

Case Report



Anal Protrusion of Peritoneal End of Ventriculoperitoneal Shunt and Multiple Brain Abscesses: A Case Report With Review of Literature

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ABSTRACT

Background and Importance: Ventriculoperitoneal shunt surgery is a widely accepted treatment for hydrocephalus, but it is not free from complications. Of all the complications, bowel perforation represents only 0.01-0.07% and it often presents with asymptomatic anal protrusion of the distal end of the ventriculoperitoneal shunt. The mechanism causing shunt ejection is unknown, but the most widely accepted theory is that after intestinal perforation, the tubing of the shunt is propelled out by the peristaltic movements in the gut.

Case Presentation: A case of a 3.5-year-old boy with anal protrusion of the peritoneal end of ventriculoperitoneal shunt and multiple brain abscesses is reported. In surgery, the ventriculoperitoneal shunt was divided at the clavicular region, and the peritoneal end was gently pulled out of the anus while the ventricular end was exteriorized. Empirical antibiotics, antiepileptics, and steroids were given. The culture and sensitivity report revealed no microorganisms. The child improved over a period of two weeks and then a new ventriculoperitoneal shunt was inserted on the opposite side.

Conclusion: Suspicion for bowel perforation must be kept high in symptomatic ventriculoperitoneal shunt patients even though most of the patients present with asymptomatic anal protrusion of the peritoneal end of ventriculoperitoneal shunt. In order to avoid infectious and neurological consequences, early identification and then subsequent treatment are crucial. The extruded end can easily be removed from the migrated orifice without the need for extensive surgery.

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Highlights

- Asymptomatic anal protrusion of the peritoneal end of the ventriculoperitoneal shunt is a common symptom of bowel perforation.
- The actual mechanism of shunt extrusion is unknown so far.
- In infants, the time between the initial shunt procedure and the subsequent detection of intestinal perforation is minimal, but it tends to rise with age.
- The extruded end can easily be removed from the migrated orifice without the need for extensive surgery.

Plain Language Summary

Hydrocephalus is a condition, in which the cerebrospinal fluid in the brain builds up abnormally. Ventriculoperitoneal shunt surgery diverts cerebrospinal fluid from the brain to the peritoneal cavity. It is an effective treatment for hydrocephalus but is not free from complications. One of the many risks associated with shunting is bowel perforation, which commonly manifests as asymptomatic protrusion of the distal end of the ventriculoperitoneal shunt through the anus. The mechanism of this shunt extrusion is unknown so far but it can easily be removed. In order to avoid infectious and neurological consequences, early identification and treatment are crucial.

1. Background and Importance

Hydrocephalus can be effectively treated by putting a mechanical shunt in place to drain the Cerebrospinal Fluid (CSF). Despite the fact that Ventriculoperitoneal (VP) shunting is a well-known treatment, it has a number of drawbacks, including shunt failure, blockage, infection, and abdominal complications (10%-30% of patients). CSF ascites, peritoneal pseudocyst, mesenteric pseudotumor, volvulus, inguinal hernia, peritonitis, intestinal obstruction, and catheter relocation through the scrotum, vagina, umbilicus and intestinal tract have all been reported as abdominal complications. Bowel perforation following VP shunt surgery is an incredibly intriguing complication that accounts for only 0.01%-0.07% of abdominal complications yet has a 15% mortality rate. The colon is the most well-known site of intestinal perforation, and more than half of these individuals are asymptomatic, with anal protrusion of the shunt catheter being the most prevalent symptom [1]. The exact pathophysiology of shunt extrusion is unclear so far and various mechanisms have been proposed to explain it. A satisfactory outcome requires early diagnosis followed by proper management.

2. Case Presentation

A case of a 3.5-year-old boy who presented to us through the emergency department with complaints

of fever, vomiting, and seizures (two episodes) for the last ten days is reported. The peritoneal end of the VP shunt was seen protruding out of his anus with a clear discharge of CSF through it as shown in [Figure 1](#). He had lumbar myelomeningocele, which was operated on at the age of one year. Following repair surgery of myelomeningocele, he developed hydrocephalus and underwent ventriculoperitoneal shunt surgery. He remained fine until the age of 3.4 years when he developed a brain abscess and underwent drainage at some other center. According to parents, this peritoneal end of the VP shunt occasionally comes out of the anus after defecation and then goes back by itself.

On examination, the child was conscious and febrile, and dribbling of CSF from the protruded part of the VP shunt could be seen. No signs of meningeal irritation and peritonitis were noted. We did erect abdominal X-rays and plain Computed Tomography (CT) of the brain. X-ray showed complete shunt tubing and part of tubing in the pelvic region as shown in [Figure 2](#). Plain CT of the brain showed multiple brain abscesses as shown in [Figure 3](#). The rest of the lab investigations were normal except raised total leukocyte count. The child underwent surgery in mild sedation. An incision of about 1.5 cm was given in the clavicular region of the child, and then the shunt tubing was cut and separated. The protruding part of the shunt was gently pulled out through the anus. The ventricular end was exteriorized. CSF was sent for culture and sensitivity. Empirical antibiotics, antiepi-



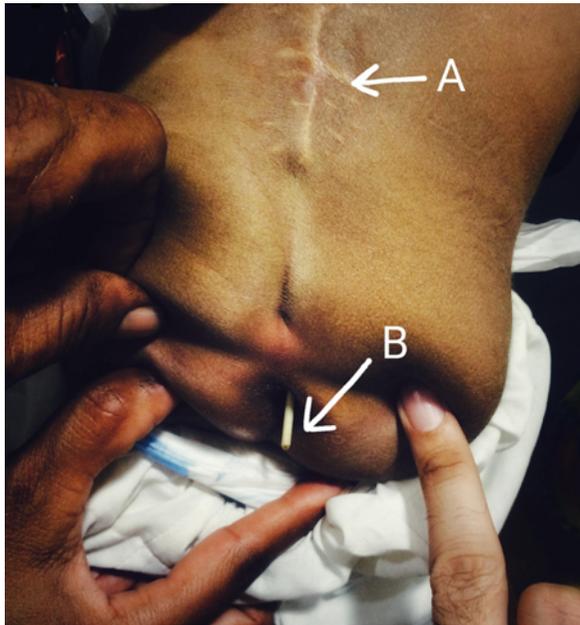


Figure 1. Arrow A indicates incisional scar for myelomeningocele repair surgery. Arrow B shows a peritoneal catheter protruding out of the anus with dribbling of cerebrospinal fluid.

leptics, and steroids were given. No microorganism was found in culture and sensitivity. The child improved over a period of two weeks and his brain abscesses resolved. After the collection of three clear CSF samples, the ventricular end of the VP shunt was removed followed by a new VP shunt insertion on the opposite side.

3. Discussion

A VP shunt anal protrusion is a rare condition. The majority of cases appear months after surgery, and the majority of patients are asymptomatic, with diagnosis based only on visualization of the prolapsed catheter from the anus. The exact pathophysiology behind shunt extrusion is not well-established, but various mechanisms have been proposed to explain it [2]. Children's thin intestine walls, the VP shunt's pointed and stiff end, operating surgeons' use of trocars, previous surgery, chronic shunt irritation, infection, and silicone allergy are only a few factors that could affect the rate of abdominal complications of VP shunt [3, 4]. In 1966, Wilson and Bertan published the first case of anal extrusion of the distal VP shunt [5]. The literature review revealed 68 reported cases of anal protrusion of ventriculoperitoneal shunt, as shown in Table 1. Abdominal peritonitis may or may not be present in patients with per anal shunt extrusion. As the fibrous tract gets developed at the perforated site, it frequently plugs the breach and prevents fecal matter's leakage into the peritoneum, which



Figure 2. X-ray of the abdomen with an erect view showing ventriculoperitoneal shunt tubing and distal part in the pelvic region.

would otherwise result in peritonitis; however, many patients do not have substantial abdominal symptoms. As a result, the correct diagnosis may not be made until gram-negative or anaerobic meningitis, encephalitis, or ventriculitis has fully progressed, resulting in significant morbidity and/or fatality. The cause of shunt ejection is unknown so far, but the most widely accepted theory is that after intestinal perforation, the tubing of the shunt is propelled out by the peristaltic movements in the gut [6].

The time between shunt placement and catheter protrusion from the anus might be between 2 and 20 months, with an average of about 6.1 months [7]. Early diagnosis, thorough clinical, radiographic, and biochemical examinations, and prompt treatment are essential for successful treatment. The conventional treatment strategy involves the removal of the extruded shunt, infection control, and general improvement of the patient, which is then followed by a CSF diversion surgery [6].

Bacterial migration backward through the shunt system can cause infections in the Central Nervous System (CNS), such as meningitis and ventriculitis, and in rare cases, a brain abscess. The most common organism found in these cases is *Escherichia coli* and sometimes other enteric pathogens are also present [8]. Gram-negative meningitis or abdominal symptoms in a patient with a VP shunt increase the risk of bowel perforation. The patient's primary treatment is determined

Table 1. Literature research revealed 68 cases of anal protrusion of ventriculoperitoneal shunt

Sr.no.	Authors' Name	Year Reported	No. of Cases Reported
1	Wilson and Bartan [5]	1966	2
2	Miserocchi et al. [11]	1984	1
3	Aricó et al. [12]	1985	1
4	Ali and Cheah [13]	1987	1
5	Sharma and Kak [14]	1988	1
6	Aranda et al. [15]	1989	1
7	Adeloye [16]	1997	2
8	Sathyanarayana et al. [9]	2000	1
9	Caksen et al. [17]	2003	1
10	Sharma et al. [18]	2003	1
11	Yilmaz et al. [10]	2004	2
12	Ferreira et al. [19]	2005	1
13	Gupta et al. [20]	2005	1
14	Ansari et al. [21]	2005	1
15	Akcora et al. [7]	2006	1
16	Ghritlaharey et al. [22]	2007	10
17	Zhou et al. [23]	2007	1
18	Matsuoka et al. [24]	2008	1
19	Li et al. [25]	2008	1
20	Sengul et al. [26]	2008	1
21	Etus [1]	2011	1
22	Glatstein et al. [27]	2011	1
23	Hayama et al. [28]	2011	1
24	Hai et al. [3]	2011	2
25	Ozturk et al. [29]	2012	1
26	Borkar and Mahapatra [30]	2012	1
27	Sharifian et al. [31]	2013	1
28	Phani [32]	2013	1
29	Gedik et al. [33]	2013	2
30	Plummer et al. [34]	2014	1
31	Grewal et al. [35]	2014	1
32	Bansal et al. [36]	2015	1

Sr.no.	Authors' Name	Year Reported	No. of Cases Reported
33	Thiong'o et al. [37]	2015	2
34	Bodeliwala et al. [6]	2016	1
35	Kumar and Kishore [38]	2016	1
36	Bales et al. [39]	2016	1
37	Sosuncu et al. [40]	2016	1
38	Gunawan and Ranuh [41]	2017	1
39	Liu et al. [42]	2017	1
40	Amouei et al. [43]	2017	1
41	Burhan et al. [44]	2018	2
42	Hasan et al. [4]	2018	2
43	Guthe et al. [45]	2018	1
44	Marino and Phillips [8]	2019	1
45	Turkis et al. [46]	2019	1
46	Bakshi [47]	2020	1
47	Jonuzi et al. [48]	2021	1
48	Heng and Yap [49]	2021	1
49	Lim et al. [50]	2021	1
50	Alhendawy et al. [2]	2021	1
51	Bosy et al. [51]	2021	1



by the presence of sepsis, peritonitis, or intraperitoneal abscess symptoms. A formal exploratory laparotomy is usually not required in a patient with a minor intestinal perforation and no accompanying problems, as in our reported case. After disconnecting the shunt tubing at the clavicular area or the abdominal wall, the bottom end of the shunt tubing should be removed via the rectum, either by proctoscopy, colonoscopy, and sigmoidoscopy, or gently pulling on the protruding tube [4, 9].

The VP shunt's distal end must never be pulled back into the peritoneal cavity, as this might cause contamination throughout the tract. To prevent CSF infection, an external ventriculostomy should be in place for at least three weeks, coupled with the use of broad-spectrum antibiotics [4, 9, 10]. The patient should get another VP shunt on the other or the same side after recurrent CSF cultures are determined to be sterile. An exploratory

laparotomy with shunt removal, thorough lavage, and primary gut wall closure should be performed on patients with bowel perforation peritonitis [4].

4. Conclusion

The risk of bowel perforation in symptomatic ventriculoperitoneal shunt patients must be kept high in case they develop gastrointestinal symptoms or maybe gram-negative or anaerobic meningitis. In children, the time between initial shunt operation and later the discovery of bowel perforation is shortest, and it gradually increases with age. The majority of them have an asymptomatic peritoneal end of the ventriculoperitoneal shunt per anus route. The extruded shunt is removed, infection is controlled, and then a CSF diversion surgery is performed. The extruded end can safely be removed from the migrating orifice. Revision surgery should be

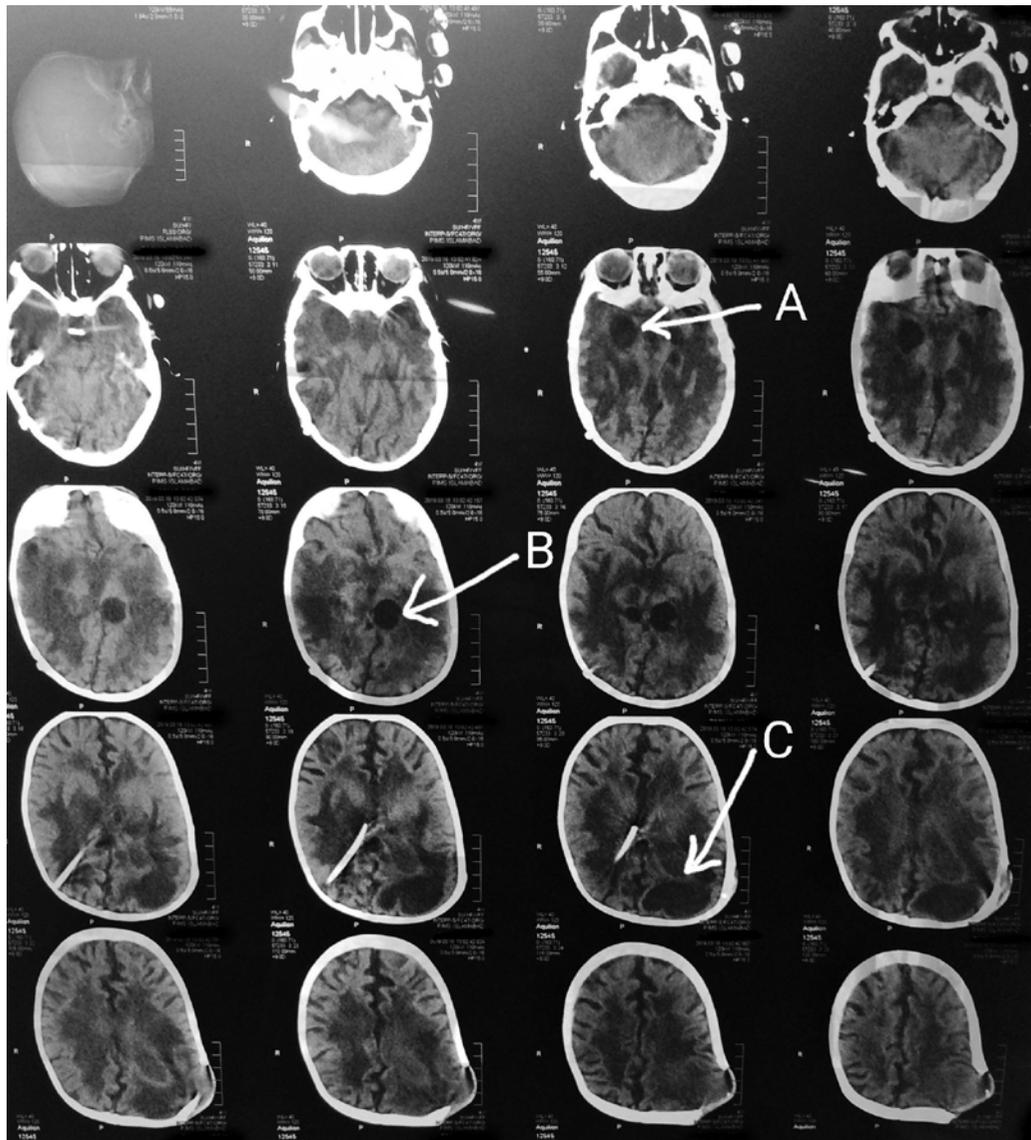


Figure 3. CT Brain Plain

Arrows A, B and C show multiple brain abscesses with cerebral edema. The ventricular catheter can be appreciated on the right side of the brain

considered once recurrent CSF cultures are sterile and the patient is determined to be non-toxic. Early detection and treatment are critical for minimizing and possibly preventing infectious and neurological problems.

Ethical Considerations

Compliance with ethical guidelines

The parents of the child provided written informed consent for the publication of this case report and associated pictures.

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Authors' contributions

Conception and design, Reviewing submitted version of manuscript: Ahtesham Khizar; Data collection: Ahtesham Khizar; Drafting the article: Ahtesham Khizar and Soha Zahid; Critically revising the article and Approving the final version: Ahtesham Khizar and Soha Zahid.

Conflict of interest

The authors declared no conflict of interest.



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