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Rare complication of ventriculoperitoneal shunt. Early onset of distal catheter migration into scrotum in an adult male: Case report and literature review



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ABSTRACT

INTRODUCTION: The role of shunt placement is to divert cerebrospinal fluid from within the ventricles to an alternative location in the setting of hydrocephalus. One of the rare shunt complications is distal catheter migration, and various body sites have been reported, including the scrotum. Although cases of scrotal migration of distal catheter have been reported in pediatric patients, cases in adult patients are rare due to obliterated processus vaginalis. Furthermore, there has not been a case reported for scrotal migration in an adult at an early onset.

PRESENTATION OF CASE: 65-year-old male underwent shunt placement for normal-pressure hydrocephalus-like symptoms. On post-operative day seven patient developed right testicular edema, for which ultrasound was performed, revealing hydrocele along with the presence of distal catheter in the scrotum. On post-operative day nine patient underwent distal catheter trimming via laparo-scopic approach with general surgery, with post-operative imaging showing satisfactory location of distal catheter in the peritoneal cavity.

DISCUSSION/CONCLUSION: Early onset of distal catheter migration into scrotum in an adult male is a unique case, as most cases are reported in pediatric patients, and it is the first case reported in the English literature to have occurrence at an early onset during the peri-operative period. As our case demonstrates, early occurrence and detection of scrotal migration of the distal catheter prevent shunt malfunction. Prompt surgical management of catheter repositioning is therefore recommended to avoid the risk of further complications.

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1. Background and importance

The role of shunt placement is to divert cerebrospinal fluid (CSF) from within the ventricles, from subarachnoid space in lumbar spine, or from a pre-existing cyst to an alternative location in the setting of hydrocephalus.⁵ The most common location for CSF diversion is from the ventricle to the peritoneum, and this placement is known as the ventriculoperitoneal shunt (VPS). Other commonly used sites include the heart (ventriculoatrial shunt), pleura (ventriculo-pleural shunts), and from lumbar space to periotoneum (lumbo-peritoneal shunt). VPS is associated with many complications, including overdrainage, valve failure, breakage of catheter, catheter obstruction, coiling of catheter, spontaneous knot formation, infection, and migration

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of distal catheter into another body part, ultimately leading to obstructive hydrocephalus. One of the rare sites of distal catheter migration is the scrotum.^{32,46} Other reported sites of migration include the ventricle,³⁴ scalp/subgaleal space,¹⁰ neck,¹¹ mouth,³⁰ breast,³¹ breast implant,⁵² thoracic cavity,¹⁷ pulmonary artery,³⁵ intracardiac,⁶⁰ lungs/pleural space/trans-diaphragmatic,^{7,25,50} anterior chest wall,⁶ intra-abdominal wall,³⁹ abdominal subcutaneous fat tissue,³³ umbilicus,²³ stomach,³ large intestine,¹⁵ liver,⁵⁷ gall bladder,⁴¹ bladder/urethra,⁹ inguinal sac,⁶² buttocks,⁴⁸ canal of Nuck, which is the female counterpart of the spermatic cord,⁶³ vulva/vagina,⁵⁵ rectum/anus,⁵⁴ and knee.³⁶ Although cases of scrotal migration of distal catheter have been reported in pediatric patients, cases in adult patients are rare due to obliterated processus vaginalis.⁴⁶ Furthermore, there has not been a case reported for scrotal migration in an adult at an early onset. By reporting this rare case and reviewing English literature of similar rare complications of VPS, the authors strongly feel that the results of this manuscript can be useful to the journal readership given the rarity of such complications and providing readers with information about how different complications were managed.

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Fig. 1. Testicular US showing hydrocele and presence of catheter in scrotum.



Fig. 2. Abdominal X-ray confirming distal catheter migration.

2. Clinical presentation

A 65-year-old male with past medical history of epilepsy status post left temporal lobectomy, and syncope and asystole status post pacemaker placement, presented with symptoms of imbalance, memory loss with episodic confusion, and urinary incontinence present for months. Initial computed tomography (CT) of brain revealed ventriculomegaly. After seizures were ruled out with bedside electroencephalography (EEG) monitoring, patient underwent VPS placement two days after admission, with valve pre-set at 100 mm H₂0 (Codman-Medos Hakim® programmable valve). Post-operative imaging with CT brain and shunt series X-ray were satisfactory and confirmed the proper locations of catheters and valve setting. On post-operative day seven, patient developed right testicular edema, for which testicular ultrasound (US) was performed, revealing hydrocele along with the presence of distal catheter in the scrotum (Fig. 1). Abdominal X-ray was performed, confirming the migration of distal catheter through the inguinal canal (Fig. 2). On post-operative day nine, patient received another operation for distal catheter trimming via laparoscopic approach with general surgery, and post-operative imaging was satisfactory for the location of distal catheter in the peritoneal cavity (Fig. 3). Patient was then discharged home in a stable condition.



Fig. 3. Post-operative abdominal X-ray after distal catheter trimming.

3. Discussion

The distal catheter of VPS can migrate into various body parts. Migration into the scrotum is a rare complication and has been reported only in 30 case reports in the English literature (Table 1). As demonstrated most cases occurred in pediatric patients, mostly during infancy and in the first six months after VPS shunt placement.³² A higher incidence of unobliterated processus vaginalis in pediatric patients than in adult patients leads to a higher likelihood of VPS distal catheter migration into the scrotum.²⁸ Anatomically the distal catheter enters the scrotum from the patent processus vaginalis, which becomes the scrotal tunica vaginalis as it separates from the peritoneum.²⁶ In the majority of the population the processus vaginalis becomes obliterated. It remains patent in 90% of population at birth, 50-60% at one year of age, 40% between ages two and 16, and 15-30% in older adults at necropsy.^{19,49} The presence of patent processus vaginalis creates the conduit through which the distal catheter in the abdominal cavity can travel to reach the scrotum. In pediatric patients the patency of processus vaginalis can be theoretically prolonged by the increased abdominal pressure from VPS placement creating constant in-flow of fluid.^{19,22} Moreover, as the residual peritoneal cavity volume is linearly correlated with the body surface area, younger pediatric patients have a higher tendency to have VPS distal catheter migrate into the scrotum due to patent processus vaginalis and smaller peritoneal cavity. This explains the dominance of distal catheter migration into scrotum in pediatric patients. Only two cases of distal catheter migration into scrotum occurred in adolescent patients,^{20,53} and only one other case occurred in an adult male.⁴⁶ However, in the case reported by Rehm et al., post-operative period was uneventful, and the scrotal edema secondary to distal catheter migration did not occur until four years after the VPS placement. Distal catheter into scrotum has also been reported in LPS adult patients, but the migration did not occur until

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Table 1

Summary of previous cases of scrotal migration of VPS.

Agraval et al. ¹ 36 weeks3 weeksBight (R)Repositioning of disal catheter, inguinal hernia repairAlbala et al. ² 14 months7 months after revisionRtRtRepair reductionAmmare 1A. ⁶ Bistrow et al. ¹⁰ 10 months2 monthsLeft (L1)VS removal and reinsertionClarnette et al. ¹⁰ 25 patients (age range from ites sin a weeks to a patients (38 weeks)3 months, 3 months, 1RtReposition patientsCrofford et al. ¹⁴ 4 patients (38 weeks)5 months, 3 months, 1 month, 3 months, 3 months, 1 month, 3 months, 3 months, 1 month, 3 months, 3 months, 1 a month, 3 months, 3 months, 1 month, 3 months, 1 a month, 3 months, 1 a monthsRtCatheter removal via siguinal incision and repair of hermina sac month, 3 months, 1 a monthsGo et al. ¹⁰ (1) et al. ¹⁰ 14 wonths a monthsNear 4 months a monthsRtRtRepositioning of catheter and processus vagainalis closureJamjoon et al. ³¹ (1) et al. ³² 4 months a monthsNear 4 months a monthsRtRtRepositioning of achieter and processus vagainalis closureKowk et al. ³² 3) weeks1 weeks7 days 6 daysRtRtRepositioning of achieter and processus vagainalis closure<	Authors	Age of migration	Interval time	Affected side	Management
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	Wong et al. ⁶¹	7 months	4 weeks	Kt	Repositioning of distal shunt

four weeks after the implantation.^{24,40} The interval between the latest shunt implantation and the migration report date ranged from one day to five years in all pediatric and adult patients. The present case occurred in the oldest patient documented and reported to date. Furthermore, there has not been an adult case in which the migration occurred at an early onset within seven days during the peri-operative period. The involvement of the right-sided scrotum was dominant, and this can be explained by the fact that the right testicle descends later than the left testicle. The most common management encompassed repositioning of the distal catheter and processus vaginalis closure. The CSF flow into the patent processus vaginalis can create a trough effect, drawing the shunt tip into the trough center.²⁸ This would indicate the proper management would include not only the repositioning of the catheter but would also have to include catheter truncation, as simple repositioning can lead to recurrence of migration. In our case patient's distal catheter was truncated properly via laparoscopic approach to prevent recurrence.

4. Conclusion

In this case report an early onset of distal catheter migration into scrotum in an adult male is illustrated. It is a unique case as most cases are reported in pediatric patients, and there is only one other case reported in an adult patient with VPS migration into the scrotum. It is the first case reported in the English literature to have occurrence in an adult patient at an early onset during the peri-operative period. As our case demonstrates, early occurrence and detection of scrotal migration of the distal catheter prevent VPS malfunction. Prompt surgical management of catheter

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repositioning and truncation is therefore recommended to avoid the risk of further complications.

Conflict of interest

None.

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None.

Ethical approval

None.

Author contribution

Bryan S Lee – study concept, data collection, writing the paper; Sumeet Vadera – editing; Jorge A Gonzalez-Martinez – editing.

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