

Ventriculoperitoneal Shunt-Associated Abdominal Cerebrospinal Fluid Pseudocyst: A Rare Late Complication in a Young Male

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ABSTRACT

Background:

Ventriculoperitoneal (VP) shunt placement is a commonly performed neurosurgical procedure for the management of hydrocephalus. Although generally safe and effective, VP shunts are associated with a range of complications, including rare intra-abdominal conditions such as cerebrospinal fluid (CSF) pseudocyst formation. CSF pseudocysts are encapsulated fluid collections without a true epithelial lining and may present with nonspecific abdominal and neurological symptoms, often indicating shunt dysfunction.

Case Presentation:

We report the case of a 19-year-old male with a history of VP shunt placement in infancy for obstructive hydrocephalus secondary to aqueductal stenosis, who presented with progressive abdominal distension, diffuse abdominal pain, severe headache, recurrent vomiting, and sudden diminution of vision. Clinical evaluation raised suspicion of raised intracranial pressure with possible shunt malfunction. Imaging studies, including ultrasonography and contrast-enhanced computed tomography, revealed a large, well-defined, thin-walled loculated intra-abdominal cystic collection measuring approximately 10.1 × 23.3 × 34.5 cm, encasing the distal tip of the VP shunt, consistent with a CSF pseudocyst. Ultrasound-guided paracentesis was performed, leading to symptomatic improvement following fluid drainage and conservative management.

Conclusion:

CSF pseudocyst is a rare but important complication of VP shunt placement that should be considered in patients presenting with concurrent abdominal and neurological symptoms. Timely imaging plays a crucial role in diagnosis, while early multidisciplinary management is essential to prevent complications related to shunt malfunction and raised intracranial pressure.

Keywords: Ventriculoperitoneal Shunt, Cerebrospinal Fluid Pseudocyst, Hydrocephalus, Shunt Malfunction, Raised Intracranial Pressure, Abdominal Distension, Aqueductal Stenosis

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Key Points

- **Delayed presentation of VP shunt associated CSF Pseudocyst**
- **Abdominal Distention with features of raised intracranial pressure**
- **Imaging showing distal VP Shunt within the fluid collection.**

Background

Ventriculoperitoneal (VP) shunt placement is one of the most commonly performed neurosurgical procedures for the management of hydrocephalus and is generally considered a safe and effective long-term treatment modality. Despite its widespread use, VP shunting is associated with a broad spectrum of complications, including infection, obstruction, over-drainage, catheter migration, and abdominal complications. Among the rare abdominal complications, cerebrospinal fluid (CSF) pseudocyst formation represents an uncommon but clinically significant entity that may lead to shunt malfunction and raised intracranial pressure.

CSF pseudocysts are localized encapsulated intraperitoneal fluid collections lacking a true epithelial lining and are thought to arise secondary to chronic inflammation, infection, impaired CSF absorption, or peritoneal adhesions. Although uncommon, they may occur months to years after shunt placement and can present with highly variable and nonspecific manifestations. Adults more commonly present with abdominal symptoms such as distension, pain, palpable abdominal mass, nausea, or ascites, whereas children frequently present with neurological manifestations related to shunt dysfunction. In some cases, patients may present with a combination of abdominal and neurological symptoms, creating diagnostic difficulty and delaying appropriate management.

Imaging plays a pivotal role in diagnosis, with ultrasonography often serving as the initial modality for detecting cystic intra-abdominal collections, while contrast-enhanced computed tomography (CECT) provides better delineation of the size, extent, loculations, and relationship of the cyst to the distal shunt catheter. Early recognition is important because delayed diagnosis may result in progressive shunt failure, recurrent intracranial hypertension, infection, or visual complications. Management strategies vary depending on the underlying etiology and clinical severity and may include percutaneous drainage, shunt revision, repositioning of the distal catheter, or surgical excision of the pseudocyst.

We report a case of a giant intra-abdominal CSF pseudocyst in a young adult with a history of VP shunt placement in infancy for obstructive hydrocephalus secondary to aqueductal stenosis, presenting with progressive abdominal distension along with features of raised intracranial pressure. This case highlights the importance of maintaining a high index of suspicion for CSF pseudocyst in patients with VP shunts presenting with concurrent abdominal and neurological symptoms, even many years after shunt placement.

Case Presentation

A 19-year-old male presented with complaints of progressive abdominal distension and diffuse abdominal pain over a period of several weeks. The pain was insidious in onset, dull aching in character, and diffuse in distribution, with gradual worsening of abdominal fullness causing significant discomfort and restriction of routine activities. The patient also reported severe right-sided headache, recurrent episodes of vomiting, and sudden diminution of vision, suggestive of raised intracranial pressure in addition to an underlying intra-abdominal pathology.

There was no associated history of fever, altered bowel or bladder habits, trauma, seizures, or recent infection. The patient denied any prior similar episodes. His past medical history was significant for obstructive hydrocephalus secondary to aqueductal stenosis, for which a ventriculoperitoneal (VP) shunt had been placed at the age of four months. Birth history revealed meconium aspiration syndrome complicated by neonatal meningitis, following which shunt placement was performed during infancy. The patient had remained relatively asymptomatic for several years prior to the current presentation.

On presentation to our institution, the patient was conscious, alert, and oriented, with stable vital parameters. Abdominal examination revealed marked abdominal distension with mild diffuse tenderness on palpation; however, there were no features suggestive of peritonitis such as guarding, rigidity, or rebound tenderness. No palpable organomegaly was appreciated clinically. Neurological examination did not reveal focal motor or sensory deficits, although fundoscopy demonstrated findings

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consistent with raised intracranial pressure. In view of the combination of abdominal distension, symptoms suggestive of shunt dysfunction, and a prior history of VP shunt placement, suspicion was raised for an intra-abdominal complication related to the distal shunt catheter, including the possibility of a cerebrospinal fluid (CSF) pseudocyst.

Diagnostic Assessment

Initial Laboratory Results:

TABLE 1

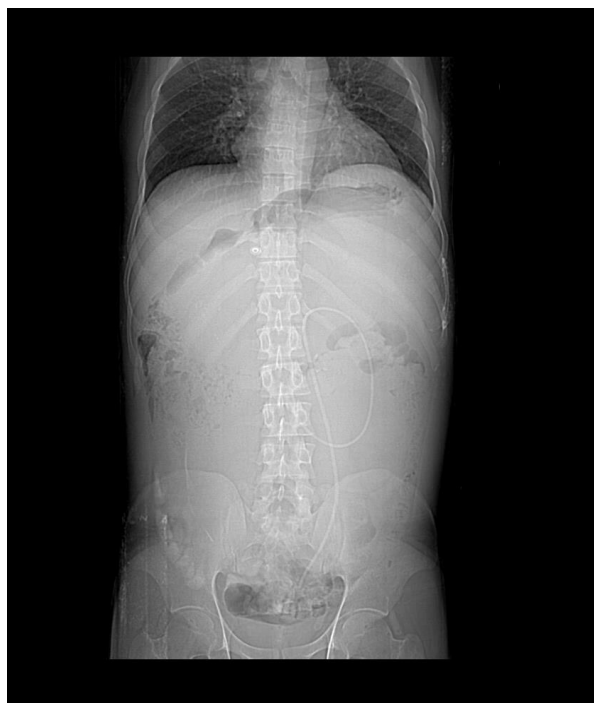
Parameter	Result	Reference Range
Hemoglobin (Hb)	12.7	12-16 g/dL
Total Leukocyte Count (TLC)	8.9	4-11 $\times 10^3$ /cmm
Differential Count (DLC)	N=70/L= 20/E=1.93/M=6.5	40-70, 20-45, 0-10
Platelet Count	34	150-450 $\times 10^3$ /cmm
RBC Count	3.67	3.5-5.2
PCV	40.4	35-47 %
MCV	110	82-98 fL
MCH	33.7	26-34 pg
MCHC	30.2	30-36 %
Total Bilirubin	0.83	0.2-1.3 mg/dL
Direct / Indirect Bilirubin	0.31/0.52	0.1-0.3 /0-1.1 mg/dL
Total Protein / Albumin	7.8/4.1	6.3-8.2 / 3.5-5 g/dL
ALP	83	38-126 U/L
SGOT (AST)	31	14-36 U/L
SGPT (ALT)	43	0-35 U/L
GGT	-	11-61 U/L
LDH	-	120-246 U/L
Urea / Creatinine	24.9/0.7	
Uric Acid	3.8	
Na/K/CL	144/3.3/102	
Ca/P	9/3.4	

Laboratory evaluation revealed : Hematological investigations demonstrated thrombocytopenia with progressive leukopenia & relative lymphopenia. Peripheral smear showed macrocytes & serum vitamin B12 & vitamin D levels revealed hypovitaminosis B12 & D . Renal & liver functions tests were within normal limit. Tridot was negative.

Imaging

- **X-Ray Abdomen:**

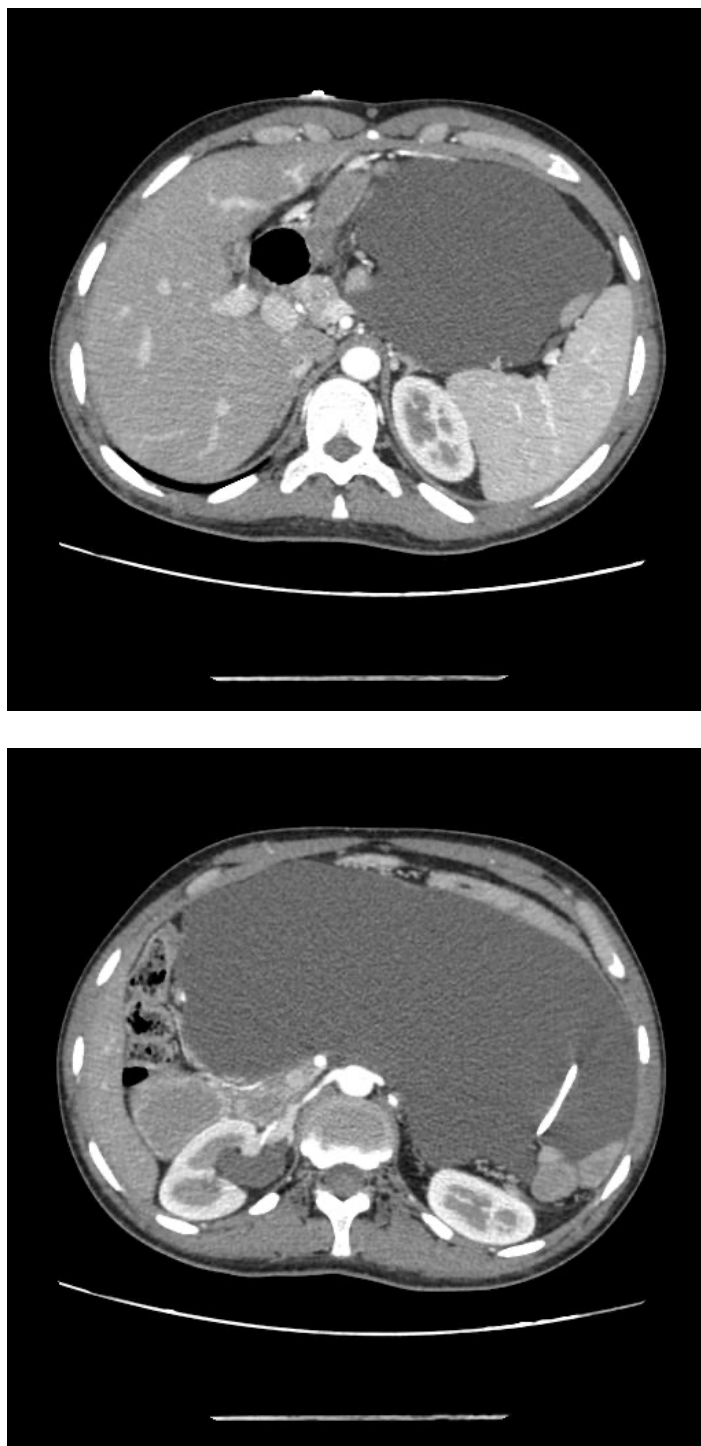
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- **Ultrasound Abdomen:** Large cystic Intra-abdominal collection with encysted ascites with free floating echoes.
- **CECT Whole Abdomen:** Imaging findings are suggestive of well defined, loculated intra abdominal collection with distal VP SHUNT tip lying within it likely suggestive of CSF pseudocyst formation.
A well defined large, thin walled loculated fluid collection of size 10.1 x 23.3 x 34.5 cm is seen in abdomen reaching upto pelvis. The distal end of VP shunt catheter is seen within the collection.



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Imaging studies were suggestive of a significant intra-abdominal fluid collection related to the VP shunt system. Ultrasonography of the abdomen demonstrated a large cystic intra-abdominal collection with associated ascites. Further evaluation with contrast-enhanced computed tomography (CECT) of the whole abdomen revealed a large, well-defined, thin-walled loculated cystic lesion encasing the distal end of the VP shunt catheter, consistent with a giant cerebrospinal fluid (CSF) pseudocyst.

Further Evaluation:

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Paracentesis was performed at her initial presentation and had shown an ascitic albumin level of 0.6 G/DL. Trans BF2 was found in the ascitic fluid, indicating the presence of cerebrospinal fluid in the ascites. Based on this and the normal serum albumin level of 4.0 g/dL, serum-ascites albumin gradient (SAAG) > 1.1 indicated a high probability of portal hypertension and probable underlying liver disease

Parameter	Result	Reference Range
Albumin (ascitic fluid)	1 g%	
Albumin (serum)	3.2	
Trans BF2 (ascitic fluid)	Positive	
SAAG	2.2	
CYTOLOGY	TLC: 85 Cells/cumm (N: 10% L: 80%)	
BIOCHEMISTRY	SUGAR: 93, TOTAL PROTEIN: 2.0)	
LDH	212	
ADA	13.96	
KOH MOUNT	NEGATIVE	
M CELL GRAM STAIN	NEGATIVE FEW PUS CELLS, NO MICRO ORGANISMS SEEN	
AFB	NO ACID FAST BACILLI	

Verification of trans BF2 protein in the ascites helped identify that the cerebrospinal fluid (CSF) is the source of ascitic fluid, and in the absence of any other cause for the ascites, it was determined that the VP shunt was the cause of this patient's ascites

Hospitalization Course

In view of the large symptomatic intra-abdominal collection, the patient underwent ultrasound-guided paracentesis for therapeutic drainage. Supportive and conservative management was initiated, including analgesics, antiemetics, and close neurological monitoring. Following fluid drainage, the patient demonstrated symptomatic improvement with reduction in abdominal distension and not much improvement in symptoms related to raised intracranial pressure. The patient remained hemodynamically stable and was advised regular follow-up for continued neurosurgical evaluation and monitoring of VP shunt function.

Discussion

Hydrocephalus is a chronic neurological disorder characterized by abnormal accumulation of cerebrospinal fluid (CSF) within the ventricular system, frequently requiring long-term cerebrospinal fluid diversion through ventriculoperitoneal (VP) shunt placement. VP shunting remains one of the most commonly performed and effective neurosurgical procedures for the management of raised intracranial pressure and hydrocephalus of diverse etiologies. Despite its therapeutic efficacy, VP shunts are associated with a broad spectrum of complications, including infection, obstruction, overdrainage, catheter migration, and mechanical malfunction. Among the less common but clinically significant abdominal complications is the formation of a CSF pseudocyst, a rare entity characterized by a loculated intra-abdominal fluid collection lacking a true epithelial lining and typically surrounding the distal end of the shunt catheter.¹

The exact pathogenesis of CSF pseudocyst formation remains incompletely understood and is believed to be multifactorial. Proposed mechanisms include chronic peritoneal inflammation, impaired CSF absorption, low-grade infection, foreign body reaction to the catheter, adhesions from previous abdominal surgery, elevated CSF protein content, and repeated shunt revisions. Although pseudocysts are reported more frequently in pediatric populations, they may occur across all age groups and can develop several years after the original VP shunt placement.² In the present case, the delayed presentation in a young adult with a remote history of VP shunt surgery highlights the need for continued long-term surveillance and clinical suspicion even in apparently stable patients.

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Clinically, CSF pseudocysts often present with nonspecific abdominal manifestations, including abdominal pain, distension, nausea, vomiting, early satiety, or palpable abdominal mass. Importantly, symptoms of shunt malfunction and raised intracranial pressure may coexist due to impaired CSF drainage. Patients may therefore present with headache, vomiting, visual disturbances, altered sensorium, papilledema, or cranial nerve palsies. In our patient, the simultaneous occurrence of progressive abdominal distension, severe headache, and diminution of vision suggested both intra-abdominal pathology and functional shunt obstruction. Recognition of this dual presentation is particularly important because neurological deterioration may be subtle initially and can progress rapidly if the diagnosis is delayed.

One of the principal diagnostic challenges in such cases lies in differentiating CSF pseudocysts from other causes of intra-abdominal fluid collections, including ascites, abscesses, mesenteric cysts, lymphoceles, pancreatic pseudocysts, or cystic neoplasms. In tuberculosis-endemic regions, infective etiologies may also be considered, especially when constitutional symptoms or abdominal fluid collections are present. Imaging therefore plays a central role in establishing the diagnosis and guiding management. Ultrasonography serves as a rapid and noninvasive initial modality for detecting cystic intra-abdominal collections and identifying the distal shunt tip within the lesion. However, computed tomography (CT) provides superior anatomical delineation, allowing accurate assessment of cyst size, loculation, catheter position, mass effect on adjacent viscera, and associated complications. In the present case, CT imaging demonstrated a large, well-defined loculated cystic collection encasing the distal VP shunt catheter, thereby confirming the diagnosis of a CSF pseudocyst and facilitating surgical planning.

The presence of a pseudocyst should also prompt evaluation for underlying shunt infection, as infectious etiologies have been implicated in a substantial proportion of reported cases. Microbiological analysis of CSF and cyst fluid, along with inflammatory markers and culture studies, may aid in identifying occult infection and guiding antimicrobial therapy.³ Failure to recognize an infected pseudocyst may lead to persistent shunt malfunction, recurrent collections, meningitis, or systemic sepsis. Consequently, a multidisciplinary approach involving neurosurgeons, radiologists, and infectious disease specialists is often required for optimal management.

Management strategies for CSF pseudocysts are individualized and depend on the patient's clinical status, presence of infection, size and recurrence of the cyst, and functionality of the shunt system. Therapeutic options include image-guided aspiration, surgical drainage, laparoscopic or open excision of the cyst wall, repositioning or revision of the distal catheter, and conversion to alternative CSF diversion pathways such as ventriculoatrial or ventriculopleural shunting. Although simple aspiration or drainage may provide temporary symptomatic relief, recurrence rates are relatively high unless definitive correction of the underlying shunt dysfunction is undertaken. In infected cases, externalization or removal of the shunt followed by targeted antibiotic therapy and delayed shunt replacement may be necessary.² Early recognition and definitive management are essential to prevent recurrent intracranial hypertension, visual impairment, and other potentially life-threatening complications.

The present case is noteworthy because of the coexistence of significant abdominal distension and manifestations of raised intracranial pressure in a young adult several years after VP shunt placement. This case underscores the importance of considering late shunt-related abdominal complications in any patient with prior VP shunt surgery presenting with unexplained abdominal symptoms or neurological deterioration. Delay in diagnosis may result in progressive shunt failure, worsening hydrocephalus, visual loss, and increased morbidity. Similar atypical delayed presentations have also been described in the literature, emphasizing that VP shunt complications may occur even long after apparently successful surgical intervention.³

Overall, this case highlights the importance of maintaining a high index of suspicion for CSF pseudocyst formation in patients with VP shunts presenting with abdominal complaints and concurrent neurological symptoms. Early imaging evaluation, particularly with CT, combined with timely neurosurgical intervention is crucial for accurate diagnosis and favorable outcomes. A multidisciplinary and systematic approach remains essential in preventing diagnostic delays and reducing morbidity associated with this uncommon but significant complication of VP shunting.

Conclusion

CSF pseudocyst should be considered in patients with ventriculoperitoneal shunts presenting with unexplained abdominal distension, abdominal pain, or features of raised intracranial pressure, even years after shunt placement. The coexistence of abdominal and neurological symptoms should raise suspicion for shunt-related complications rather than isolated intra-abdominal pathology alone. Ultrasonography and CT imaging are invaluable for early diagnosis and surgical planning, while timely shunt revision and definitive management are essential to prevent recurrence, shunt failure, and neurological deterioration. A multidisciplinary approach with early intervention is crucial for achieving favorable clinical outcomes.

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