Migration of a Distal Ventriculoperitoneal Shunt Catheter Into The Internal Jugular Vein – A Case Report

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ABSTRACT

A rare case of migration of the distal ventriculoperitoneal (VP) shunt catheter into the internal jugular vein is presented with its resolution by a conversion to a ventriculoatrial (VA) shunt. A 75-year-old female patient underwent a near-total surgical resection of a left vestibular schwannoma (grade 4b) while the postoperative period was complicated by acute decompensation of secondary normal pressure hydrocephalus. Subsequently performed VP shunt procedure was complicated by convolution of the distal catheter in the abdominal subcutaneous tissue with a collection of fluid and developed loop of the VP shunt course in the cervical region. Despite surgical revision, distal catheter completely migrated into the internal jugular vein. As a result, surgical conversion of the VP shunt to the VA shunt was successfully performed. Follow- up period was uneventful, and the patient is able to independently carry out ordinary daily activities Tunneling procedure through the supraclavicular region is associated with a risk of direct vein damage. Conversion to a VA shunt represents an effective solution of VP shunt migration into the internal jugular vein with the need for its early detection and prompt treatment.

Keywords: Secondary normal pressure hydrocephalus, Surgical complication Ventriculoperitoneal shunt, Ventriculoatrial shunt, Shunt migration,Internal jugular vein

INTRODUCTION

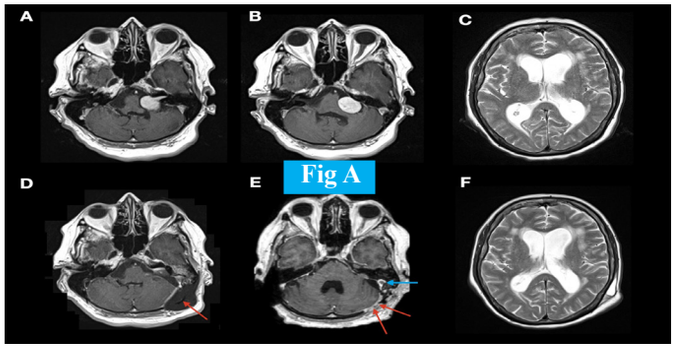
Ventriculoperitoneal (VP) shunting is the most common surgical treatment for hydrocephalus. Although it is a simple procedure, effective and generally provides an adequate solution to most hydrocephalus etiologies, complications and subsequent shunt revisions remain common.[1] These mainly belong to shunt malfunction – overdrainage and underdrainage, infections related to the procedure or the shunt itself, such as catheter malpositioning, intracerebral hemorrhage, shunt pullouts, disconnections and others.[2] Unusual complications includes migration, which was classified by Harischandra et al. in 2019[3] into 3 groups based on compartment of migration (intracranial, subgaleal, breast, thorax, abdominal wall, hollow viscus, or genitourinary), direction of migration (cranial/caudal) and the component of the shunt system that migrates. Migration of the VP shunt catheter into the heart or adjacent vascular components is very rare, with only dozens of reports [3]. We report a case of migration of the distal VP shunt catheter into the internal jugular vein which was resolved by a conversion to a ventriculoatrial (VA) shunt.

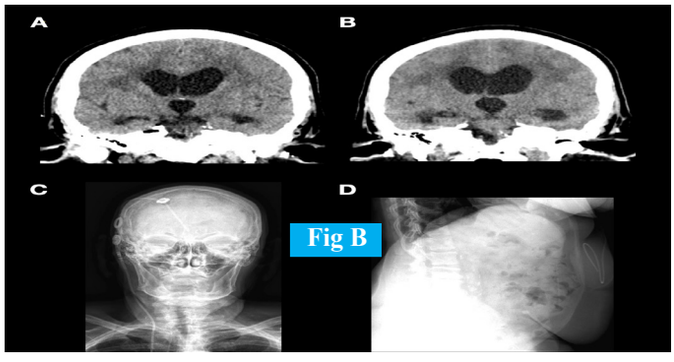
CASE DESCRIPTION

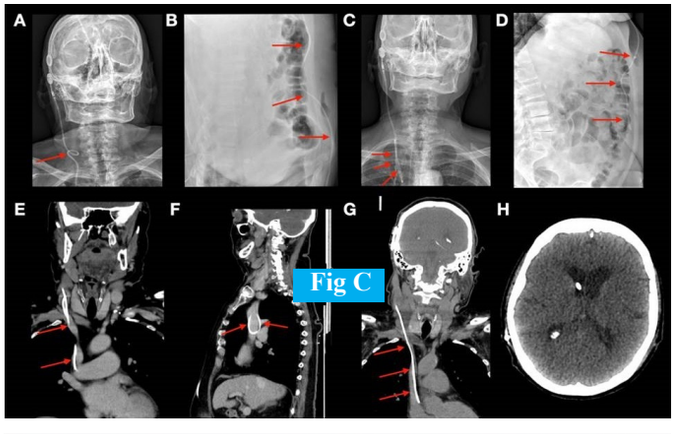
A 75-year-old female patient underwent a near-total surgical resection of a left vestibular schwannoma (grade 4b) at the ENT clinic. Postoperative course was complicated by severe peripheral paresis of the left facial nerve (House-Brackmann score 6), left ear hypacusis, cerebrospinal fluid pseudocyst and left sigmoid sinus thrombosis (Figure 1). During the stay in the ICU her GCS and consciousness quality declined. A subsequent CT scan revealed acute decompensation of secondary normal pressure

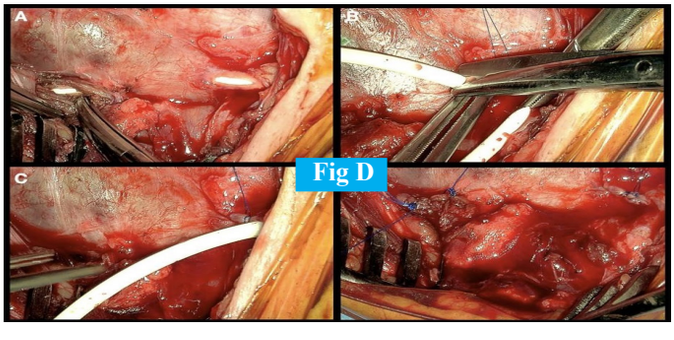
hydrocephalus (based on the preoperative MR scan, case history and clinically Hakim triad). Consequently, she was referred to the neurosurgical department (Figure 2). In the initial procedure a lumbar drain was placed, and a revision of the original wound was performed together with a duraplasty procedure. A left tarsorrhaphy was performed afterwards. Although her consciousness initially slightly improved, it declined again after the auto removal of the lumbar drain. Subsequently, VP shunting was performed using an adjustable device (Miethke proGAV 2.0, 8 cm H2O + 20 cm H2O; Cristoph Miethke, Potsdam, Germany). The peritoneal catheter was inserted in the peritoneal cavity through an open laparotomy in the epigastrium. During the immediate postoperative course, her consciousness remained stable with no ventricular regression on the postoperative CT scan. The opening pressure was lowered. Gradually, her GCS began to improve, and after a few days, she achieved a GCS 15 and was able to walk with the assistance of a walker. A subsequent brain MR revealed regression of the hydrocephalus. Treatment of the thrombosis commenced using low molecular weight heparin (LMWH) was started with a gradual increase in dosage based on anti-Xa levels. This was subsequently converted to DOACs. Three days after referral to rehabilitation, a bump in the region of the abdominal scar started to develop. An X-ray of the whole shunt revealed a convoluted distal catheter in the abdominal subcutaneous tissue with a collection of fluid and no other abnormalities (Figure 2C-D). She underwent revision of the distal catheter with fluid removal and repositioning into the peritoneal cavity. Postoperative shunt X-ray showed a gentle loop of the distal catheter in the cervical region (Figure 3A) and normal intraabdominal course (Figure 3B). However, the postoperative shunt X-ray showed a long loop in the cervical region (Figure 3C) and despite the fixation of distal catheter the intraabdominal course was shorter.(Figure 3D).

CT and CT angiogram of the thorax and cervical regions was performed and revealed a migration of the distal catheter into the internal jugular vein (Figure 3E, 3F). Revision in the cervical region, through an approach medial to the sternocleidomastoid muscle, was performed. Due to the distance between entry and exit points into the internal jugular vein (Figure 4A), the procedure was intraoperatively converted from a VP to a VA shunt under fluoroscopic monitoring. The distal catheter was partially pulled out (11 cm) under fluoroscopic vision, cut, and pushed back into the vein with a prepared tobacco suture in the exit point (Figure 4B). There was no significant the catheter was then easily removed by traction. The postoperative period was uneventful. After spending two weeks in the rehabilitation department, she was discharged home, able to walk with a single French cane and able to independently carry out ordinary daily activities. She continued to experience persistent facial paresis, decent left neocerebellar syndrome, but was otherwise neurologically intact. The follow-up CT scan showed regression of the ventriculomegaly (Figure 3H).









DISCUSSION

Carrasco et al.[4] conducted a review in 2015, examining 26 cases of intracardiac migration of the distal ventriculoperitoneal shunt catheter. Most patients presented within the first 3 months. The clinical symptoms ranged from cardiac or respiratory issues to shunt dysfunction, swelling, tenderness and pain. However, incidental discovery occurred in 6 patients. Proposed theories revolved around either unrecognized damage to the internal jugular vein or chronic erosion due to catheter's close proximity to the vein[4,5]. Unrecognized damage is also often difficult to assess intraoperatively [6]. Migration after entering the vessel likely results from negative intrathoracic pressure and venous flow to the heart. Given that most migrations occur within the initial first 3 months after shunting, the role of chronic erosion is rather less likely [3]. One case report mentioned cranial-to-caudal tunneling of the distal catheter that may be responsible for the migration[5]. Only two case reports mentioned bleeding during tunneling. [7, 8] In one of these cases, a worn-out catheter was used, potentially damaging the external jugular vein in the cervical subcutaneous tissue. [8] In our case, the tunneling was also cranial-to-caudal in the area of loose subcutaneous tissue in the neck with relatively low tone in cervical muscles. However, we did not observe signs of a hematoma in the neck or other indications of venous perforation, and the patient recovered well during the postoperative period. The distance between the entry and exit points of the catheter within the vein was approximately 3 cm. While it is incredible to assume a direct passage through the vein wall, given the tunneler's blunt tip with a sleeve for catheter passage the migration timing in our case might be attributed to pressure developing inside the subcutaneous fluid collection or scar around the rectus fascia. This pressure could have partially countered the negative pressures pulling the catheter into the vein. After the first revision, which involved repositioning the catheter back into the peritoneal cavity where positive pressure occurs, the balance might have shifted back to the second side. [9]

In nearly 30 reported cases, two other case reports demonstrated successful conversion of the migrated distal catheter to a VA shunt. Both Ruggiero et al.[10] and Imamura

CONCLUSION

Migration of a distal ventriculoperitoneal shunt catheter via internal jugular vein is an exceedingly rare shunting complication. Surgeons should be very careful during the tunneling procedure, particularly through the supraclavicular region. Our case report aligns with the theory of direct vein wall damage. Early detection and prompt treatment are paramount. Several approaches have been proposed with no clear preference of choice, but if possible, conversion to a VA shunt is a simple and effective solution.

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