respect to the research, authorship and/or publication of this article.

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Informed consent

Written informed consent was obtained from the patient for publication of this case report and accompanying images. The patient had the decisional capacity to provide written informed consent. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request. Written informed consent was obtained from the patient(s) for their anonymized information to be published in this article. The patient had the decisional capacity to provide written informed consent.

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Supplemental material

Supplemental material for this article is available online.

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