Perforation of the Colon by a Ventriculoperitoneal Shunt Tube —A Case Report—

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Summary: Although abdominal complications caused by ventriculoperitoneal shunts have been reported, it was rare to observe an abdominal shunt tube penetrating into the intestinal tract. Such a case is presented with the literature review.

Key words: hydrocephalus — ventriculoperitoneal shunt — shunt complication — colon — septic meningitis

Introduction

A case is reported of a perforation of the descending colon for an unknown reason, but probably associated with a ventriculoperitoneal shunt (V-P shunt) used for treating hydrocephalus. This abdominal problem from a V-P shunt is somewhat rare and only four cases have been reported in Japan (Takagi et al. 1976; Nishimura et al. 1980; Ito et al. 1981; Tsutsumi et al. 1983). Both metrizamide shuntgraphy and abdominal CT scans are very effective tools for diagnosing this particular problem. The application of these methodologies in one case is discussed.

Case Report

A 51 year-old female was admitted on April, 1984, with sudden decreasing consciousness and hemiplegia on her right side. The problems began about one p. m. while she was working outside. About

six months later, she had another episode with vomiting and loss of consciousness.

Examinations

1. Neurological findings:

On admission, her consciousness level was 100, as judged by the 3-3-9 Japan coma scale. Anisocoric pupils were noted with the right pupil smaller than the left. No response was registered to light and the corneal reflex was weak from both sides. A decerebrate posture could be induced in her right trunk by painful stimuli.

2. Neuroradiological and laboratory test findings:

A high density area with a clear boundary on the CT scan occupied areas from the right side of the thalamus to the internal capsule and basal ganglia. There was also a high density zone in the ventricles.

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The laboratory tests indicated no sign of a problem.

Diagnosis and Treatment

1. The first episode:

She was diagnosed as having a hypertensive intracerebral hemorrhage in the left side of the thalamus and ventricular drainage of CSF was initiated. After placement of the drainage tube, her level of consciousness improved to 20 on the 3-3-9 system. To prevent infection the tube was replaced with a V-P shunt. She recovered to level 3 on the coma scale by June, 1984.

2. The second episode:

She began vomiting and her consciousness decreased to 30 on the coma scale. A recurring enlargement of her ventricles

was observed in the CT study. Since the pumping device in the shunt was functioning well, she was kept under close observation until February, 1985.

Her condition did not improve at all, thus a malfunction of the abdominal tube in the shunt was suspected and shuntgraphy and abdominal CT scans were performed. The shuntgraphy was conducted 90 min after injecting 5 ml of a metrizamide solution (300 mg I/ml) through a reservoir tap. As shown in Figs. 1 and 2, it flowed into both the ascending and descending colon.

There was no evidence of meningitis since her CSF was clear. The leakage of the colon was confirmed with gamma scanning using ^{111}In -DTPA which was injected from the tap. Therefore, it was

Fig. 1. Abdominal x-ray film. A-P view; Shuntgraphy with metrizamide injected through the reservoir tap shows that the abdominal shunt tube (triangle) had penetrated into the ascending colon (arrow).

Fig. 2. Abdominal CT scan. The end of the shunt tube was in the ascending colon. The tube was enhanced and the descending colon had a high density area from metrizamide which was injected for abdominal radiography about one hour earlier.

concluded that the complication was due to a perforation of the ascending colon wall by the tube. The tube was replaced with a new catheter that was inserted in her left abdomen.

Her consciousness regained to 3 on the coma scale and the enlargement of her ventricle became smaller. At present, she is under rehabilitation for her right side hemiplegia.

Discussion

Today, surgical therapy for hydrocephalus involves mainly the V-P shunt. The shunt could cause some complications in the peritoneal space such as peritonitis, cyst formation, ascites accumulation, perforation of the gastrointestinal tract, kinking and obstruction of the shunt tube. The frequency of perforation was a concern in the past. The following investigators reported the incidence from their own cases; Grosfeld et al. (1974), 5 of 185

(2.7 %); King (1976), 2 of 112 (1.8 %) and Murtagh et al. (1980), 3 of 96 (3.1 %).

Tsutsumi et al. (1983) reviewed the literature of 20 investigators and noted 38 cases of perforation of the intestinal wall.

In Japan, Takagi et al. (1976) first noticed this problem. Four cases have been reported. Table 1 is a summary of the five cases, including the present case. Two cases occurred in children and the other three were in adults. The shunt methods used were Pudenz's in two cases, and Dow Corning, Denver and Holter methods were each used once.

Four cases had headache, fever, neck-stiffness and other symptoms which were similar to the symptoms of meningitis. Cerebrospinal fluid infected by *E. coli* was found in three patients. Perforations made by the abdominal tube were found once in the stomach and for the others in the colon. No particular location of the perforation was noted.

To diagnose this problem after 1981, three cases including the present one

TABLE 1
Summary of Gastrointestinal Tract Perforations Caused by V-P shunts in Japan

Investigator	Age	Sex	Shunt system	Symptoms and signs	Site	Diagnostic procedure
Takagi et al. (1976) brain tumor	23 Y	M	Pudenz	retrograde meningitis <i>E. coli</i>	ascending colon	visualization
Nishijima et al. (1980) NPH	69 Y	F	Dow Corning	retrograde meningitis <i>E. coli</i>	stomach	autopsy
Ito et al. (1981)	4 Y	M	Pudenz	retrograde meningitis	transverse colon	shuntgraphy with water soluble contrast media
Tsutsumi et al. (1983)	16 m	M	Denver	retrograde meningitis <i>E. coli</i>	sigmoid	shuntgraphy with In ¹¹¹ DPTA and metrizamide
Hayashi et al. (1986)	51 Y	F	Holter	shunt mal-function C-2	descending colon	shuntgraphy with In ¹¹¹ DPTA and metrizamide, and metrizamide abdominal CT

used shuntgraphy for making an intestinal image by injecting water soluble contrasting material via a tap in the shunt reservoir. With this method the ruptures were easily confirmed (Ito et al. 1981; Tsutsumi et al. 1983). In addition to this approach, Tsutsumi et al. (1983) and we applied ^{111}In -DTPA through the tap and localized the radioactivity to the colon. We also conducted an abdominal CT scan immediately after the metrizamide shuntgraphy and ascertained the relation between the shunt tube and the perforated descending colon.

Thus effective approaches to treat shunt patients who have meningitis symptoms and an *E. coli* infection in the CSF would be metrizamide shuntgraphy immediately followed by an abdominal CT scan for confirmation.

There cause of this complication from the shunt is uncertain. There have been several cases in which Raimondi tubes containing metal wires were used for the abdominal tube. The perforations in these cases were probably caused by the wire tips exposed at the end of the catheter (Sells and Loesser, 1973; Giuffre and Di Lorenzo, 1975; Peirce and Loesser, 1975). Since all other cases had used soft silicon rubber tubing without metal wires the cause of the perforations must be different.

There are several possible causes including hypoproteinemia due to a weakening condition and a weak intestinal wall in infants. Also, the intestinal wall of infants is very rich in lymph nodules which lead to an inflammatory reaction near the shunt tube (Tsutsumi et al. 1983).

The treatment for perforation in either the stomach or intestine would be to remove the shunt tube and replace it with an external drainage tube. After the patient recovers completely from the meningitis, a new V-P shunt is installed. It

is unnecessary to perform a laparotomy unless the patient has an abscess formation in the peritoneal space or a mechanical ileus.

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