Asymptomatic Perforation of Large Bowel and Urinary Bladder as a Complication of Ventriculoperitoneal Shunt: Report of Two Cases

Miljan Mihajlović[1], Goran Tasić[2,3], Mirjana Raičević[1], Milan Mrdak[1], Bojana Petrović[1], Vladimir Radlović[1]

[1]University Children's Hospital, Belgrade, Serbia;
[2]Clinic for Neurosurgery, Clinical Centre of Serbia, Belgrade, Serbia;
[3]School of Medicine, University of Belgrade, Belgrade, Serbia

SUMMARY

Introduction Insertion of a ventriculoperitoneal (VP) shunt, the method of choice in the treatment of hydrocephalus, is often followed by various mechanical and/or infective complications. We present two children with asymptomatic perforation of the large bowel and urinary bladder, relatively rare and potentially severe complications of this surgical procedure.

Outline of Cases In both patients a VP shunt was implanted in the first month after birth; in a boy due to congenital hydrocephalus and in a girl due to the consequences of intracranial haemorrhage. Immediately after surgery, as well as during the further course, in both children growth and development were optimal and without any signs of infection or VP shunt malfunction. In the boy at age 6 months and in the girl at age 4 years, without any signs of complications, mothers noted the prominence of the VP shunt tip from the anus in the first case and from the urethral orifice in the second one. The VP shunts were immediately changed, so that both complications were resolved without any consequences.

Conclusion Insertion of a VP shunt represents the most frequent method of choice of the surgical treatment of hydrocephalus, but also potentially a highly risky procedure followed by various complications about which parents should be informed when patients are children. Owing to adequate approach in the follow-up of children with implanted VP shunt, large bowel and urinary bladder perforation, examples of severe and potentially fatal complications of this surgical intervention, could be disclosed on time and adequately resolved.

Keywords: hydrocephalus; ventriculoperitoneal shunt; complications

INTRODUCTION

Insertion of a ventriculoperitoneal (VP) shunt represents a classical and most frequently used method in the treatment of hydrocephalus [1]. Although introduced already in 1908 and followed by numerous complications, it still remains the solution of choice in the treatment of this pathological condition [1-4].

VP shunt complications, early or late, are classified as mechanical, infective and functional, i.e. associated with either excessive or insufficient drainage of cerebrospinal fluid [5]. The group of rarer complications of mechanical nature, usually associated with infection and/or poor cerebrospinal fluid drainage, includes the migration of VP shunt distal segment into the thoracic cavity, heart, large bowel, urinary bladder, scrotum, umbilicus, inguinal hernia and other body regions [6-11]. As they can remain asymptomatic for a long period of time, the penetration of a VP catheter into the visceral organs is most frequently additionally complicated and disclosed late, and are thus followed by high mortality which, according to Ghritlaharey et al. [12], rates even up to 15%.

We present two children with asymptomatic disclosed on time and adequately resolved VP shunt migration into the large bowel and urinary bladder.

CASE REPORTS

Patient 1

A six-month-old male neonate, with a VP shunt inserted due to congenital hydrocephalus with onset at age one month, presented at the hospital for an unplanned neurosurgical check-up due to a transanal protrusion of the anterior shunt noted during clothes changing of the child (Figure 1). According to parents, except for an unexplained rectal temperature of 38.5°C a week before admission, the child did not manifest any other setups. On examination neurological and general clinical findings were within normal limits. The fontanella was at the same level as the calvaria, the abdomen was soft and insensitive on palpation, with normal peristaltic sounds. Laboratory findings of liquor, blood count and urine were also normal. Endocranial CT imaging showed a normal shunt function, while thoracic and abdominal X-ray examination clearly showed the presence of the shunt in the large bowel lumen (Figure 2). A surgical revision of the entire VP shunt system was performed, and its peritoneal portion was removed and changed. There was no need to place suture at the area of colon perforation. With a seven-day cessation of oral food intake, namely, the introduction of parenteral

Correspondence to:
Miljan MIHAJLOVIĆ
University Children's Hospital
Tiršova 10, 11000 Belgrade
Serbia
miljanmihajlovic@yahoo.com

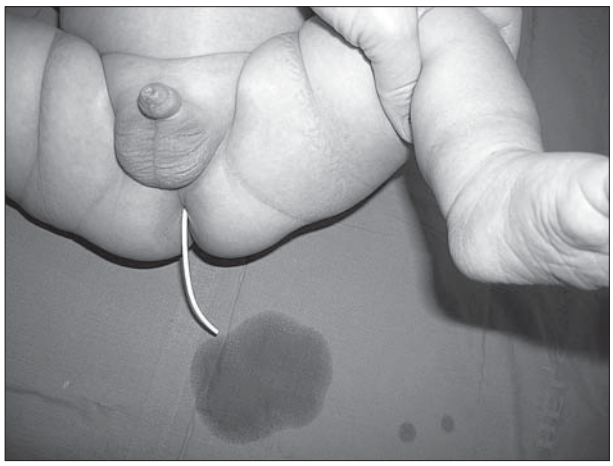

Figure 1. Protrusion of peritoneal catheter through the anal orifice

nutriton and antibiotic therapy (amikacin, cephtriaxon, metronidazole), the patient completely recovered. VP shunt function, as well as control endocranial CT and abdominal X-ray were completely normal. He was discharged in good general condition and without neurological sequels. Signs or any consequences of the complications were not registered during further follow-up.

Patient 2

A 4-year-old girl with inserted VP shunt at age one month due to posthaemorrhagic hydrocephalus, who came for a neurological examination due to the transurethral prominence of the distal catheter of the VP shunt disclosed by chance. Neurological abnormalities, micturation problems, fever or any other upsets were not registered. A complete clinical finding also including inspection of the urethral orifice was normal. Abdominal X-ray and ultrasonographic examination of the small pelvis showed the presence of the distal portion of the VP catheter in the urinary bladder (Figures 3 and 4). A control endocranial CT examination verified the usual width of the chamber system speaking in favour of normal shunt function. Urinary analysis and uroculture confirmed urinary infection (Klebsiella spp.), while liquor was sterile. WBC count and leukocyte formula were within the referent limits, CRP was 20 mg/L and RBC sedimentation rate was 16/38. After the introduction of amikacin and cephtriaxon the peritoneal portion of the VP shunt was cystoscopically removed and a new one was percutaneously inserted. During cystoscopy in the area of the right side of the urinary bladder wall we verified the site of catheter perforation of about 3 mm in diameter surrounded by a field of inflammation. A Foley catheter was inserted into the urinary bladder, and antibiotic therapy was continued for further two weeks. The entire postoperative recovery of the patient was normal, so that after a week the Foley catheter was removed. Control cystoscopy showed a preserved anatomic integrity of the urinary bladder with a scar formation at the site of protrusion of the VP shunt distal segment. A few days after the removal of the Foley catheter the function of the detrusor and urinary bladder sphincter was restored. In further course the girl was in good condition, without any setups and with adequate neurological and neurosurgical findings, so that

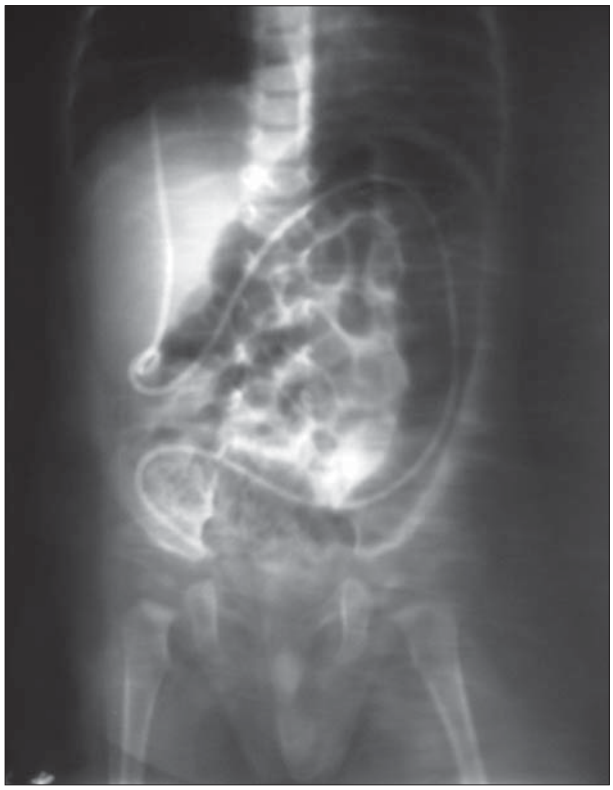

Figure 2. Abdominal X-ray with shadow of VP catheter in the large bowel lumen

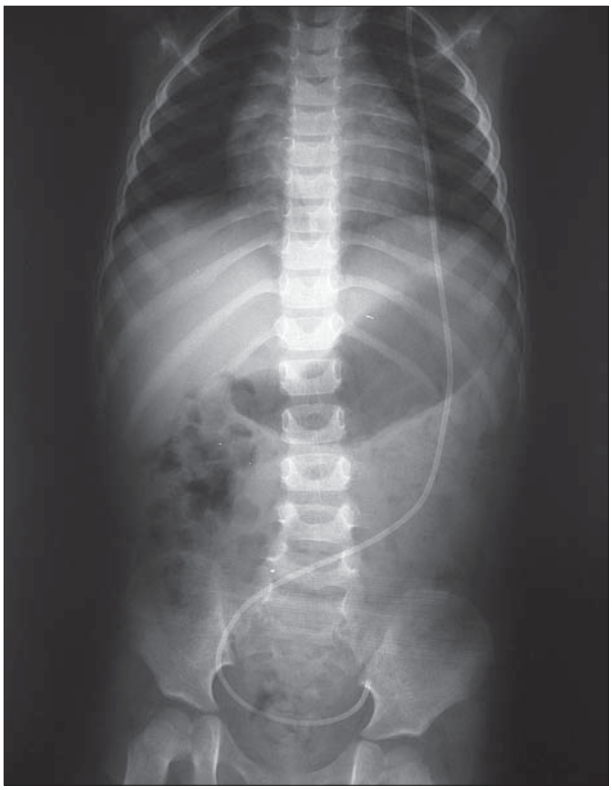

Figure 3. X-ray of the abdomen and pelvis with shadow of VP catheter in the urinary bladder

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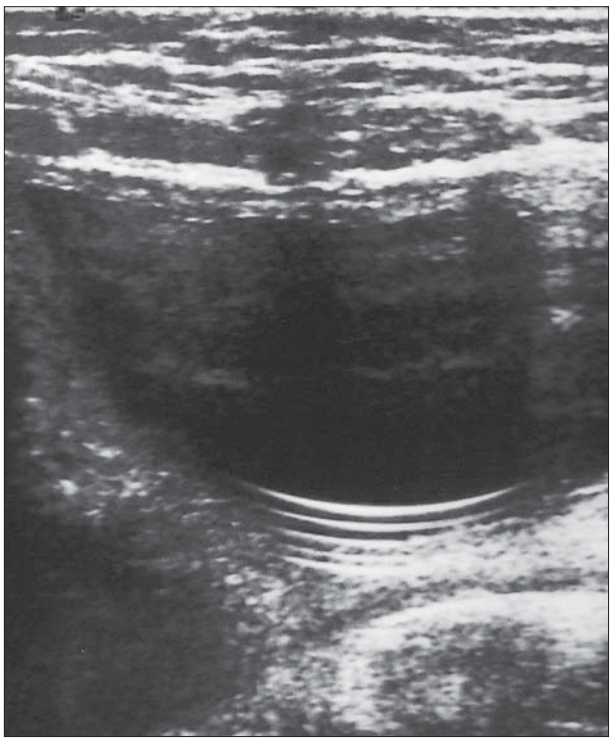

Figure 4. Ultrasonographic imaging of the pelvis with VP catheter in the urinary bladder lumen

after two weeks of hospitalization she was discharged from hospital. During further follow-up, the presence of no set-ups or complications was verified.

DISCUSSION

In children with hydrocephalus, the immediate risk of surgical insertion of a VP shunt is relatively low; however, later complications are quite frequent and are seen in 24-47% of cases [13]. About one-fourth of complications occur at the abdominal level, most frequently involving the intestinal volvulus, peritoneal pseudocysts or extrusion and penetration of the VP shunt distal part into the visceral organs [14, 15, 16]. In the literature one can sporadically find examples of VP catheter visceral perforation into the urinary bladder, vagina, gallbladder, stomach, bowels, scrotum, liver, vagina, urethra and other organs, with extrusion of its distal part through natural orifices (rectum, vagina, external urethral orifice) or the abdominal wall itself [5, 11, 15, 17, 18].

Gastrointestinal tract, and predominantly the large bowel, with an incidence of 0.1-0.7%, presents the most frequent area of VP shunt perforation [19]. First descriptions of large bowel perforation after the insertion of VP shut were published in 1966 by Wilson and Bertan [20]. Since then, 70 such cases have been reported in the literature, of which most occurred in children. It has been disclosed that visceral perforation of such aetiology in over 50% of cases has asymptomatic course, and that it is almost always diagnosed only after the extrusion of the VP catheter through the natural orifices of the damaged organ, the abdominal wall itself or associated with the malfunction of the shunt [17, 18]. However, in a smaller number of children the perforation of the visceral organs by the VP catheter is manifested by septic symptoms due to peritonitis, intra-abdominal abscess, meningitis, encephalitis, ventriculitis and/or brain abscesses [21, 22, 23]. Extensive clinical experience has shown that in such children underlying purulent meningitis or ventriculitis caused by Escherichia coli or some other coliform gram-negative bacteria is most probably a hidden asymptomatic bowel perforation caused by a VP catheter [18-24]. In addition, independent or combined with neurological indicators of shunt malfunction, intestinal or urinary perforation caused by the VP shunt is often followed by abdominal pain, vomiting diarrhoea and dysuric disorders [24, 25].

The exact basis of peritoneal catheter perforation into the lumen of body cavities has not been fully defined yet. There have been descriptions of cases of allergic and immunogenic reactions to chemical components of the VP catheter (silicon, latex), which resulted in the disruption of skin continuity above the shunt, its obstruction, as well as the perforation of the visceral organs [26, 27]. The formation of local inflammatory response and the resulting fibrosis, adherence and penetration of the distal portion of the catheter through the intestinal wall are presented as the stages of a possible mechanism of intestinal wall perforation [18]. It has been suggested that subclinical infection of liquor, as well as increased protein quantity in the liquor trigger the above mechanism. Also undoubtedly, previously formed intra-abdominal adhesions can facilitate organ wall perforation by the catheter [19]. Researches conducted by certain authors have shown that in children with congenital hydrocephalus and spinal dysraphism intestinal wall innervation is weak, thus leading to the increased risk of visceral organ perforation [19, 26]. Despite the publication of numerous studies, a correlation between the length of the peritoneal part of the catheter and its intra-abdominal complications has not been either proved or disapproved [12].

The operative technique of VP shunt insertion itself imposes the question of possible prevention of system migration. Having in mind the presence of the so called memory effect of peritoneal catheter twisting, as well as associated mechanical factors, such as propulsive forces, motion of extension and flexion of the child's head, loss of subcutaneous fat tissue and positive intra-abdominal pressure, many authors suggest that the prevention of migration may be achieved by the fixation of shunt system using non-absorptive suture materials [28, 29, 30].

The presentation of two patients, as well as the correlative analysis of clinical cases and experience of other authors imposes the essential significance of adequate follow-up of patients with a VP shunt, so as to disclose on time and immediately remove potentially numerous complications of this inevitable, but also a highly risky neurosurgical procedure. Accordingly, particularly regarding children, and above all those of the youngest age, parents should be also informed in detail. If such approach is applied, both severe and even potentially fatal complications of the VP shunt can be detected on time to be promptly followed by adequate treatment.

Insertion of a VP shunt represents an old, classical, well-checked and most frequently used method in the operative treatment of hydrocephalus, but also concurrently a potentially highly risky procedure followed by various complications about which, especially regarding children, parents must be informed. By cultivating such an approach in the follow-up of children with inserted VP shunt, the perforation of the large bowel and urinary bladder, as well as severe and potentially fatal complications of this surgical intervention can be detected in time and adequately resolved.

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Асимптоматска перфорација дебелог црева и мокраћне бешике као компликација вентрикулоперитонеалног шанта – приказ два болесника

Миљан Михајловић[1], Горан Тасић[2,3], Мирјана Раичевић[1], Милан Мрдак[1], Бојана Петровић[1], Владимир Радловић[1]

[1]Универзитетска дечја клиника, Београд, Србија;
[2]Клиника за неурохирургију, Клинички центар Србије, Београд, Србија;
[3]Медицински факултет, Универзитет у Београду, Београд, Србија

КРАТАК САДРЖАЈ

Увод Уградња ветрикулоперитонеалног (ВП) шанта јесте метода избора у лечењу оболелих од хидроцефалуса која је често праћена различитим механичким, односно инфективним компликацијама. Приказујемо два детета с асимптоматском перфорацијом дебелог црева и мокраћне бешике, релативно ретке, али потенцијално тешке компликације овог хируршког захвата.

Приказ болесника ВП шант је код оба болесника уграђен током првог месеца по рођењу: код дечака због развоја конгениталног хидроцефалуса, а код девојчице због последица интракранијалне хеморагије. Непосредно након операције, као и у даљем току, раст и развој оба детета био је оптималан, без знакова инфекције или лоше функције ВП шанта. Код дечака је у узрасту од шест месеци, а код девојчице у узрасту од четири године уочена проминенција врха ВП шанта без знакова, односно симптома компликације, и то у првом случају из ануса, а у другом из орифицијума уретре. ВП шантови су убрзо замењени, те су обе компликације санирање без последица.

Закључак Уградња ВП шанта је најчешћа метода избора хируршког лечења оболелих од хидроцефалуса, али и високо ризична процедура праћена различитим компликацијама на које, када су у питању деца, морају бити упућени родитељи. Захваљујући одговарајућем приступу у клиничком праћењу деце с уграђеним ВП шантом, перфорација дебелог црева и мокраћне бешике, као примери тешких и потенцијално фаталних компликација овог хируршког захвата, могу се благовремено уочити и адекватно санирати.

Кључне речи: хидроцефалус; вентрикулоперитонеални шант; компликације

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