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Ventriculoperitoneal shunt occlusion secondary to strangulated ventral hernia: A case report

Luke X. Bauerle[1], Wayne B. Bauerle[2], Brandon S. Sloan[2], Lauryn A. Ullrich[3]

Abstract

Ventriculoperitoneal (VP) shunting is the gold-standard treatment for hydrocephalus; however, it can lead to numerous complications. VP shunt malfunction from occlusion secondary to a ventral wall hernia is rare and poorly described. Herein, we present the case of a VP shunt occlusion complicated by a strangulated ventral wall hernia. A 39-year-old male with a past medical history of hydrocephalus and multiple previous abdominal surgeries presented with headache, abdominal pain, and erythema along with a non-reducible ventral hernia. Computed tomography (CT) scan of the head demonstrated interval ventriculomegaly when compared to prior imaging of the head. CT abdominal scan revealed a strangulated ventral hernia containing omental fat as well as a section of the peritoneal portion of the patient's VP shunt. The patient would ultimately undergo peritoneal catheter re-positioning and ventral hernia repair without mesh placement. Despite utilizing an open technique to repair the patient's hernia, the VP shunt was successfully re-positioned, and the feared complication of a shunt infection was nullified.

Keywords:

Case report, shunt malfunction, shunt occlusion, strangulated hernia, ventral hernia, ventriculoperitoneal shunt

Introduction

Ventriculoperitoneal (VP) shunts are beneficial for treating ventriculomegaly and alleviating neurological symptoms associated with hydrocephalus; however, abdominal wall hernias pose a serious complication.[1] Due to weaknesses in the abdominal wall and elevations in intra-abdominal pressure secondary to diverted cerebrospinal fluid (CSF) from VP shunts, abdominal hernias can develop, thereby leading to catheter migration into these abdominal wall outpouchings.[2,3] Given the lack of literature regarding appropriate treatment strategies for the aforementioned topic, we present the case of a successfully managed VP shunt occlusion secondary to a strangulated ventral hernia.

Case History

A 39-year-old male with a body mass index of 37.94 and a complex past medical history of prematurity and hydrocephalus since birth presented with the chief complaints of headache, abdominal pain, and an associated epigastric bulge that had been present for less than 24 hours. Multiple previous abdominal surgeries, including a laparoscopic cholecystectomy and an estimated 32 prior VP shunt revisions, were carried out. Physical examination revealed a 5 cm × 5 cm nonreducible right upper quadrant ventral wall hernia with overlying erythema, most concerning for strangulation. Computed tomography (CT) abdominal scan revealed a ventral hernia containing edematous omental fat as well as a section of the peritoneal portion of the patient's VP shunt [Figure 1A and B]. CT

[1]College of Medicine, Medical University of South Carolina, Charleston, SC, [2]Department of Surgery, [3]Division of Trauma and Acute Care Surgery, Department of Surgery, St. Luke's University Health Network, Bethlehem, PA, USA

Address for correspondence:
Dr. Luke X. Bauerle, College of Medicine, Medical University of South Carolina, 268 Calhoun Street, Charleston 29425, SC, USA.
E-mail: lbauerle51@gmail.com

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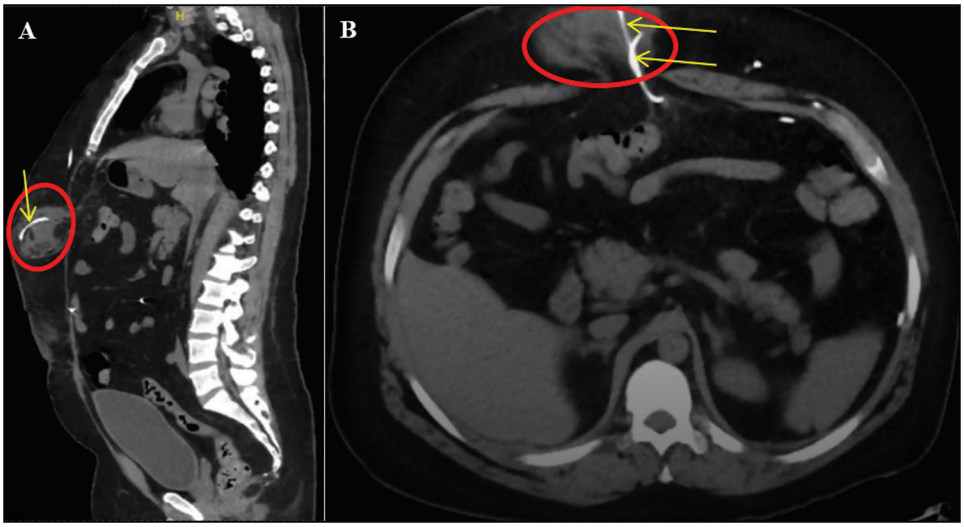

Figure 1: (A) Sagittal and (B) axial abdomen computed tomography images demonstrating right-sided strangulated ventral hernia (circle) containing portions of omental fat and the peritoneal catheter of patient's ventriculoperitoneal shunt (arrows)

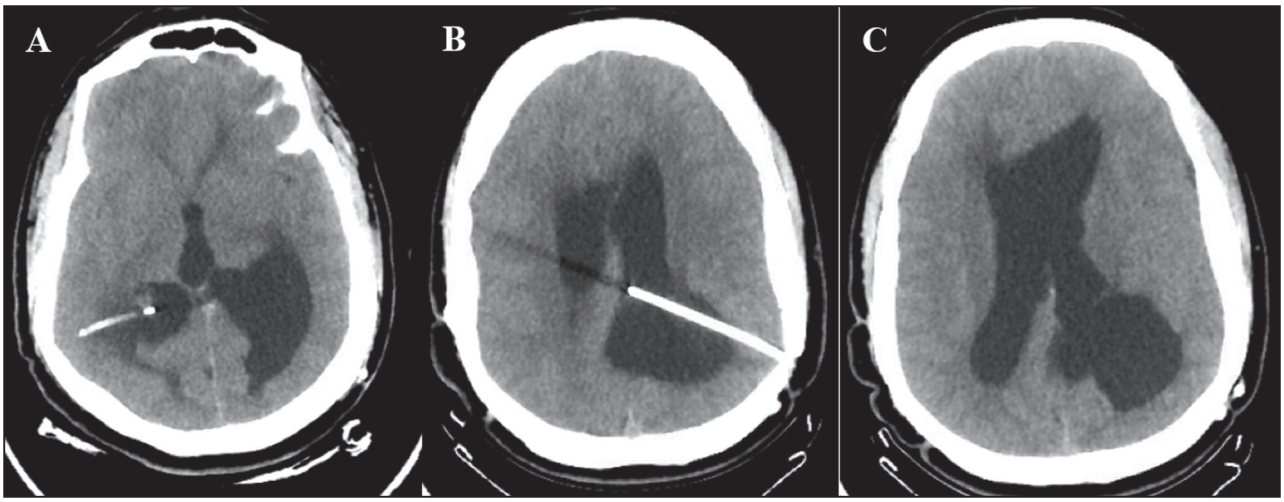

Figure 2: (A–C) Preoperative axial head computed tomography (brain window) images display the course of ventriculoperitoneal shunt and enlargement of cerebral ventricles secondary to suspected shunt occlusion or malfunction

scan of the head demonstrated interval enlargement of the ventricular system compared to head CT scans from 2 months prior [Figures 2A, C and 3A, D]. Due to the noted skin changes in conjunction with the imaging findings, a concern for bowel necrosis within the ventral hernia was suspected; therefore, urgent surgical intervention was undertaken. Due to the concern for compromised bowel function in the presence of an extensive past surgical history, open primary hernia repair was favored over laparoscopy.

Pertinent operative findings included 20 cm of the VP shunt within the strangulated omentum in the ventral hernia and numerous dense intra-abdominal adhesions, although no necrotic areas of the omentum or bowel were noted. Following assessment of shunt patency by neurosurgery and aspiration of CSF cultures, the distal end of the VP shunt was re-positioned in the left pericolic gutter. Afterward, the fascia and skin were closed with semi-absorbable running sutures and staples. There were no intra-operative complications. The total operative time was 80 minutes. Postoperatively, the CSF cultures would ultimately be negative. The post-operative shunt series confirmed an appropriately placed VP shunt in the abdominal cavity [Figures 4A, D and 5A, D]. By postoperative day 4, the patient was discharged home in a hemodynamically stable condition with no additional needs.

Discussion

Abdominal ventral wall hernias are defects in the fascia of the abdominal wall, and these fascial defects can either be acquired or a sequela of congenital syndromes. In the

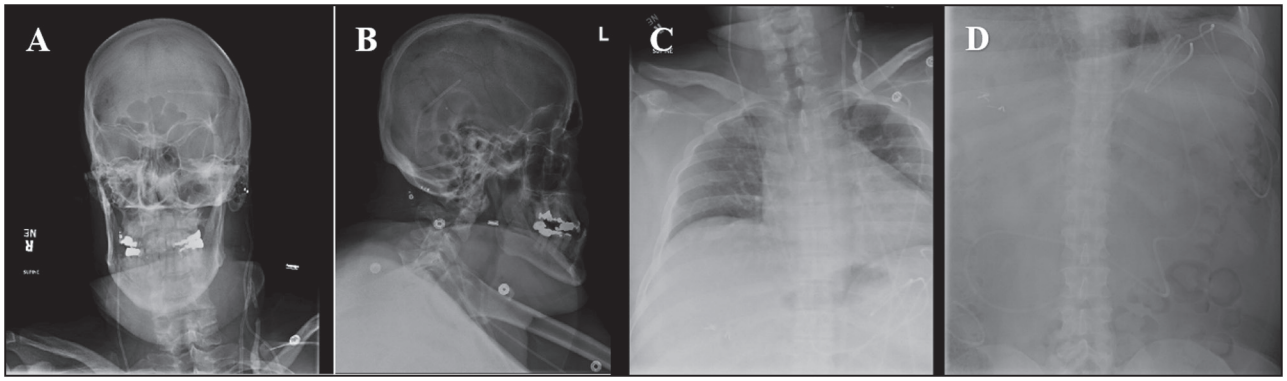

Figure 3: (A–D) Preoperative X-ray shunt series displaying the course of ventriculoperitoneal shunt as well as containment of the peritoneal catheter of the shunt in the anterior compartment of the peritoneal cavity

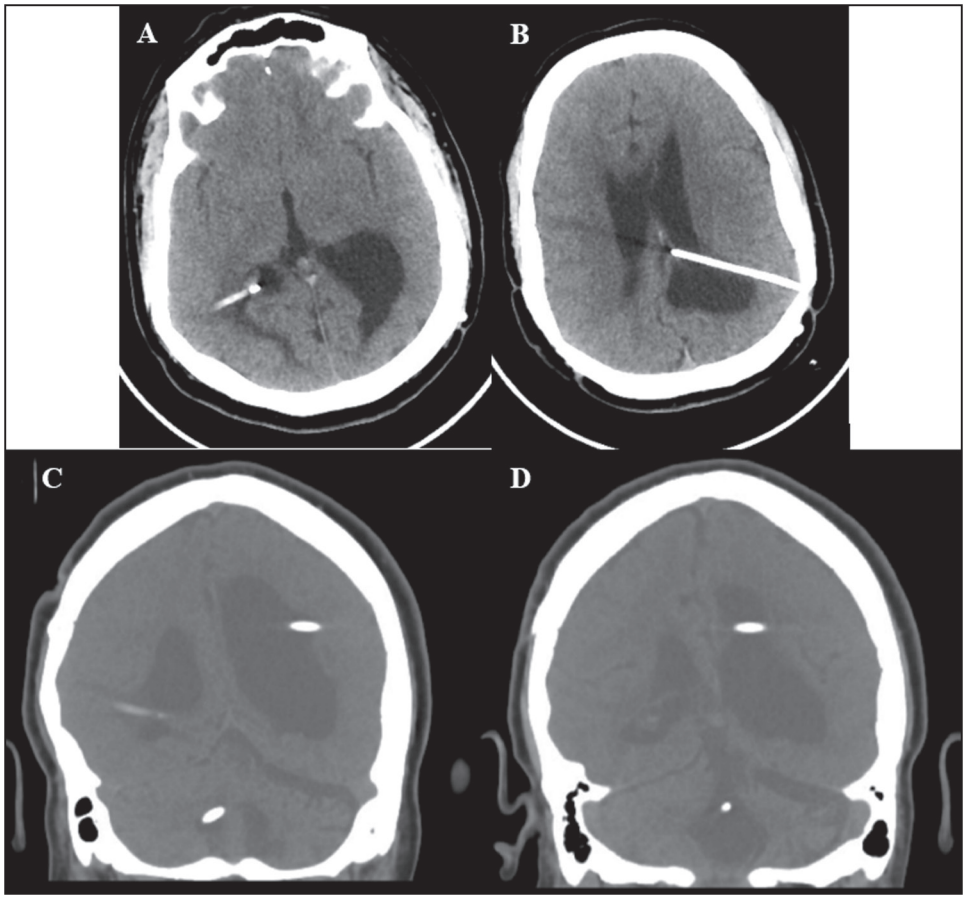

Figure 4: (A, B) Axial (brain window) and (C, D) coronal (bone window) post-operative head computed tomography images displaying the course of ventriculoperitoneal shunt as well as the resolution of previous ventriculomegaly following repair of strangulated ventral hernia and peritoneal catheter re-positioning

present case, we postulate that the likely cause of the hernia was an incisional hernia below a right subcostal VP shunt revision incision site, likely resulting from an elevation in intra-abdominal pressure due to diverted CSF in combination with repeated surgical trauma to the patient's abdominal wall.

In such cases of hernia development and enlargement, surgical repair can be accomplished through a number of different surgical techniques. Open mesh repair using a mesh comprising synthetic substances, such as polypropylene, or absorbable materials can strengthen and reinforce weakened abdominal walls of ventral hernias in order to lessen the risk of future collapse, subsequently resulting in reportedly low recurrence rates of around 1%–3%.[4] Robotic-assisted hernia repair as well as laparoscopic repair techniques, such as the transabdominal preperitoneal or the transverse abdominis plane procedures, have also been utilized and result in decreased post-operative pain and faster recovery times

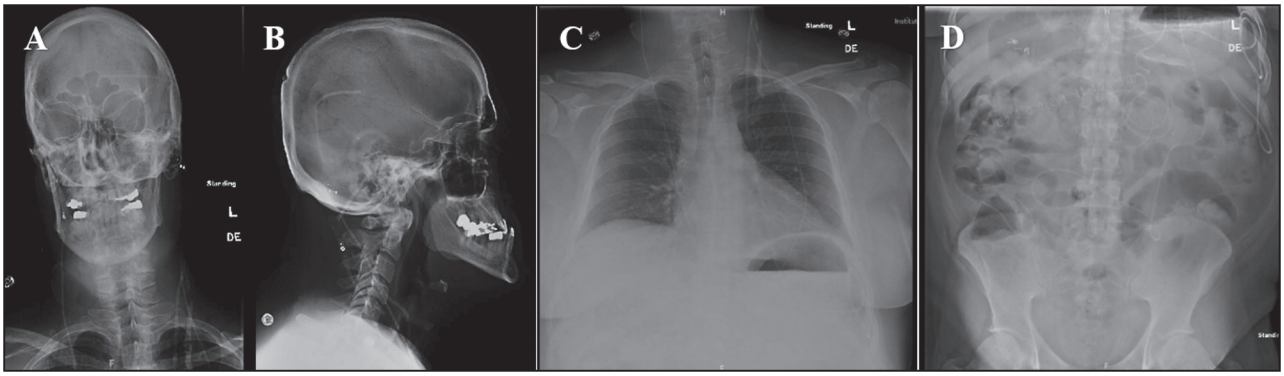

Figure 5: (A–D) Postoperative X-ray shunt series displaying the course of ventriculoperitoneal shunt from the head to peritoneal cavity following hernia repair and peritoneal catheter re-positioning

with similar recurrence rates in comparison to open mesh repairs despite concerns such as longer operative times, increased costs, and longer specialized training.[4]

When managing ventral hernias in the setting of an occluded VP shunt, the surgical approach is an essential point to consider with extreme caution, especially when deciding on whether to proceed with an open versus minimally invasive technique. Surgical site infection between a minimally invasive approach versus an open approach for ventral hernia repair is well documented in the literature at 1%–3% and 5%–10%, respectively, with the Society of American Gastrointestinal and Endoscopic Surgeons guidelines recommending laparoscopic over open repair when feasible.[5,6] However, in cases when an open procedure is needed, factors to reduce the likelihood of a surgical site infection, such as minimizing tissue damage, careful hemostasis, and controlling comorbidities such as diabetes, obesity, and smoking, should still be strongly considered.[7]

Conclusion

Herein, we present the case of a strangulated ventral hernia in an adult patient resulting in a malfunction and occlusion of a VP shunt. Though a rare phenomenon in comparison to other reported abdominal complications related to VP shunts, it is possible that VP shunt patients with extensive histories of abdominal surgeries may develop ventral hernias secondary to frequent surgical trauma. In such cases, ventral hernia repair can be successfully managed using an open approach when laparoscopy is not indicated and when appropriate infection reduction techniques are utilized.

Author Contributions

LXB: manuscript preparation, literature search, design, guarantor; WBB: manuscript editing, data acquisition, literature search, design, concept; BSS: concept, manuscript preparation, data acquisition; LAU: manuscript review, guarantor.

Ethical policy and Institutional Review board statement

We declare that our study adhered to the ethical principles of the Declaration of Helsinki and treated all the patients' data with confidentiality and were used for scientific purpose only.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. Due to the patient expiring before the development and submission of this work, no written informed consent for his/her/their images and other clinical information to be reported in the journal could be obtained from the patient. However, verbal consent was obtained from the patient's family and documented as appropriate. The patient's family understands that the patient's name and initials will not be published and due efforts will be made to conceal their identify, but anonymity cannot be guaranteed.

Data availability statement

There are no datasets generated or analyzed in the current study; hence, data sharing is not applicable.

Financial support and sponsorship

Not applicable.

Conflicts of interest

There are no conflicts of interest.

Acknowledgments

Not applicable.

Abbreviations

CM	Centimeter
CSF	Cerebrospinal fluid
VP	Ventriculoperitoneal
CT	Computed tomography
TAPP	Transabdominal preperitoneal
TAP	Transversus abdominis plane

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