The aim of this study is to show a rare complication of the drainage system insufficiency in hydrocephalus in adult patients. This study presents 3 patients who had different causes of hydrocephalus (tumor of the cerebello-pontine angle, spontaneous subarachnoid hemorrhage after rupture of an aneurysm at the anterior communicating artery and unknown cause). All three patients were operated and V-P shunt with Hakim valve was implanted. Due to the system insufficiency, all three patients were re-operated. All three patients had, as the final complication, expulsion (expelling) of the peritoneal catheter from the peritoneal cavity into the abdominal wall where a pseudo cyst appeared. The cause of the expulsion in two patients was an infection, one being direct catheter contamination with Staphylococcus aureus, and the second by secondary system contamination as an accompanying occurrence of the sepsis caused by Proteus mirabilis, (the intrusion spots were decubitus ulcers). In the third case, the expulsion and pseudo cyst were caused by ascites due to the heart failure. In the case of system contamination and pseudocyst, attempts of the peritoneal catheter re-implantation did not have sustainable effect. The only possible solution was system extirpation followed by the appropriate antibiotic therapy. The third case was solved by peritoneal catheter implantation and administration of diuretics.

Key words: hydrocephalus, V-P shunt, complications

INTRODUCTION

Diagnosed internal hydrocephalus in adults sets two tasks to the clinicians: determining of the cause of hydrocephalus and defining of appropriate, the best treatment option. The cause of hydrocephalus could be found at three levels: at the level of liquor production, the level of liquor circulation pathway and the level of liquor absorption. Increased liquor production has been the rarest cause of hydrocephalus and it appears in tumors of plexus chorioideus. An obstacle in the liquor circulation can be caused by tumors and pseudotumors of the cerebral ventricles, brain stem, hemispheres of the cerebrum and cerebellum, the pineal region, cerebello-pontine angles or by the obstruction of the aqueduct of Sylvius due to adhesions after infections or hemorrhage. Non-obstructive hydrocephalus where liquor absorption is compromised becomes most frequently the consequence of inflammatory processes or subarachnoid hemorrhage.

The recognition of hydrocephalus causes in adults makes the causal treatment of hydrocephalus possible. If the causal treatment does not give the total effect in

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curing of hydrocephalus or if it is not possible at all, the only solution is some of drainage operations. Another problem of hydrocephalus in adults is the fact that normotensive hydrocephalus has been the most common, which eliminates a significant number of operative solutions. In the first place, intra cranial liquor drainage (ventriculocisternostomy) is impossible because there is no pressure gradient between the ventricles and basilar cisterns. From this, we can conclude that the method of choice should be some of the extra cranial drainages: ventriculoatrial (V-A) or ventriculoperitoneal (V-P) shunt. V-A and V-P shunt with Pudenz or Hakim valve with modifications are used in practice most commonly. Regarding normotensive hydrocephalus, the systems for average, moderately low and low pressure are used in practice. In our institution, we apply the systems with programmable valve that enable changing of the postoperative system efficacy by external pressure regulation. Correctly set indication and appropriate kind of drainage operation are a prerequisite of the positive outcome. After adequate drainage operation, the triad of symptoms (dementia, incontinency and difficulties in walking) vanishes.

Although a high standard has been reached in drainage operations, everyday practice and numerous references speak of a significant number of complications. On one side, there are the complications which are not associated with the adequately chosen system, as an infection and rarely, allergy to silicone material, and on the other side, there are the complications associated with the system, like ventricular catheter obstructions, inadequate valve function, distal catheter obstruction or its migration into natural orifices, hollow organs and the outer environment. The dilemma whether to drain the liquor into the venous system or peritoneal cavity regarding the aspect of possible complications is not justified. The percentage of complications on distal catheter is approximately the same in V-A as well as in V-P shunt. V-P shunt is more suitable because it is simple for implantation and the complications are easy to solve (1).

Dysfunction of the peritoneal catheter due to appearance of pseudo cysts around it as well as ascites, has been described in literature. Pseudo cysts are manifested by signs of the system insufficiency and are most frequently the consequence of infection. On the other hand, the appearance of ascites is the consequence of reduced resorption capacity of the peritoneal liquor because of the venous stasis in heart failure, liver cirrhosis and similar conditions and this is manifested by abdominal symptoms. The biochemical structure of liquor is by rule transudate. When a pseudo cyst is in question, it can be cured by reimplantation into other parts of the peritoneal cavity. When the cause of the system dysfunction is ascites, an adequate reintervention is implantation of the distal catheter into the venous system (2).

Publications which deal with this problem, describe a series of complications at the peritoneal catheter level such as its migration into abdominal organs through natural and made orifices, into other cavities or into the outer environment through umbilicus (3), through the gastrostomy orifice (4), through the colon and anus into the scrotum (5), into the thoracic cavity (6). Frazier and his associates (7) describe a rare complication such as migration of the peritoneal catheter through a damaged jugular vein into the right heart. In fact, while pulling the peritoneal catheter, damage of the jugular vein occurred through which the peritoneal catheter migrated later.

The aim of this study was to show three cases of irregular complication of V-P shunt in hydrocephalus such as retroauricular expulsion of the peritoneal catheter into the abdominal wall and subcutaneous tissue.

CASES

Three adult patients were operated: the first patient with hydrocephalus as a consequence of the cerebello-pontine angle neurinoma, the second after subarachnoid hemorrhage, and the third due to an unknown cause.

The first patient

The patient, 74 years old, had hydrocephalus caused by the left cerebello-pontine angle neurinoma and was hospitalized in another neurosurgical institution. Because of the age and poor somatic status, he was not radically operated but the drainage operation was done (V-P shunt sec. Hakim-Cordis, medium pressure). Eight months after his release from the Clinic, the infection signs appeared around the peritoneal catheter on the thoracic wall. Incisions were made and Staphylococcus aureus was isolated. After administration of the antibiotic therapy, the condition became stable. After a year, a painless swelling on the spot of a surgical incision on the front abdominal wall with the diameter around 10 cm was found. A pseudo cyst filled with liquor was detected by the ultrasound examination. A revision was done in total endotracheal anesthesia, the pseudo cyst was found below the fascia in the muscular layer and it was filled with clear liquor, having the whole distal end of the peritoneal catheter in it. The operation was completed by the catheter reimplantation into the peritoneal cavity. Pathological germs were not found in the cyst structure and Staphylococcus aureus was isolated in the blood. Antibiotics were prescribed according to the antibiogram. The wound healed up, the sutures were taken off and the patient was released in a good shape from the hospital. After 11 months, he came again with the painful swelling behind the right ear, about the size of a child fist. Clear liquor was obtained by puncture but again, pathological germs were not found. By native radiography of the tumor, wrapped and retracted peritoneal catheter was noticed and its top was found subcutaneously on the front wall of the rib cage. The catheter was re-implanted into the abdominal cavity by another
operation. In spite of negative bacteriological results in the catheter swab and pseudocyst structure, the antibiotics according to the antibiogram for blood culture were prescribed and the patient was released home in a good shape. After 3 months, inflammation signs along the whole peritoneal catheter were noticed so that the whole drainage system was surgically removed and Neisseria species were isolated in the swab from the catheter channel. After administration of appropriate antibiotics, the condition became stable. After a year, the patient is well without the signs of intracranial hypertension (normotensive hydrocephalus) and no other surgical interventions were considered necessary.

The second patient

The patient, 45 years old, had spontaneous subarachnoid hemorrhage because of the aneurysm rupture of the anterior communicating artery. After the re-rupture and long lasting treatment with physical therapy, during a prolonged vegetative condition after 8 months, a large internal hydrocephalus with a liquor perfusion into the periventricular area was noticed on the control CT scan. Drainage operation (V-A shunt) with Hakim valve for the average low blood pressure was performed. Due to the system dysfunction, it was converted into V-P shunt. After a month, the system insufficiency was diagnosed with the ventricles still widened, so valve was replaced with the valve for low blood pressure. General condition of the female patient was slightly improved and moderate decrease in the size of hydrocephalus was verified on the control CT scan. In the meantime, an infection of decubital ulcers appeared on both gluteus regions which was followed by sepsis (Proteus mirabilis had been isolated in the blood culture). The antibiotics were prescribed, but a pseudo cyst on the anterior abdominal wall was found, and later on, along its canal the internal hydrocephalus system and the antibiotic therapy according to the antibiogram was performed, the symptoms were present and it was found that hydrocephalus was not reduced on the CT scan. The ventricular catheter was slightly longer, so after a reintervention the catheter was shortened. After a year, signs of the system insufficiency were found such as imbalanced walk and incontinency. On the spot of laparotomy on the abdominal wall, a pseudo cyst about the size of male fist was found, and by native radiography and ultrasound, the peritoneal catheter end in the cyst was noticed. The revision was done, clear cerebrospinal fluid in the cyst was found, and clear liquor was leaking from the canal by which the cyst communicated with the peritoneal cavity— the fibrous canal created around the catheter while it was in the peritoneal cavity. Otherwise, the system functioned regularly. The cyst was obliterated by the stitches, and the catheter was implanted into the peritoneal cavity through a new laparotomy opening. During the next period, the physical condition was better, with occasional incontinency, and by CT, the dilated chamber system was noticed. After 6 months, since the condition was stable, a revision was done so that the valve was replaced with the programmable valve. In the next period, the patient’s condition was stable, but after 2 months, the cyst was again found on the anterior abdominal wall, being filled with clear liquor from the peritoneal catheter which migrated out of the peritoneal cavity. The catheter was re-implanted into the abdominal cavity and the fibrous canal extended by a new laparotomy opening. By laboratory examinations, the possibility of local as well as general infection was excluded. After that period, the patient felt fairly well and diuretics were introduced along with the other therapy for cardiovascular diseases.

DISCUSSION

This study deals with three patients with drainage operations. All three were operated several times and all had similar complications. In the first patient, just after the operation, the contamination of the system and its peritoneal catheter was found and the conservative treatment by antibiotics led to control of local infection. After that, expulsion of the system from the peritoneal cavity into the abdominal wall was found, and later on, along its canal even to the retroauricular region. The same causative agent that was isolated beside the catheter at the beginning was now found in the blood culture. An infection of the central nervous system and infection of the peritoneal cavity were not found in the patient. The condition was improved after the extirpation of the whole drainage system and the antibiotic therapy according to the antibiogram. In the second patient, hydrocephalus appeared as a consequence of spontaneous subarachnoid hem-
orrhage and the patient was re-operated several times, because of insufficient function of the drainage system and, finally, implantation of the adequate system for low pressure resulted in improvement of the general condition of the patient. Worsening of the patient condition was caused by sepsis, starting from decubital ulcers. This resulted with the system contamination and expulsion of the peritoneal catheter from the peritoneal cavity into the anterior abdominal wall, where a purulent pseudocyst was found. The complication was solved by the extirpation of the whole system and the antibiotic therapy according to the culture results. In the third patient, hydrocephalus of an unknown cause was solved with drainage operation; signs of insufficient function of the system at the beginning were caused by an inadequate drainage system, and later because of the heart failure and insufficient resorption capacity of the peritoneum. The ascites developed and the peritoneal catheter migration into the front abdominal wall with a pseudo cyst was found. The case was solved by the catheter re-implantation and introduction of diuretic therapy.

All three patients had hydrocephalus of different genesis. The hydrocephalus in all three cases was cured by V-P shunt. In all three, several re-interventions were done because of the system failure. All three patients had the same complications at the end, that is, expulsion of the peritoneal catheter from the peritoneal cavity into the abdominal wall. In the first two patients, the complication caused the infection, in the first case through the primary system contamination and in the second case, as a part of the sepsis. In the third patient, the system expulsion ensued because of the ascites caused by the heart failure. All attempts to save the system in the patients where the infection appeared were unsuccessful and the only adequate solution was extirpation of the whole system. The surgical methods performed in the first and in the second patient were similar to previous published experience (1, 5). On the other side, for the third patient we did not convert V-P into V-A shunt as it was recommended by other authors. That patient had congestive heart failure, reduced absorption capacity of the peritoneal liquor because of the venous stasis. The administration of a diuretic, furosemide, normalized the pressure of the cerebrospinal liquor. In the patient with ascites, although it is recommended in literature that drainage should be converted by some other method, the authors have chosen re-implantation along with the diuretic therapy.

We recommend that, in case of catheter expulsion caused by infection, whole system should be removed with administration of antibiotics until blood and cerebrospinal fluid cultures become sterile. Additional therapy could include diuretics (in the case of sustainable high pressure of cerebrospinal fluid) as well as temporary external drainage. In the case of system expulsion due to ascites and heart failure, it is necessary to administer appropriate drug therapy in consultation with cardiologist. Another option is to convert V-P into V-A shunt.
REFERENCES


