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Case Report

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# Chronic ventriculoperitoneal shunt-related costal destruction: a rare case report

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## ABSTRACT

Although ventriculoperitoneal (VP) shunts are widely used in the treatment of pediatric hydrocephalus, they are associated with various infectious and mechanical complications. The most frequently reported problems are shunt infections and catheter obstructions; rare complications, however, can pose diagnostic difficulties. To the best of our knowledge, this study presents one of the rare examples in the literature of costal destruction and osteomyelitis resulting from chronic mechanical contact with a VP shunt catheter. A five-year-old female patient, who had a VP shunt placed on the second postnatal day due to meningomyelocele and hydrocephalus, presented with an abscess in the right flank region and subsequent transparent discharge. Ultrasonography revealed infectious changes in the subcutaneous adipose tissue, while computed tomography showed dilation and lytic destruction in the distal segment of the right 10th rib, along with the shunt catheter located within the rib. The patient underwent surgical exploration, the infected costal segment was excised, and VP shunt revision was performed simultaneously. The patient received appropriate antibiotic treatment for osteomyelitis in the postoperative period and achieved clinical improvement. This case demonstrates that chronic mechanical contact along the course of VP shunts can, albeit rarely, lead to bone destruction and osteomyelitis; it emphasizes the need to consider bone involvement in cases of unexplained local infection findings along the shunt line.

**Keywords**: Ventriculoperitoneal shunt, shunt complications, costal destruction, osteomyelitis

## INTRODUCTION

Ventriculoperitoneal (VP) shunts are the most commonly preferred method in the surgical treatment of pediatric hydrocephalus. However, shunt systems are associated with high complication and revision rates. The literature reports that approximately one-third of shunts require revision within the first year, with the most common complications being infection, proximal or distal catheter obstruction, and mechanical failure.[1-3]

Although abdominal complications are less common, they can present with serious conditions such as peritoneal pseudocysts, bowel perforation, and intestinal obstruction.[4-6] Although cases of thoracic and abdominal migration have been reported, to the best of our knowledge, complications involving bone involvement, particularly those associated with costal osteomyelitis, represent a rarely reported entity in the literature.[7-9] This study presents a case of costal destruction and osteomyelitis resulting from chronic mechanical contact with a VP shunt catheter, discussing important diagnostic and therapeutic considerations.

## CASE

A five-year-old female patient underwent surgery on the second postnatal day for meningomyelocele and hydrocephalus, and a ventriculoperitoneal shunt was placed during the same session. The patient had no prior shunt revisions, and symptoms had been present for approximately two weeks before presentation. She was initially evaluated in the outpatient clinic for an abscess in the right flank region and was treated medically. During this period, the abscess drained spontaneously, and the patient presented again with clear discharge.

Laboratory tests revealed normal white blood cell count and acute phase reactants. Ultrasonographic evaluation showed infectious changes in the subcutaneous adipose tissue. Computed tomography (CT) imaging demonstrated cortical disruption and medullary involvement causing enlargement and lytic destruction in the distal segment of the right 10th rib. Furthermore, the scan revealed that the distal VP shunt catheter segment was closely abutting and partially extending into the affected bone structure (**Figure 1**). The patient underwent surgical exploration; intraoperatively,

the purulent collection was drained, and the infected costal segment was excised (**Figure 2**). During the same session, the neurosurgery team performed a VP shunt revision. Oral feeding was initiated on the first postoperative day. On the second day, the patient was transferred to the pediatric infectious diseases department. Following the diagnosis of osteomyelitis and the detection of *Pseudomonas aeruginosa* growth in the culture, antibiotic treatment was continued accordingly. The patient showed clinical improvement and was discharged during the postoperative period.

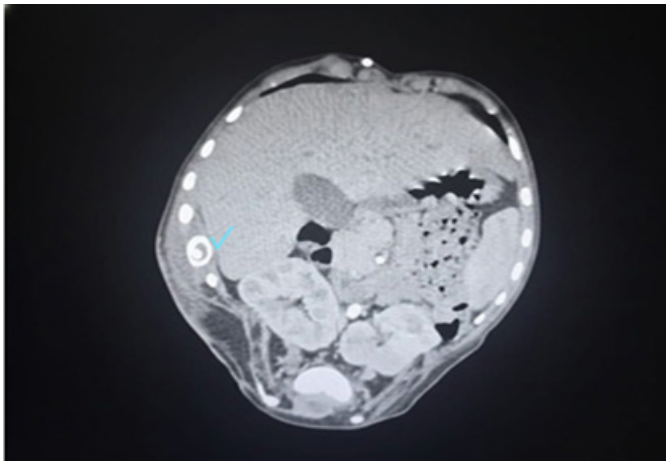

**Figure 1.** Computed tomography (CT) image demonstrating lytic destruction and enlargement of the distal segment of the right 10th rib. The blue arrow highlights the VP shunt catheter positioned within the costal bone.
VP: Ventriculoperitoneal

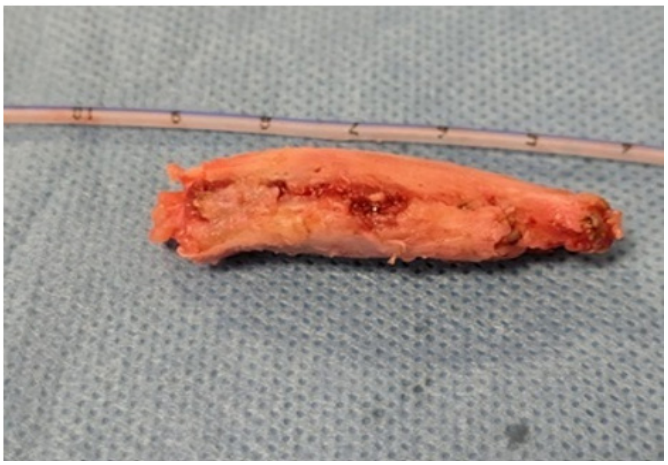

**Figure 2.** Macroscopic appearance of the excised infected costal segment. Specimen demonstrates the area of chronic mechanical contact where lytic destruction and osteomyelitis developed.

## DISCUSSION

The majority of complications associated with VP shunts manifest as infections and mechanical dysfunctions. Abdominal complications related to the distal catheter are rare but can lead to serious morbidity; pseudocysts, intestinal perforation, and obstruction have been reported as abdominal complications.[4,5] Although thoracic or abdominal organ involvement due to shunt migration has been reported in the literature, to the best of our knowledge, this case represents one of the rare examples of costal bone destruction and osteomyelitis associated with chronic mechanical contact.[7-9]

While instances of catheter migration and subsequent skeletal involvement have been documented as extremely rare events in the broader literature, they provide a crucial comparative reference for understanding such unique mechanical failures. Neto et al.[10] reported a case of a shunt catheter penetrating the sacral bone and extruding through the skin, demonstrating that mechanical contact can cause progressive damage to bone tissue. In our case, lytic destruction and osteomyelitis developing in the costal bone without extrusion represent a rare but possible spectrum of bone complications associated with VP shunts.

In the presented case, the underlying pathogenetic mechanism likely involves a cascade of mechanical and biological factors. Long-term continuous pressure from the shunt catheter against the costal margin may have impaired periosteal microcirculation, resulting in localized periosteal ischemia. Furthermore, repetitive microtraumas induced by respiratory excursions and physical activities could have weakened the structural integrity of the bone cortex over time. Concurrently, the catheter surface acts as a favorable substrate for potential biofilm formation, which can harbor pathogens and predispose the area to a low-grade infection. Based on this clinical picture, we hypothesize that the mechanical damage was the primary event; the progressive periosteal ischemia and cortical disruption severely compromised local tissue defenses, thereby paving the way for a secondary localized infection and subsequent osteomyelitis. As normal laboratory parameters in such low-grade, biofilm-associated infections may delay diagnosis, the use of advanced imaging techniques is crucial in the presence of unexplained local infection findings along the shunt line.[11,12]

Treatment involves the surgical removal of infected tissue, simultaneous shunt revision, and appropriate antibiotic therapy, forming the basis of a multidisciplinary approach.[13-15]

Written informed consent was obtained from the patient's legal guardians for the publication of this case report and any accompanying images.

## CONCLUSION

This case demonstrates that chronic mechanical contact during the course of VP shunts can, albeit rarely, lead to bone destruction and osteomyelitis. Importantly, it also highlights the need to consider underlying bone involvement in patients presenting with persistent or atypical infection along the shunt tract. Therefore, appropriate imaging and surgical intervention should be planned at an early stage.

## ETHICAL DECLARATIONS

### Informed Consent

Informed consent was obtained from the legal guardians of the pediatric patient described in this report. Where developmentally appropriate, assent was also sought from the child.

### Peer Review Process

This report underwent external peer review.

## Conflict of Interest

The authors declare no conflicts of interest.

## Financial Disclosure

This case report did not receive any financial support.

## Author Contributions

Concept: EBK, BT; Design: EBK, BT; Control: EBK, BT; Resources: EBK, BT; Materials: EBK, BT; Data Collection and/or Processing: EBK, BT; Analysis and/or Interpretation: EBK, BT; Literature Review: EBK, BT; Writing the Article: EBK, BT; Critical Review: EBK, BT.

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