

Treatment Approaches for Abdominal Migration of Peritoneal Catheter of Ventriculoperitoneal Shunt

ABSTRACT

Migration of peritoneal catheter into the abdominal cavity is rare. We have discussed and presented the treatment options in two cases with accompanying literature. Abdominal migration of peritoneal catheter appears as a result of shunt fracture and disconnection. The complaints on presentation in the abdominal cavity migration of peritoneal catheter are due to shunt dysfunction and peritoneal irritation. The peritoneal catheter with abdominal migration should be removed in cases where abdominal symptoms are present. This procedure may be easily performed laparoscopically with a single mini incision. In some cases, the catheter may cause adhesions to the intra-abdominal organs. Forcefully pulled catheters may result in organ injuries. One should therefore switch to laparotomy in these cases.

KEY WORDS: Abdominal migration, Peritoneal catheter, VP shunt complication

INTRODUCTION

Ventriculoperitoneal shunts are widely used in treatment of hydrocephalus and shunt complications are frequent problems in neurosurgery clinics. Among these complications, shunt fracture, disconnection and consequent migration to various cavities are rarely seen. Shunt migration may occur into the lateral ventricles (17), mediastinum (5), gastrointestinal tract (19), abdominal wall (22), urinary bladder (7), vagina (16), scrotum (15) and the abdominal cavity (2, 9). In this report, treatment options in peritoneal catheter migration to the abdominal cavity are discussed.

CASE 1:

A three-year-old boy presented with nausea, vomiting, and abdominal pain. During the neurological examination, he was restless, lethargic, and irrelevant to his surroundings. Head circumference was measured as 56.5 cm. During the abdominal examination, palpation revealed sensitivity. In the medical history, he had a VP shunt due to hydrocephalus in our clinic 2 years ago. In the computerized brain tomography, the third and lateral ventricles were seen to be dilated. Although the shunt catheter tract was palpable, there was a fracture in the peritoneal catheter at the cervical level with direct x-ray (Figure 1) and migration of the distal end to the abdominal cavity (Figure 2). Laboratory analysis revealed a WBC count of $29.03 \times 10^3 / \text{mm}^3$. Cerebrospinal fluid (CSF) analysis was performed for intermittent fever. Microscopic and biochemical analyses of CSF were normal. A shunt revision was planned for the hydrocephalus. The distal peritoneal end

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Figure 1: A fracture of the peritoneal catheter at the cervical level is seen with direct x-ray.

that had migrated to the abdominal cavity was removed laparoscopically with a single incision in the right upper quadrant of the abdomen. It was observed that the ventricular end and the valve were working properly. A revision was performed with a new peritoneal catheter. The distal end of the peritoneal catheter was placed into the peritoneal cavity through the laparoscopy incision. No growth was observed in CSF, blood and urine cultures. The patient received no antibiotics other than the prophylactic ones (ceftriaxone 75 mg/kg single dose pre-operatively and twice dose post-operatively). Neurological problems and the increased white blood cell count returned to normal after the operation.

CASE 2:

A seven-year-old boy had fever, abdominal pain and an increased number of epileptic episodes on admission. History revealed left hemiparesis due to



Figure 2: There is migration of the distal peritoneal end to the abdominal cavity.

meningitis in the neonatal period and at six months of age. A VP shunt was performed in another center. He had been under antiepileptic treatment for about 3 years. Neurological examination revealed motor aphasia and left hemiparesis (3/5 strength in upper and lower extremities). Although the shunt tract was palpable on the physical examination, ventricular and peritoneal ends were seen to be disconnected from the valve in direct x-ray (Figure 3). The peritoneal catheter had migrated to the abdominal cavity (Figure 4). The third and lateral ventricles were seen to be slightly dilated on CT. Epileptic activity was observed in the right fronto-temporal region on the electroencephalogram. The ventricular



Figure 3: Ventricular and peritoneal ends are disconnected from the valve in direct x-ray.

end, which was completely independent from the valve, was removed during the operation. A fibrotic tract towards brain tissue was observed, through which the ventricular catheter in the intracranial segment of the Burr hole type valve passed. The fibrotic tract was freed from brain tissue and excised. Through the laparoscopy incision, an attempt was made to remove the peritoneal catheter that had migrated to the abdominal cavity, but the attempt was unsuccessful. At laparotomy it was seen that the catheter was attached to liver by adhesions (Figure 5). The peritoneal catheter was freed from the liver and removed. In the pre-operative tomography, since there was no significant hydrocephalus despite the non-functional shunt, establishing a new shunt did not prove necessary. Despite antiepileptic treatment (phenytoin, carbamazepine) pre-operatively, the seizure frequency of the patient, experiencing hourly episodes on average, decreased significantly, and on his follow-up after two months,

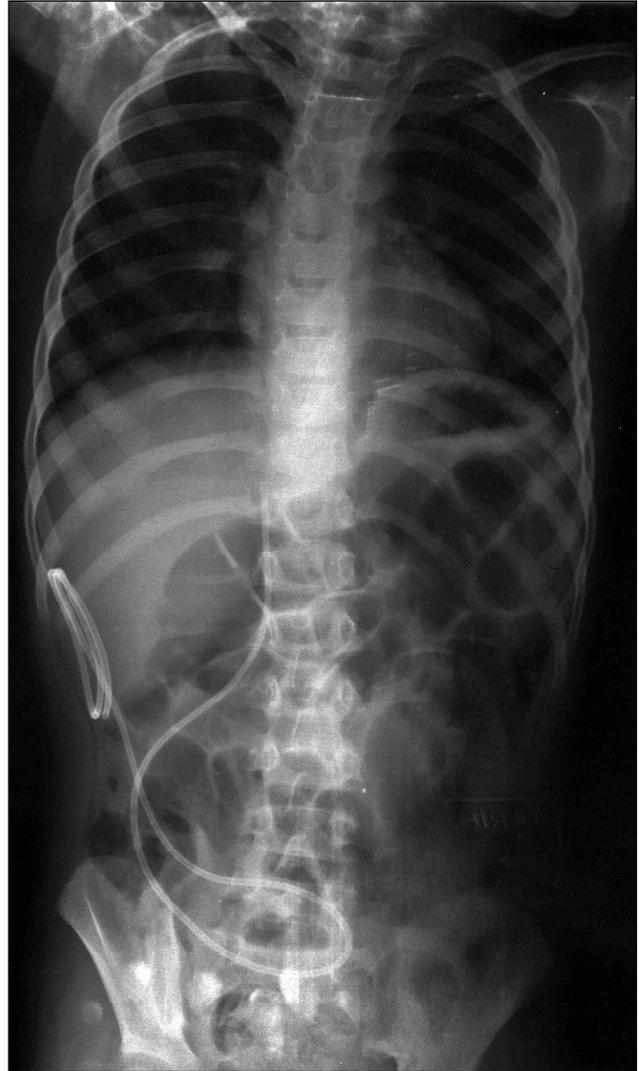


Figure 4: The peritoneal catheter has migrated to the abdominal cavity.

he had had no epileptic episodes for about one month. The patient continues to use phenytoin and carbamazepine.

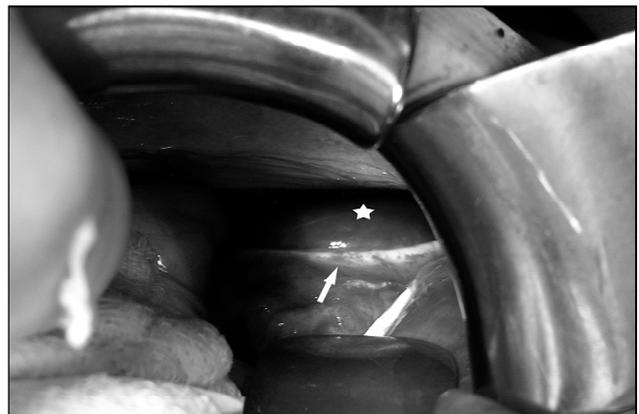


Figure 5: The catheter is attached to the liver. White arrow; peritoneal catheter, white star; liver.

DISCUSSION

Abdominal complications related to ventriculo-peritoneal shunt range between 5 and 47% (3). Migration of a peritoneal catheter into the abdominal cavity is rare among these complications. In a study on 356 patients, Davidson reported migration of shunt particles into the peritoneal cavity in 11 cases (9). In another study on 80 patients with ventriculo-peritoneal shunt, only two had peritoneal cavity migration of a disconnected catheter (2). 249 ventriculo-peritoneal shunts were performed in our clinic between 1998 and 2006, and abdominal migration was observed in only two cases.

Abdominal migration of a peritoneal catheter appears as a result of shunt fracture and disconnection. The age at which fractures of the shunt catheter occur most frequently are early childhood and the age at which primary school begins, which are characterized by rapid child growth. Rapid length and weight increases are observed in this period. With rapid growth of the child, the distal catheter is stretched between the abdomen and the valve (14). The first case was in early childhood and the second case was at the beginning of primary school. Another facilitative factor is the chronic irritative effects of the occipital bone, clavicle and the arcus costarum, on the shunt catheter with head and neck movements (14). Disconnection may take place in any part and is usually due to loose ligation and stretching of the shunt catheter between two fixed points. The shunt catheter may be fixed to subcutaneous tissue by calcification, and this may also result in fracture and disconnection of stretched catheter, particularly in the neck and the thoracic region (1, 20). The fractured or disconnected peritoneal catheter displaces into the peritoneal cavity by means of repetitive body movements, effects of gravity, intestinal peristalsis and respiratory rhythmic thoracic and abdominal movements (8).

The complaints on presentation in the abdominal cavity migration of a peritoneal catheter are due to shunt dysfunction and peritoneal irritation. Symptoms secondary to these two reasons were observed in both cases. Besides, *Klebsiella pneumoniae* growth was observed in the peritoneal catheter that had migrated to the abdominal cavity. In cases with leukocytosis, increased CRP and ESR, abdominal migration of the peritoneal catheter may

be the cause of infection. Therefore, we suggest investigating cultures for the peritoneal catheter.

Following installation of the ventriculo-peritoneal shunt, a fibrous tract occurs around the shunt material. In spite of the disconnection or fracture of peritoneal end, this fibrous tract may maintain normal CSF flow between the ventricle and the abdomen. Therefore, there may be no signs or symptoms related to shunt dysfunction. The tract also gives the impression of being intact by palpation (13). Diagnosis of these cases should be based on radiological evaluation (6, 7, 10). Tracts were palpable in both cases. Abdominal migration of the disconnected and fractured peritoneal catheter was diagnosed by direct x-ray.

Abdominal cavity migration of the peritoneal catheter should be interpreted as a foreign body in this region. Our view on this substance determines the diagnostic approach. There have been no trials comparing the incidences of problems caused by a peritoneal catheter with both ends free and another in VP shunt with one end free. In the literature and our clinical observations, a significant difference is not expected. In children, the risk of intestinal obstruction associated with adhesions following laparotomy is 2.2% and ranks 7th among the causes of intestinal obstruction (4). The question 'Should migrated peritoneal catheters which have no symptoms be removed?' has to be discussed. Peritoneal catheters that had migrated into the abdominal cavity were removed in both cases due to abdominal symptoms. When *Klebsiella* growth in the catheter in second case is considered, catheters should be removed in cases with abdominal symptoms, even though no shunt revision is necessary.

Laparoscopic and open surgery may both be performed in catheter migration into the abdominal cavity. Recently, the laparoscopic approach has replaced open surgery (11, 12, 18, 21). When compared with laparotomy, a smaller incision is needed, the peritoneal cavity is better visualized, the duration of surgery is shorter, operative complications are less frequent, the period before returning to work is shorter, and there are cosmetic advantages with the laparoscopic approach. In the literature, single (11, 21) and double (12, 18) abdominal incisions have been used in the laparoscopic surgical approach. In the first case, the catheter was easily removed laparoscopically with a

single incision and a new peritoneal catheter was inserted through the same route. In cases where shunt revision is planned, the procedure can be easily performed when proper localization of the incision to insert a new peritoneal catheter is chosen in the laparoscopic approach. Previous abdominal surgery may complicate the laparoscopic approach. However, frequent clinical applications and the surgeons' experience overcome these disadvantages. The second case shows that the peritoneal catheter may adhere to any organ in the abdomen. In such cases, forcefully pulled shunt catheters during laparoscopy may result in organ injuries. Therefore, when difficulties are encountered in pulling out the shunt catheter during laparoscopy, intra-abdominal adhesions should be remembered and laparotomy should be considered when needed.

In conclusion, we think that peritoneal catheters with abdominal migration should be removed in cases with abdominal symptoms. This procedure may be easily performed laparoscopically with a single incision. In some cases, the catheter may accompany intra-abdominal adhesions. Therefore, forcefully pulled catheters may cause organ injuries. In that case, a switch to laparotomy is necessary.

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