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Peritoneal Shunt Migration into the Pulmonary Artery

—Case Report—

Shigeki KUBO, Hiroshi TAKIMOTO, Shuji TAKAKURA, Kousuke IWAISAKO, Kazunori YAMANAKA, Kazuki HOSOI, Shingo TOYOTA, Masato UENO, Toshitaka MORISAKO, Jun KARASAWA, and Toshiki YOSHIMINE*

Department of Neurosurgery, Osaka Neurological Institute, Osaka;
**Department of Neurosurgery, Osaka University Graduate School of Medicine, Osaka*

Abstract

A 48-year-old man underwent ventriculoperitoneal shunting for hydrocephalus secondary to subarachnoid hemorrhage due to left vertebral artery dissection, which had been successfully treated by trapping. The peritoneal catheter was correctly positioned via a right upper abdominal incision, and symptoms related to the hydrocephalus disappeared. One month later, the patient began to complain of pain on the right side of the neck. Chest radiography revealed that the peritoneal end of the catheter had migrated into the right pulmonary artery. The catheter route was explored through a small neck incision, and was found to enter the external jugular vein. The catheter was extracted and repositioned into the peritoneum. This type of shunt migration is quite unusual, but could be lethal by causing pulmonary infarction or arrhythmia. The catheter had probably entered the external jugular vein through a perforation caused by the shunt guide during the ventriculoperitoneal shunt operation. Follow-up radiography should be scheduled to detect such a complication.

Key words: hydrocephalus, ventriculoperitoneal shunt, migration, pulmonary artery

Introduction

Ventriculoperitoneal (VP) shunting is commonly used to manage hydrocephalus, but may be complicated by migration of the peritoneal end of the shunt catheter to various sites outside the peritoneal cavity, including the gastrointestinal tract, the urinary bladder, the vagina, and the scrotum.[1,3,7–9] Migration to the heart or the pulmonary artery is quite unusual, with only three such cases reported.[4–6] We have experienced a fourth such case and identified the entry point of the catheter into the external jugular vein at surgery.

Case Report

A 48-year-old man experienced severe pain in his left posterior neck while working. He lost consciousness for about 5 minutes. He was transferred to our department. Neurological examination found the patient was stuporous with mild nuchal rigidity. Computed tomography (CT) showed subarachnoid hemorrhage, and cerebral angiography subsequently revealed left vertebral artery dissection. On the day of admission, the dissected segment of the vertebral artery was successfully trapped via the lateral suboccipital approach. Thereafter, the patient gradually regained consciousness. However, he remained lethargic 6 weeks after surgery.

Repeat CT revealed hydrocephalus. He underwent a VP shunt operation with a pressure adjustable valve (Codman HAKIM Programmable Valve; Medos S.A., Le Locle, Switzerland). The shunt catheter was easily placed subcutaneously by tunneling with an ordinary shunt passer. The 25-cm long abdominal catheter was introduced into the peritoneum via an incision over the right rectus muscle. Postoperative abdominal radiography confirmed the correct catheter position (Fig. 1). The patient's mental status as well as the other symptoms related to the hydrocephalus were improved.

One month after VP shunting, the patient began to complain of neck pain on the right side. Chest radiography revealed that the peritoneal end of the catheter had migrated into the right pulmonary

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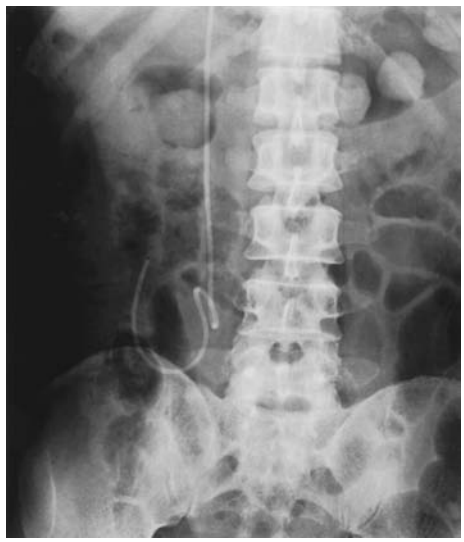

Fig. 1 **Abdominal radiograph shortly after the ventriculoperitoneal shunt operation demonstrating the correct intraperitoneal position of the distal shunt tubing.**

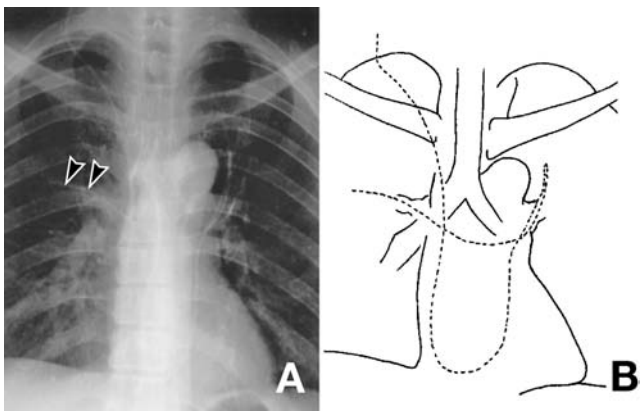

Fig. 2 **A: Chest radiograph one month after ventriculoperitoneal shunting showing migration of the distal tip of the catheter into the right pulmonary artery (*arrowheads*). B: Schematic drawing of A. The course of the catheter is depicted by the *dotted line*.**

artery (Fig. 2). CT examination from the neck to the thorax showed the tube passing through the superior vena cava, right atrium, and right ventricle, into the left pulmonary artery, and then reversing direction into the right pulmonary artery. Palpation of the neck could follow the catheter until it disappeared into the right supraclavicular fossa (Fig. 3A). The catheter route was explored through a small incision on the neck, and was found to enter the external jugular vein (Fig. 3B). The catheter was easily extracted, and was found to be functional, with good cerebrospinal fluid outflow from the peritoneal end. The catheter was repositioned into the peritoneum via a newly created midabdominal incision.

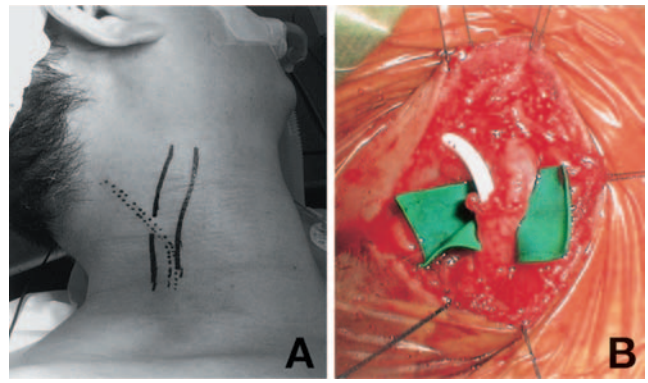

Fig. 3 **A: Photograph showing the subcutaneous courses of the external jugular vein (*double lines*) and the shunt catheter (*double dotted lines*) marked on the right side of the neck. B: Intraoperative photograph at revision surgery showing the shunt tubing entering the external jugular vein.**

Postoperative radiography showed the correct positioning of the catheter in the peritoneal cavity. The patient remained free of neurological deficit except for mild ataxia during the 6 months after discharge.

Discussion

Three cases of catheter migration into the heart or pulmonary artery were reported previously. In one case, the catheter migrated into the right atrium. The kinked catheter was removed from the superior vena cava by open heart surgery, but the catheter entry point into the vascular system was not identified.[5] In another case, the catheter migrated into the pulmonary artery. The catheter tip had strongly adhered to the pulmonary artery, and required considerable effort to remove the catheter with an intravascular snare. The location of the catheter entry into the circulation was not identified.[6] In the most recent case, the catheter was coiled in the heart and was found by three-dimensional CT to have entered the heart via the internal jugular vein. The catheter was relocated by pulling it through a neck incision to place the tip in the atrium as in a ventriculoatrial shunt. The entry point was not confirmed during surgery.[4] In contrast to these cases, we clearly determined that the catheter in our patient had penetrated the external jugular vein during revision surgery.

The most probable mechanism of catheter migration into the heart was suggested in a previous case, in which the subcutaneous catheter guide had perforated the internal jugular vein during the VP shunt procedure and negative pressure in the vein drew the catheter into the heart.[4] The same mechanism probably occurred in our case, except that the catheter had entered the external jugular vein. The external jugular vein is located near the surface beneath the platysma in the neck, whereas the internal jugular vein runs deep in the carotid triangle. The shunt passer runs near the external jugular vein in the neck during the VP shunt procedure, and the routes often cross. Therefore, the chance of vessel perforation in the external jugular vein may be higher than in the internal jugular vein.

We did not notice subcutaneous hematoma or any signs of vessel injury during the original VP shunt operation. Perforation of the external jugular vein by the shunt guide is difficult to detect during surgery. This type of migration may be lethal, possibly causing pulmonary emboli, arrhythmia, sepsis, or cardiac insufficiency,[2,6] so periodic follow-up radiography should be scheduled after VP shunt placement.

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Address reprint requests to: S. Kubo, M.D., Department of Neurosurgery, Osaka Neurological Institute, 2–6–23 Shounai Takara-machi, Toyonaka, Osaka 561–0836, Japan.
e-mail: sig-kubo@momo.so-net.ne.jp.