Case Report

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Laparoscopic management of associated abdominal complications of ventriculoperitoneal shunt: case report

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Laparoskopische Therapie einer Bauchkomplikation durch einen ventrikuloperitonealen Shunt: ein Fallbericht

Zusammenfassung. *Grundlagen:* In 5–47 % der Fälle kommt es nach ventrikuloperitonealem Shunt zu abdominellen Komplikationen. Eine seltene Komplikation ist die abdominelle zerebrospinale Flüssigkeits-Pseudozyste, die meist bei Kindern vorkommt. Abdominale Pseudozysten und intraabdominelle Katheter-Migration sind bei Erwachsenen selten. Obstruktion des Shunts führt zu erhöhtem Hirndruck und bedarf einer sofortigen Intervention.

Methodik: Fallbericht.

Ergebnisse: Wir berichten über das erfolgreiche Management einer 20-jährigen Frau, die eine solche Pseudozyste mit Migration des abgebrochenen Katheters in die Bauchhöhle 9 Jahre nach Hydrozephalus-Therapie entwickelte.

Schlussfolgerungen: Laparoskopisch kann die abdominelle Komplikation eines solchen Shunts gut therapiert werden.

Schlüsselwörter: Ventrikuloperitonealer Shunt, Pseudozyste, Laparoskopie.

Summary. *Background:* Abdominal complications after ventriculoperitoneal (VP) shunt placement are reported in 5–47% of cases. Abdominal cerebrospinal fluid (CSF) pseudocyst is an uncommon complication of a VP shunt, the majority being reported in children. Abdominal pseudocysts and intra-abdominal catheter migration are rare in adult patients. Ventriculoperitoneal shunt obstruction or malfunction results in elevated intracranial pressure, representing an indication for immediate intervention.

Methods: Case report.

Results: The authors report a case of successful laparoscopic management in a 20-year-old female patient who developed CSF pseudocyst combined with migration of the fractured catheter in the abdominal cavity nine years after VP shunting for hydrocephalus.

Conclusions: Laparoscopic approach is a safe and useful treatment modality for combined peritoneal complications of VP shunt.

Keywords: Ventriculoperitoneal shunt, cerebrospinal fluid pseudocyst, laparoscopic management.

Introduction

The VP shunts are the most common surgical procedures for hydrocephalus treatment [1]. The goal of this procedure is to drain CSF from the ventricles to the peritoneal cavity, thus to decrease the intracranial pressure. The peritoneal cavity is considered the best site to drain CSF because of its capacity for absorption and low rate of complications [2]. The complications of this surgical procedure usually occur at the peritoneal side of the VP shunt [3]. The most common complications encountered at the peritoneal end are: (1) extraperitoneal retraction of the catheter, (2) development of incisional hernia, (3) subcutaneous collection of the CSF, (4) peritoneal pseudocyst formation due to low-grade infection leading to wrapping around by the omentum [3] and (5) intra-abdominal catheter migration [4]. Intra-abdominal migration of the catheter with abdominal CSF pseudocysts are among the least common complications around the peritoneal end of the shunt and are reported to occur in less than 1% of VP shunts [3, 4]. Shunt complications at the lower end of the catheter always represent an emergency as these may lead to increased intracranial pressure

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[5]. Up to now, these complications were treated by laparotomy. Recently several case reports of laparoscopic management for abdominal CSF pseudocysts were published [3, 4, 6]. We report an additional case of successful laparoscopic management of intra-abdominal migration of the distal part of the catheter with abdominal CSF pseudocyst formation.

Case report

A 20-year-old female was admitted to our unit with a 72-hour history of abdominal pain nausea and a temperature of 37.4°C. Nine years ago, she underwent VP shunting for hydrocephalus. Blood test on admission showed elevated WBC (16×10^9/L), abdominal ultrasound and CT scans revealed an encysted fluid collection in the abdominal cavity of about 200 cc (Fig. 1). The VP shunt catheter tip was identified within the fluid collection, thus a CSF pseudocyst was diagnosed. A free fragment of the VP shunt was observed in the pelvis (Figs. 1 and 2). Laparoscopic exploration of the abdomen was carried out. A large encysted collection of CSF was seen in the left middle third of the abdominal cavity, wrapped around by the omentum and small bowel. Omentum and adherent bowel were released and the collection was laid open. After the VP shunt was identified to be patent, reposition of the distal catheter into the right subdiaphragmatic area was performed and the fragment displaced into the pelvis was removed. Transparent CSF was obtained from the VP shunt. Microbiological analysis of the CSF from the pseudocyst showed *Staphylococcus epidermidis*. Fever and abdominal pain disappeared following the laparoscopic procedure. The patient had an uneventful recovery being discharged four days following the procedure. The patient was symptom free during 1-month follow-up and the abdominal ultrasound showed no shunt tube related problems.

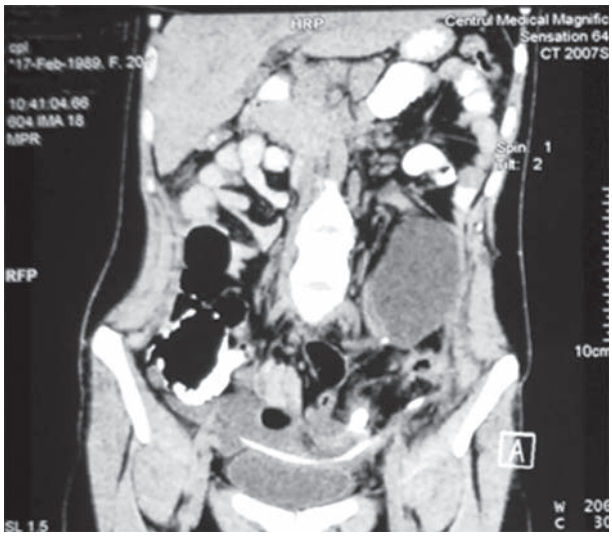

Fig. 1: Fluid collection on the left flank containing the shunt tip within the pseudocyst and the free VP shunt fragment located in the pelvis

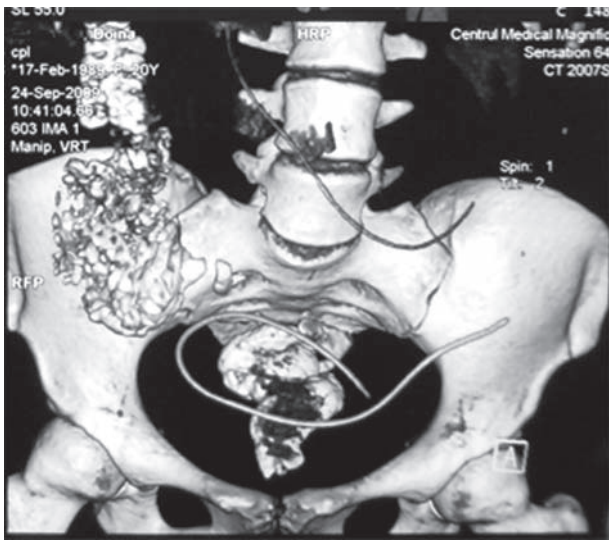

Fig. 2: VP shunt in the peritoneal cavity and the shunt fragment

Discussion

Since its introduction by Kausch in 1905, a variety of complications of VP shunt have been described in the published literature. The overall abdominal complication rate in patients with VP shunt remains high, ranging between 5 and 47% [3]. The most common intraperitoneal complications are VP shunt obstruction, shunt disconnection, intestinal perforation, intestinal obstruction, CSF ascites, pseudocyst formation, development of inguinal hernia and chronic peritoneal infection [3, 4]. These complications may present either as local abdominal signs or with elevated intracranial pressure.

Formation of a CSF pseudocyst as a complication of VP shunt was first described by Harsh in 1954 [7]. According to the literature data, the incidence of this complication ranges between 0.7 and 10% [3, 8, 9]. In a review of 95 cases, abdominal pain (63%), abdominal distension (37%), abdominal tenderness (31%) and abdominal mass (29%) were the most common symptoms and signs [8].

There are several factors related to CSF pseudocyst formation: acute infection, a history of CSF infection, high CSF protein and central nervous system tumour [10, 11].

According to the literature data, CSF pseudocysts most commonly occur during the first 6 months after surgery [12].

Some authors suggest that smaller pseudocysts tend to be infected, and larger pseudocysts tend to be sterile [10], although others found no relationship between the pseudocyst size and infection [13].

Intra-abdominal migration of the fractured VP shunt occurs in 0.8–3% of cases [7, 14, 15]. The possible mechanisms of this complication are repetitive body movements, gravity, intestinal peristalsis, respiratory and abdominal movements [16].

To the best of our knowledge, this is the first case report of laparoscopic management of combined (CSF

pseudocyst formation and migration of the fractured catheter in the abdominal cavity) complications at the peritoneal end of a VP shunt in the same patient.

The diagnosis is made upon the imaging techniques: (1) plane radiographs might show the shunt tube coiled in a soft tissue mass that displaces adjacent bowel loops [17]; (2) ultrasound shows a well-defined sonolucent mass, with posterior acoustic enhancement [18, 19]. Computed tomography examination shows a cyst containing homogeneous water density fluid; identifying the shunt tip within the cyst also helps distinguish a CSF pseudocyst from pancreatic pseudocyst or ovarian cystadenoma [18]. This diagnostic tool proved very useful in our case, since it not only facilitated the diagnosis, but also allowed to visualize the fragment of the VP shunt displaced into the pelvis (Figs. 1 and 2).

Complications of VP shunts are a surgical emergency due to the potential elevation of intracranial pressure [5]. There are several management options described: (1) conversion to ventriculo-atrial or ventriculopleural shunt, (2) external ventricular drainage, (3) computed tomography (CT) guided needle aspiration and (4) exploratory laparotomy with adhesiolysis and catheter tip repositioning [3]. Some authors recommend shunt removal with external ventricular drainage until the CSF culture becomes sterile and abdominal symptoms resolve, once this goal is achieved, a new shunt placement in the abdomen on the opposite side is advocated [3], while others advocate shunt tip reposition in case of no evidence of infection [20]. Once the shunt tip is removed from the pseudocyst, it gradually collapses since there is no secretory epithelium in the cyst. In our case we followed the above-mentioned procedure (removing the shunt tip from the pseudocyst and since the VP shunt was identified to be patent, reposition of the distal catheter into the right subdiaphragmatic area was performed and the fragment displaced into the pelvis was removed) with a satisfactory result, the patient being symptom free for 1 month.

Until recently laparotomy was the first treatment option for complicated VP shunt, but lately several case reports of laparoscopic management for abdominal CSF pseudocysts were published [3, 4, 6]. We managed to obtain a laparoscopic VP shunt debridment with distal catheter reposition into the right subdiaphragmatic area and laparoscopic removal of the VP shunt fragment dislocated into the pelvis. In our patient laparoscopy proved useful not only for pseudocyst drainage but also for catheter's salvage.

In conclusion, this case report proves the utility of laparoscopic approach for the treatment of combined complications of VP shunt.

Conflict of interest

The authors declare that there is no conflict of interest.

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