CASE REPORT

Migration of ventriculoperitoneal shunt to urethral and rectal orifices

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SUMMARY

Ventriculoperitoneal (VP) shunt surgery remains the most widely used neurosurgical procedure for the management of hydrocephalus. However, shunt complications are common and may require multiple surgical procedures during a patient's lifetime. We report the case of a 29-year-old patient with a background of Dandy-Walker malformation, occipital encephalocele, recurrent hydrocephalus, spina bifida and epilepsy presented with VP shunt migration into urinary and gastrointestinal tracts. In absence of sepsis or peritonism from either bowel or bladder perforation, local control of stent extrusion was successful for several years, although surgery was eventually undertaken.

BACKGROUND

Hydrocephalus, an accumulation or excess of cerebrospinal fluid (CSF) within the cerebral ventricular system, is a relatively common diagnosis in neurosurgical practice and most commonly treated by placement of ventriculoperitoneal (VP) shunts.¹ These act to divert excess CSF from the ventricles of the brain to the peritoneal cavities where normal physiological processes absorb the fluid.¹ Although implanted for life, complications are common and revision or replacement is required in 30%–50%.²

Well-recognised complications exist, such as malfunction, infection, overdrainage, underdrainage, haematoma and slit ventricles.^{3–4} Less commonly migration can occur, with several reports of perforation into surrounding structures such as bowel, vagina, scrotal wall with or without systemic upset dependent on communication between ventricles and penetration of bacteria filled viscera.^{4–5} Migration into the urinary tract system is extremely rare and on literature search only 10 cases could be identified.^{6–14}

CASE PRESENTATION

A 29-year-old woman with a background of Dandy-Walker malformation with occipital encephalocele, recurrent hydrocephalus, spina bifida and epilepsy presented with urethral extrusion of a foreign body. From the age of 2 weeks until 27 years of age, she had multiple VP shunt insertions for recurrent hydrocephalus. In total she underwent 26 shunt procedures, of which 20 were VP. Shunt failure was a recurrent issue throughout her neurological care, with some shunts snapping and requiring the cranial portion to be removed while peritoneal parts persisted in situ.

Although suffering from chronic daily headache, she remained asymptomatic from the redundant VP shunts for some time, until presenting in December 2013 to the Emergency Department with a shunt emerging from her urethra. On that occasion the shunt was trimmed and the patient discharged, pending further imaging to ascertain the number and position of retained shunts. Two months later, she presented with recurrent shunt extrusion from the urethra, associated with local discomfort, dysuria and haematuria. However, there was no evidence of infection—either neurological or of the urinary tract. On examination, there was no evidence of peritonism and on genital examination a 3 cm segment of VP shunt was protruding from the urethra. On subsequent review appointment, a further shunt protruded from her anus, but without bowel symptoms or systemic upset. On three acute presentations the external portion of the migrated urethral shunt was cut flush with the urethra and replaced in the bladder, which temporarily relieved symptoms while further investigations were arranged.

Plain X-ray (figures 1 and 2) revealed multiple shunt tubing in the lower abdomen and pelvis. MRI performed confirmed multiple abdominal shunts with a cluster of shunts in the pelvis, with one penetrating the urinary bladder and another entering the sigmoid colon with the distal end in the rectum. Following multidisciplinary discussion with colorectal surgeons and neurosurgeons, conservative endoscopic and open surgical management options were considered. Given the lack of intracranial infections, the MRI findings (figure 3) and the absence of any evidence of ventricular communication with the abdominal/pelvic shunts, endoscopic therapy was preferred initially.

Cystoscopy was performed with broad-spectrum antibiotic cover. This confirmed a single shunt perforating into the bladder but with very little surrounding bladder inflammation. Attempts at excising the shunt with biopsy forceps and with laser via the cystoscope sheath were unsuccessful. Laparoscopic roticulating scissors were therefore carefully inserted alongside the cystoscope sheath under vision and the shunt cut flush with bladder mucosa. On a separate admission, the colorectal surgeons performed flexible sigmoidoscopy and excision of extruding shunt material flush with the bowel wall (figures 4 and 5).

Although endoscopic treatment was initially successful, the patient represented 3 months later with further abdominal pain and signs of

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Figure 1 Abdominal X-ray showing the migrated ventriculoperitoneal shunts.

intra-abdominal sepsis. One or more stents had formed a septic mass in the pelvis between the bowel and bladder. Despite her high risk for surgery and after extensive discussions with the patient and family, a laparotomy was undertaken. Intraoperatively two retained stents identified behind the anterior abdominal wall with further retained stents seen within the abscess cavity. All retained shunts were successfully removed. Evacuation of an abscess cavity involving bowel loops and bladder, followed by repair of sigmoid and bladder wall was performed

OUTCOME AND FOLLOW-UP

Postoperatively the patient was admitted to level two care unit, on a 5-day course of antibiotics. She did not require ventilation or isotopes, nor renal support. On the ward she had slow but steady recovery prolonged by poor appetite and mobility. After a period of rehabilitation by physiotherapy and dietician input, she was discharged home with family support.

Her defunctioning ileostomy was subsequently closed and the patient made a slow recovery. Two years later, she now has resumed independent living with her family and has had no further septic episodes.

DISCUSSION

The use of the peritoneal cavity for CSF absorption in ventriculoperitoneal shunting was first introduced in 1908 by Kausch.¹⁵ However, despite the longevity of the procedure, intermediate-late complications rates remain high, with around 45%

Figure 2 Pelvic X-ray showing the migrated ventriculoperitoneal shunts.

Figure 3 MRI showing the migrated ventriculoperitoneal shunts in bladder.

requiring shunt revision.^{16 17} Perforation is very rare, with the gastrointestinal tract perforation most frequently involved with a rate of 0.1%–0.7%,¹⁶ and bladder in the realms of sporadic case reports.

The aetiology of perforation is unproven, although several mechanisms have been proposed. Plausibly, the configuration of the tip of the shunt, catheter material and length of shunt may contribute.¹⁸ Subclinical infection causing a local inflammatory reaction around the distal end of shunt may cause adhesion and consequently pressure on and perforation through adjacent surfaces. Silicon or latex allergy with an immunogenic reaction has also been implicated.^{19 20} Increased intra-abdominal pressure can result in poor drainage of CSF, encouraging extrusion of the shunt by way of pressure effect.²¹ Patients with spinal cord malformations may also have congenital

Figure 4 Picture from the flexible sigmoidoscopy.

Figure 5 Picture from the flexible sigmoidoscopy.

weakness of bowel or bladder mucosa due to abnormal innervation, hence more prone to perforation.²⁰

Given the rarity of urinary bladder or bowel perforation, there is no consensus on optimal management. If no signs of systemic upset are present, clinicians have reported successful removal of the distal portion endoscopically.¹⁵ Alternatively, treatment by way of laparotomy and bowel resection/repair and bladder repair has been performed.¹⁴ With regards to the current case, there were no signs of systemic upset initially and therefore an endoscopic conservative approach was appropriate. Additionally, with more than 20 shunts in the abdominal cavity and multiple previous abdominal surgeries, laparotomy on such a patient would have been a major undertaking with significant morbidity risk. This patient also suffered a severe pneumonia secondary to an infected ventriculopleural shunt during 2014, requiring intensive care support, and thus further increasing her risks from major surgery at that time. This case highlights the importance of a multidisciplinary approach in these complex patients with detailed discussion of risks and options with the patient and family.

Prevention of shunt migration is controversial. Securing the VP shunt at the entry point has been considered. However, due to high shunt failure and revision rates of approximately 2.5 per patient, this would be impractical and significantly increase

difficulty of shunt removal.²¹ Non-absorptive materials have been suggested,²² but given migration can occur years from insertion, this seems unlikely to be of benefit.

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Learning points

- Bowel or bladder perforation following ventriculoperitoneal shunt is a rarity.
- Management must be tailored to the individual and extent of intervention based on systemic upset and feasibility of abdominal procedure.
- Where evidence of sepsis or peritonism exists, laparotomy is the mainstay of treatment. In absence of sepsis or peritonism a more conservative approach is reasonable.
- Multidisciplinary working between different surgical specialties, radiology and nursing staff is essential to achieve long-term benefits for these patients.

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