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Urethral migration of a ventriculoperitoneal shunt in a 6-month-Old female infant: A rare complication of hydrocephalus management

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ABSTRACT

Hydrocephalus, occurring in 0.9–1.8 per 1000 births, is managed through ventriculoperitoneal shunt placement. This intervention carries potential complications, with migration and infection being predominant concerns.

6-month-old female infant presented with VP shunt migration through the urethra, 5 months after hydrocephalus treatment. Clinical manifestations included irritability, mild fever, vomiting, and tense, bulging fontanelle. Laboratory findings revealed elevated white blood cell count of 21,000/mm^3 and positive microbiological cultures. Surgical intervention involved catheter removal, and shunt revision.

This rare case of VP shunt urethral migration highlights the critical importance of vigilant monitoring and prompt, multidisciplinary intervention in pediatric neurosurgery.

1. Introduction

Hydrocephalus, with an incidence of 0.4–2.5 per 1000 live births globally, is characterized by increased cerebrospinal fluid volume causing ventricular enlargement and elevated intracranial pressure.[1] Ventriculoperitoneal (VP) shunt placement remains an effective treatment for diverting cerebrospinal fluid into the peritoneal cavity.[2] Complications following implantation are diverse, including shunt obstruction, infection, migration, and organ perforations, with infection and obstruction being most common.[3,4]

Migration of the distal VP shunt catheter into the urinary bladder with per-urethral extrusion is exceptionally rare, with only 24 reported cases in medical literature.[5] Up to 49.6 % of complications occur in patients younger than 6 months, with a positive correlation between shunt complications and patient age.[6] Clinical presentations range from asymptomatic to symptomatic, emphasizing the critical need for prompt diagnosis and management to prevent potentially fatal outcomes like peritonitis and meningitis.[7]

2. Case report

A case of ventriculoperitoneal (VP) shunt migration through the urethra is reported in a 6-month-old female infant. The shunt had been placed 5 months prior for hydrocephalus at another institution. The patient presented with a one-week history of irritability, for which she had received medication. Five hours before presentation, the mother noticed an abnormal tube protruding from the infant's genital area. Examination revealed approximately 5 cm of shunt protrusion from the urethra (Fig. 1).

On admission, the patient exhibited mild fever and had experienced emesis twice before and once during examination. The fontanel was tense and bulging, though vital signs remained stable. The infant was alert and not in acute distress. Laboratory findings showed an elevated white blood cell count of 21,000/mm^3. VP shunt flow was noted to be weak. Cerebrospinal fluid (CSF) was obtained from the ventriculopleural shunt for Gram stain and culture. Thoracoabdominopelvic radiography demonstrated an intact shunt along its entire length(Fig. 2).

Surgical intervention was performed via a Pfannenstiel incision, approaching the bladder extraperitoneally. The intravesical portion of the shunt was visualized (Fig. 3), and the catheter was transected proximal to its bladder entry point. The distal segment was completely removed. The shunt's entrance site, bladder incision, and midline opening were repaired in two layers. Through a small incision at the previous abdominal scar site, the remaining abdominal portion of the

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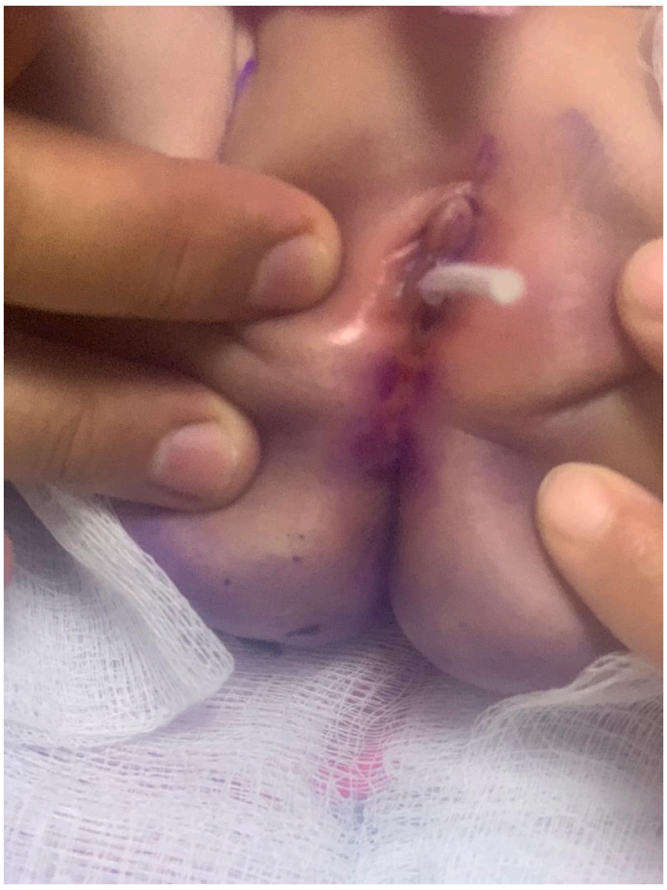

Fig. 1. Distal part of ventriculoperitoneal shunt migrated into bladder and extruded through urethra.

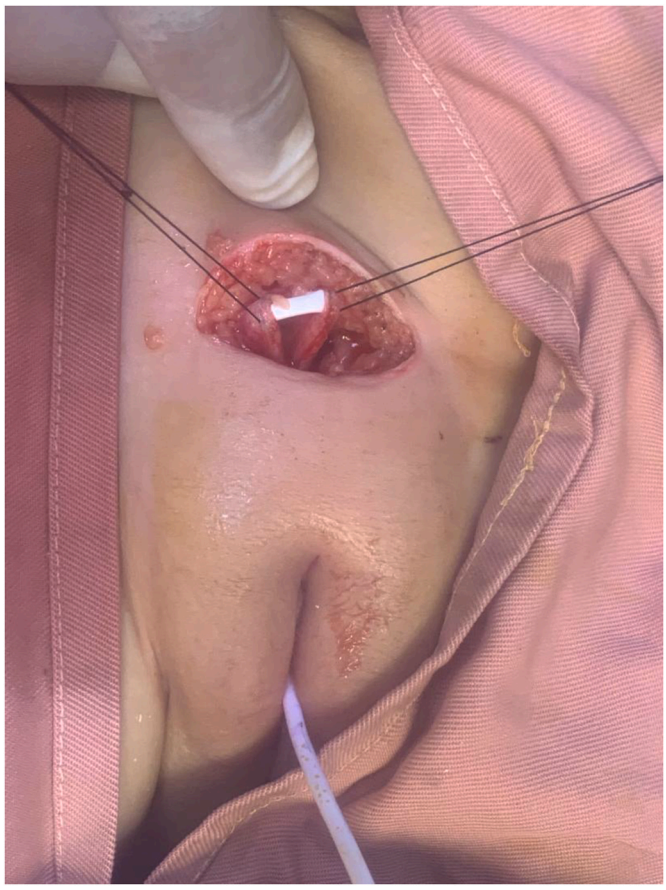

Fig. 3. Shows incision in bladder revealing presence of migrated shunt within its lumen.

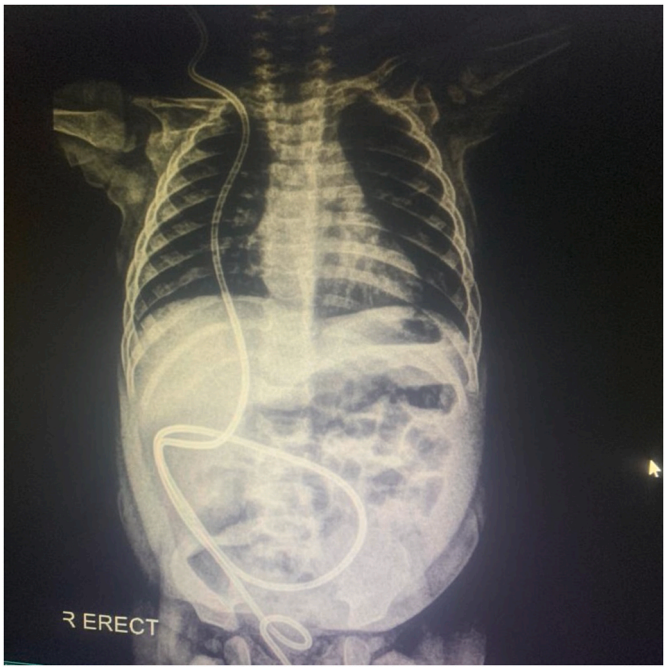

Fig. 2. Plain thoraco-abdominal X-ray showing ventriculoperitoneal shunt.

shunt was extracted (Fig. 4). Urine and CSF samples were cultured, both yielding positive results. Intravenous antibiotic therapy was initiated based on these findings.

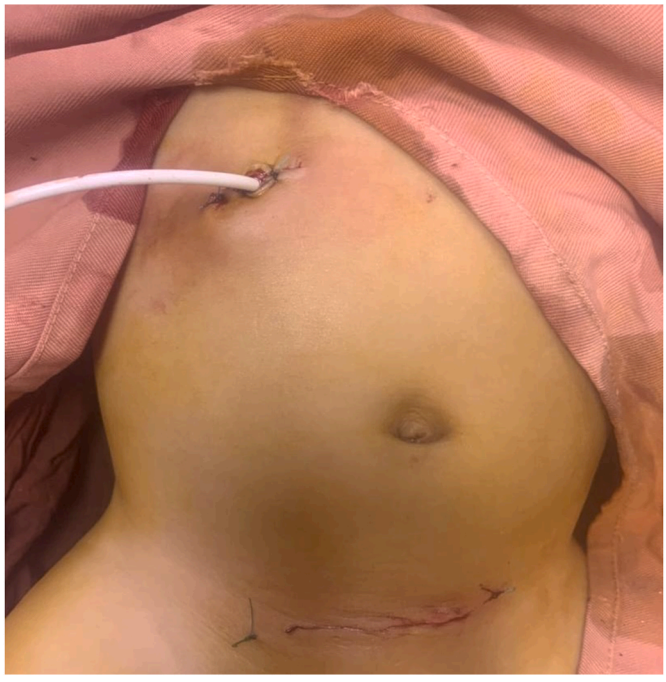

Fig. 4. Distal part of ventriculoperitoneal shunt left as external drainage pending shunt revision.

Cranial computed tomography confirmed the shunt's intracranial position. Following complete antibiotic therapy, the patient's condition improved, and the distal portion of the shunt was revised via a temporal approach in the opposite site.

3. Discussion

Ventriculoperitoneal (VP) shunt migration is a rare but serious complication in hydrocephalus management. Cases of distal catheter migration have been reported in both male and female infants, with protrusion through various anatomical sites.[8] Urethral protrusion of the abdominal catheter is an extremely rare complication, with one case reported in a girl four years post-shunt placement.[9] Transvaginal migration has also been documented in children, with previous abdominal surgeries and shunt revisions identified as consistent risk factors.[10] Other unusual migration patterns include coiling of both ventricular and peritoneal catheters under the scalp and complete shunt migration into the lateral ventricles.[11] These complications often require shunt removal, antibiotic treatment, and replacement, highlighting the importance of awareness among healthcare providers for early detection and management.

The migration of a ventriculoperitoneal (VP) shunt through the urinary system represents a complex and rare complication in pediatric neurosurgical interventions. The anatomical dynamics of shunt placement involve critical considerations regarding organ interactions and potential migration pathways.

Anatomically, the bladder presents a unique challenge as an organ that transitions between extraperitoneal and intraperitoneal states depending on its filling status. During surgical procedures, the bladder is typically empty, creating a potential space for inadvertent catheter interactions. The robust bladder wall and peritoneal separation typically provide significant protection against direct catheter penetration.[12] In this case, the shunt migration likely resulted from a combination of factors, with the length of the abdominal catheter segment being particularly significant. The continuous mechanical interaction between the shunt and surrounding peritoneal tissues potentially triggered inflammatory processes and fibrotic changes. Gradual movement along gastrointestinal tract movements could have facilitated the catheter's progressive migration into the bladder's sagittal region.

Existing literature supports the complexity of VP shunt complications. Approximately 10–30 % of VP shunt placements experience abdominal complications, including migration, pseudocyst formation, and potential organ interactions. The genitourinary region represents a notable migration site, with scrotal migration being most prevalent in previous documented cases.[13,14]

The patient's young age (6 months) aligns with statistical observations that nearly 49.6 % of shunt complications occur in patients under 6 months. This underscores the heightened vulnerability of pediatric patients to such interventional risks.[15]

Clinical implications suggest that recurrent urinary tract infections and associated symptoms should prompt careful investigation of potential shunt-related complications. Clinicians must maintain a high index of suspicion and consider comprehensive imaging studies to detect potential shunt migrations or interactions with surrounding anatomical structures.[16]

4. Conclusion

VP shunt migration through the urethra represents an exceptionally rare complication in pediatric neurosurgical interventions. This case highlights the critical importance of vigilant monitoring, comprehensive diagnostic evaluation, and prompt surgical management in patients with ventriculoperitoneal shunts. The successful intervention underscores the necessity of a multidisciplinary approach in managing complex pediatric neurological conditions, emphasizing early detection and precise surgical techniques to mitigate potential life-threatening complications.

The manuscript was prepared following the CARE guidelines (https://www.carestatement.org).

CRediT authorship contribution statement

Yalda Obaidy: Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing. **Ajmal Sherzad:** Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing. **Dunya Moghul:** Conceptualization, Data curation, Methodology, Writing – original draft, Writing – review & editing.

Informed consent

Informed consent was obtained from the patient or guardian.

Authorship

All authors attest that they meet the current ICMJE criteria for Authorship.

Declaration of competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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