Case Report

Ventriculoperitoneal shunt catheter migration in a patient with breast implants resulting in a peri-implant cerebrospinal fluid pseudocyst

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ABSTRACT

Ventriculoperitoneal (VP) shunts complications are most often divided into 2 broad categories: mechanical failure and infection. We report a case of a migrated VP shunt with subsequent development of a pseudocyst around the patient’s breast implant, a rare complication. We review the literature of VP shunt complications, including the increasing number of reported breast-related complications, and discuss proposed mechanisms by which migration may occur. With the increase in patients with breast augmentation procedures, there is potential for an increase in the number of reported cases of VP shunt migration.

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Introduction

Ventriculoperitoneal (VP) shunts are currently the definitive treatment for hydrocephalus. The procedure involves creating a conduit for cerebrospinal fluid (CSF) from the ventricles of the brain to the peritoneum via a surgically tunneled catheter through the intervening subcutaneous tissues of the chest and abdomen. These shunts are prone to complications such as shunt dysfunction, mechanical obstruction, infection, and shunt migration [1–3]. We report a relatively rare complication of VP shunt migration in which the distal catheter tip migrated from the peritoneal cavity and coiled around a patient’s breast implant. With the terminal end of the VP shunt displaced, fluid then accumulates at the tip and caused shunt malfunction. We discuss the incidence of this specific complication, breast-associated complications of VP shunts, and the potential mechanisms behind them.

Case report

A 53-year-old woman, with a history of bilateral retropectoral saline breast implant augmentation, performed at least 10 years prior, presented to our institution with a cerebellar infarct which was complicated by obstructive hydrocephalus requiring VP shunt placement and suboccipital decompression (Fig. 1). A right postauricular incision was made and the catheter was tunneled along the right side of the chest and abdomen into the peritoneal cavity (Fig. 2). The procedure was performed with no immediate complications and
the patient was discharged after her clinical symptoms improved.

Four months later, the patient presented to an outside emergency department for progressive swelling and pain of her right breast. She reported that she noticed an abdominal bulge sometime prior which resolved. Within the next several days, she reported that her breast became painful and began to enlarge. A chest radiograph was performed showing proximal migration of the VP shunt catheter from the abdomen into the anterior chest wall (Figs. 3a and 3b). A chest CT was performed which confirmed migration of the distal portion of the VP shunt catheter into the right breast (Figs. 4a and 4b). The distal end of the catheter was found residing in the fibrous capsule surrounding the saline breast implant; however, the implant itself appeared intact. The breast overall was asymmetrically enlarged with a peri-implant fluid collection. This presumably represented the accumulating CSF arising from displaced distal end of the VP shunt. No dedicated breast imaging was performed. The patient was transferred to our Neurosurgery department for further management. In the operating room, 400 cc of clear fluid were removed from the right breast. A shunt revision was subsequently performed with a new tunnel between the breasts along the midline of the chest, inferiorly along the right hemi-abdomen, and into the peritoneal cavity. The proximal end of the catheter was successfully placed in the cerebral ventricles and the distal end terminated in the peritoneal cavity as confirmed by abdominal radiograph (Fig. 5). The postoperative course was complicated...

**Fig. 1** – Axial FLAIR image through the posterior fossa demonstrates high signal edema in the bilateral occipital lobes (arrowheads) and superior cerebellum with effacement of the fourth ventricle (arrow).

**Fig. 2** – Immediate postoperative abdominal radiograph, following the initial shunt placement, shows the shunt appropriately coiled in right abdomen (white arrow). The distal end of a Dobhoff tube is also within the field of view (black arrow).

**Fig. 3a** – Frontal abdominal radiograph shows the course of the VP shunt (arrows) on the right coiled in the soft tissues of the breast.

VP, ventriculoperitoneal.
Fig. 3b – Lateral chest radiograph shows the course of the VP shunt (arrow) coiled in the soft tissues of the breast. VP, ventriculoperitoneal.

Fig. 4a – Contrast-enhanced axial CT image of the chest demonstrates asymmetrically increased size of the right breast with fluid surrounding the saline implant. The VP shunt is seen anterior to the breast implant (arrow). CT, computed tomography; VP, ventriculoperitoneal.

Fig. 4b – Contrast-enhanced sagittal CT image of the chest shows the VP shunt (arrow) anterior to the breast implant within a surrounding peri-implant fluid collection. CT, computed tomography; VP, ventriculoperitoneal.

Fig. 5 – Postoperative abdominal radiograph confirming successful revision of VP shunt and termination of the distal end in the peritoneal cavity (arrows). CT, computed tomography; VP, ventriculoperitoneal.
Discussion

Ventriculoperitoneal shunt complications are not rare. It has been reported that up to 40% of VP shunts fail within a year of placement, requiring correction [4]. VP shunt complications can be divided into 2 broad categories: mechanical failure and infection [3]. Mechanical failure includes equipment failure, breakage, obstruction, and migration of either proximal or distal catheter tip.

Of the reported literature, shunt migration accounts for 7% of all complications. [2] The prevalence of VP shunt infection is variable, reported at 2%-38%, which may lead to abscess [1,2,5,6]. This usually occurs within the first 2 months of placement and is most often due to infection of the surgical site by normal skin flora. Gram negative enteric infections have also been reported and can manifest at any time. Shunt replacement is usually necessary when infection is present.

Shunt migration is a relatively rare complication and usually occurs at the distal segment of the shunt including within the peritoneal cavity, thorax, abdominal wall, or pelvis. CSF can accumulate in these areas and form a pseudocyst. When reported, shunt migration frequently involves the thoracic cavity and can cause pleural effusions, hydrothorax, pneumonia, and pneumothorax [7–13]. These complications usually resolve upon revision of the shunt. Due to mechanisms likely similar to those of intrathoracic catheter migration, VP shunts have also been reported to migrate into breast tissue. This has been associated with complications, such as shunt dysfunction, breast CSF pseudocysts, CSF nipple discharge, breast swelling, migration into breast implant cavity for those with breast augmentation, and implant rupture [14]. In reported cases of migration in patients with breast augmentation, the breast implant remained intact. Proposed mechanisms include sexual activity as an instigating factor [15], postoperative migration following abdominal surgery [16], and increased intra-abdominal pressure [17]. While we were unable to visualize or confirm the process of migration in our patient, we can postulate that some sort of inciting factor such as abdominal trauma or strenuous activity may have caused displacement of the catheter and subsequent shunt dysfunction. The initial abdominal bulge may have represented a temporary pseudocyst, followed by the eventual migration into the breast and a subsequent peri-implant pseudocyst.

There have been increased reports in the literature of VP shunt migration in breast tissue, especially in patients with history of breast augmentation. There is thought that this trend may be related to an increase in both breast augmentation and reconstructive mammoplasties [14,18]. The mechanism remains unclear, but it is possible that these procedures result in postsurgical changes and possibly chronic inflammation that increase susceptibility to VP shunt migration.

Conclusion

Although rare, migration of the distal catheter tip of ventriculoperitoneal shunts can occur and must be considered as a potential cause of shunt dysfunction. We report a case of VP shunt migration into the breast of a patient with a saline implant resulting in a CSF pseudocyst. In addition to interesting radiological findings, the patient had substantial clinical symptoms which resolved with successful shunt revision. An increasing number of cases of VP shunt migration have been reported in patients with breast augmentation, and it is proposed that this trend may continue due to the increased in breast mammoplasties being performed in the United States. Therefore, VP shunt migration into augmented breast should be suspected in patients with appropriate clinical findings, which can be confirmed with prompt imaging and corrected with shunt revision. Potential for these complications should be considered preoperatively when planning the anatomic course of VP shunts.

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