Abdominal Cerebrospinal Fluid Pseudocyst Formation: A Rare Intra-Abdominal Complication Following Ventriculoperitoneal Shunt

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Ventriculoperitoneal (VP) shunt is a common neurosurgical procedure which is performed due to different clinical indications. Abdominal cerebrospinal fluid pseudocysts (APC) are a rare intra-abdominal complication of VP shunt.

A five-year-old female, known case of Dandy-Walker syndrome and congenital hydrocephalus, presented with two days' history of abdominal pain with fever. She underwent ventriculoperitoneal shunt insertion six months before her presentation. The patient was admitted and started on empirical antibiotics (ceftriaxone 1 gram intravenously once daily for 10 days).

A contrast-enhanced CT scan of the abdomen and pelvis revealed a large fluid-containing cystic structure in the lower abdomen measuring about 7.5x7.1x5.5 cm. The patient underwent laparoscopic adhesiolysis with shortening of VP shunt under general anesthesia. The patient had no postoperative complications and was discharged after three days.

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Intra-abdominal complications are seen frequently following ventriculoperitoneal shunting procedures; however, a peritoneal pseudocyst formation is rarely seen compared to other intra-abdominal complications, such as infection of the shunt, blockage, peritonitis and incisional hernia[1,2].

The aim of this report is to present a case of a peritoneal pseudocyst formation in a five-year-old female following VP shunt insertion.

THE CASE

A five-year-old female, known case of Dandy-Walker syndrome and congenital hydrocephalus, presented with two days' history of abdominal pain with fever. She underwent ventriculoperitoneal shunt insertion six months before her presentation. Physical examination revealed a temperature of 38°C and generalized abdominal tenderness with right side rigidity. Her laboratory investigation showed a high white cell count (16×109/L) and elevated C-reactive protein count (321 mg/L). The patient was admitted and started on empirical antibiotics (ceftriaxone 1 gram intravenously once daily for 10 days). Cerebrospinal fluid (CSF) analysis revealed no abnormalities.

An abdominal ultrasound revealed multiloculated fluid collection at the lower abdomen with multiple septations with internal echoes suggestive of debris. The VP shunt tube was seen traversing the collection, see figure 1.

A contrast-enhanced CT scan of the abdomen and pelvis revealed a large fluid-containing cystic structure in the lower abdomen measuring about 7.5x7.1x5.5 cm, most likely representing abdominal cerebrospinal fluid pseudocyst. A little amount of free fluid was found in the lower abdomen and pelvis with diffuse peritoneal fat stranding and thickening of the peritoneal reflections, see figure 2.

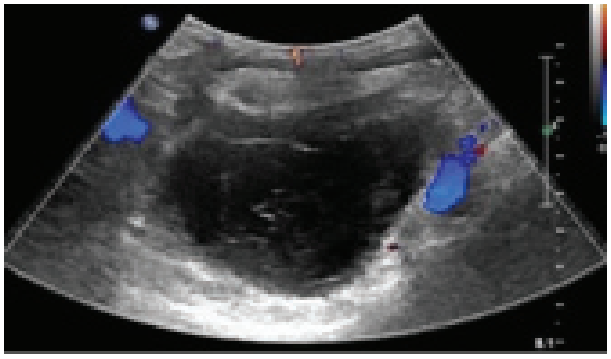

Figure 1: A Longitudinal Ultrasound Image of the Lower Abdomen and Pelvis Showed Well Defined, Multiloculated Fluid Collection with Multiple Septations with No Definite Vascularity by Color Flow Doppler

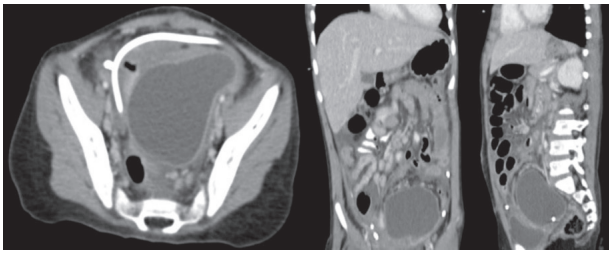

Figure 2: Axial, Coronal and Sagittal Images of the Contrast-Enhanced CT Abdomen and Pelvis Re-demonstrated the Previously Described Large Fluid-containing Cystic Structure in the Mid-abdomen toward the Left Iliac Fossa Measuring About 7.5 x 7.1 x 5.5 cm, Most Likely CSF Shunt Tube Cyst, with the 2 Peritoneal Shunt Tube Passing Close to the Cyst

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The patient underwent laparoscopic adhesiolysis with a shortening of VP shunt under general anesthesia. The patient had no postoperative complications and was discharged after three days.

DISCUSSION

VP shunt insertion is common procedure for the treatment of hydrocephalus. Complications are common; up to 50% of patients would require shunt revision. Intra-abdominal complications are commonly seen close to the peritoneal end of the shunt catheter[1,2]. Infection of the shunt is common complication followed by obstruction and extraperitoneal retraction of the catheter, migration and faulty equipment, incisional hernia, CSF subcutaneous collection, omentum wrapping, intestinal perforation, CSF ascites, inguinal hernia and intestinal volvulus[3,4,5,6].

A minimal amount of peritoneal fluid is expected in patients with non-complicated ventriculoperitoneal shunts, but it could also be a sign of recurrent ascites, a peritoneal cyst, an omental cyst or subphrenic or lesser sac loculation. Formation of peritoneal CSF pseudocyst is a rare complication, the rate is between 0.33% to 6.8%[7]. The pseudocyst wall consists of fibrous tissue or an inflamed serosal surface that has no epithelial lining and is filled with CSF and debris. In children, it presents as high intracranial pressure and abdominal pain; in adults, abdominal pain, distention, nausea or vomiting[8].

Harsh described an abdominal CSF pseudocyst in 1954[9]. Hahn et al found that almost 80% of all pseudocyst formation is caused by infection[10]. Sheathing of the peritoneal catheter is the most common intraabdominal response to infection which may result in a large intraabdominal fluid-filled cyst as CSF drains into these sheaths[8]. The causes of pseudocyst formation could be infection, high protein CSF, allergic reaction to immunization, liver dysfunction, and tissue reaction against shunt material and CSF protein[11,12]. Pseudocyst may form 3 weeks to 5 years post VP shunt insertion[12].

The pseudocyst might be seen as free peritoneal fluid or adhere to small bowel loops, solid organ serosal surface or parietal peritoneum[8].

CSF pseudocysts can be distinguished from ascites by their characteristic bowel gas pattern displacement on abdominal radiograph and the absence of shifting dullness. However, differentiation of ascites from CSF pseudocysts lesions may be difficult; therefore, fine-needle aspiration of the localized CSF collections should be performed under sonographic or CT guidance. Pseudocyst wall should be excised, and the peritoneal shunting catheter removed in case of infection[8]. The pseudocyst slowly collapses once the shunt tip is removed as there is no secretory epithelium in the cyst[3].

Treatment of pseudocysts varies and there is no established standard[13]. Treatment could be through open or laparoscopy performing percutaneous drainage of the pseudocyst with distal repositioning of the peritoneal catheter, insertion of the distal catheter in a different area such as the contralateral area, pleural space or the right atrium and endoscopic third ventriculostomy with the removal of shunt hardware completely[14].

CONCLUSION

Abdominal Cerebrospinal fluid pseudocyst formation is an uncommon complication of ventriculoperitoneal shunt insertion. Radiology plays a major role in the diagnosis and distinguishes APCs from other complications.

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