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Iatrogenic Large Bowel Perforation Following
Image-Guided Pericardiocentesis: A Case Report

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Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Patient: Male, 72-year-old
Final Diagnosis: Colonic perforation • pericardial effusion • pericarditis
Symptoms: Desaturation • distention • fever • oliguria
Clinical Procedure: Colostomy • pericardial window • pericardiocentesis • thoracentesis
Specialty: Cardiac Surgery • Cardiology • Surgery

Objective: Unusual or unexpected effect of treatment
Background: Image-guided pericardiocentesis is a diagnostic and potentially life-saving intervention, yet even under guidance, rare complications can occur. Among them, bowel perforation with subsequent fecal pericarditis is an exceptionally uncommon and often under-recognized occurrence.

Case Report: We describe the case of a 72-year-old man with multiple comorbidities, including acute colonic pseudo-obstruction (Ogilvie syndrome), Parkinson disease, and chronic kidney disease, who underwent urgent fluoroscopy-guided pericardiocentesis for a large pericardial effusion. After the procedure, his drain ceased to release any fluid, and he experienced progressive tachycardia. Imaging revealed that the catheter inadvertently penetrated the transverse colon, resulting in pneumoperitoneum and pneumopericardium. He required combined thoracic and abdominal surgery, including a pericardial window, controlled drain removal, primary colonic repair, and diverting colostomy. His recovery was uneventful, and he was discharged in stable condition.

Conclusions: Only a handful of similar cases are reported in the literature. Our case presents additional evidence that image-guided pericardiocentesis may be associated with an increased risk of iatrogenic bowel injury in patients with abdominal distension or colonic dysmotility. The patient was treated surgically for pericardial drainage and repair of colonic perforation, further addressing the patient's dysmotility at the time of surgery with the creation of a diverting colostomy. Awareness of unusual drain behavior and early imaging can expedite recognition and management of this life-threatening complication.

Keywords: Pericardiocentesis • Iatrogenic Disease • Pneumoperitoneum • Pneumopericardium • Pericardial Fluid

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Introduction

Pericardiocentesis is a well-established diagnostic and therapeutic intervention for patients presenting with pericardial effusion and cardiac tamponade. Advances in echocardiographic and fluoroscopic guidance have made the procedure safer, with reported success rates above 95%. However, even in experienced hands, image-guided pericardiocentesis carries a 1% to 3% risk of morbidity and up to a 1% risk of mortality. Serious complications include cardiac perforation, injury to adjacent structures, and iatrogenic tamponade [1-3].

Bowel injury is a rare complication, and while cases are reported in literature, the exact incidence remains unknown [2]. Most published reports involve unusual anatomical variants or intra-abdominal pathology [1]. Given the devastating potential consequences from the introduction of colonic flora into the pericardium or into the myocardium, expeditious diagnosis and management of this complication is crucial [4].

Acute colonic pseudo-obstruction (ACPO), also known as Ogilvie syndrome, is a functional obstruction of the colon that occurs in older adult or debilitated patients. In this report, we hypothesize that the bowel distention characteristic of ACPO increased the risk of iatrogenic bowel injury during pericardiocentesis. We discuss diagnostic cues as well as considerations in management and prevention.

Case Report

A 72-year-old man who was bedridden and had a history of Parkinson disease, chronic kidney disease (baseline creatinine 1.5 mg/dL), bilateral renal calculi with indwelling stents, and previous cerebrovascular accident with hemiplegia presented to a secondary hospital with recurrent fevers and oliguria for 1 week. He underwent a non-contrast-enhanced computed tomography (CT) scan of the abdomen, which incidentally revealed a pericardial effusion.

He was referred to our cardiac center where he arrived with an oxygen requirement of 2 L through a nasal cannula, and was otherwise hemodynamically stable. His white blood cell count and troponin and pro-brain natriuretic peptide levels were within normal limits. His creatinine and blood urea nitrogen levels were mildly elevated (1.71 mg/dL and 21 mg/dL, respectively). A chest X-ray showed a globular cardiac silhouette consistent with pericardial effusion, as well as left lower lobe infiltrations and an elevated diaphragm with underlying dilated bowel loops (Figure 1). Electrocardiogram showed sinus rhythm, and echocardiography confirmed a large circumferential pericardial effusion with right ventricular partial diastolic collapse. Right atrial systolic collapse was not clearly evident,

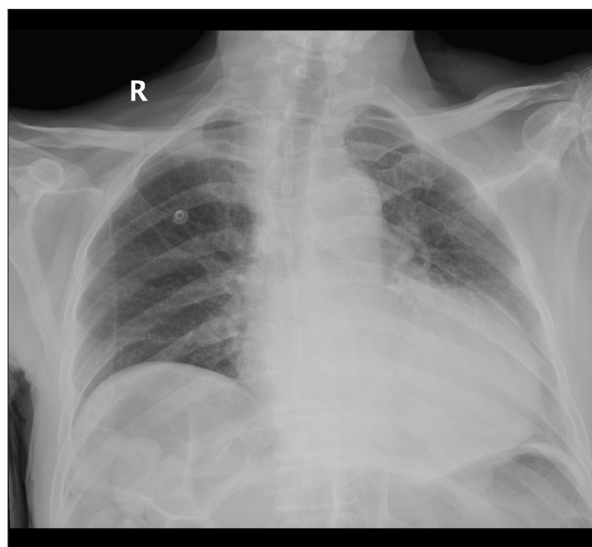


Figure 1. Chest X-ray showing globular cardiac silhouette, elevated diaphragm, and bowel dilatation.



Figure 2. Computed tomography of the abdomen demonstrating colonic pseudo-obstruction.

and the inferior vena cava was of normal diameter. These findings raised a concern for evolving tamponade. Working differential diagnoses included viral, bacterial, or uremic pericarditis, with myocarditis and myocardial infarction being less likely given the normal laboratory chemistry results.

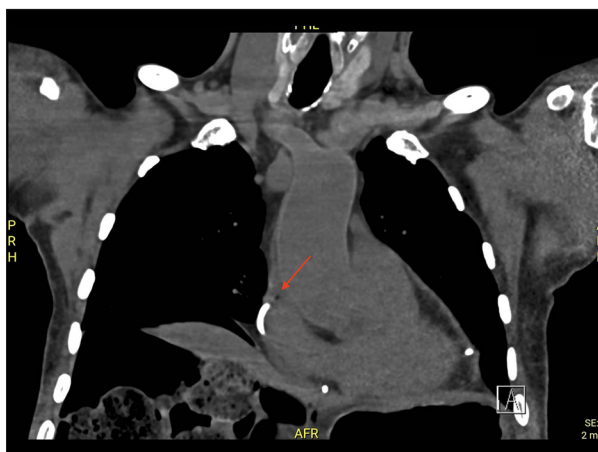


Figure 3. High resolution computed tomography showing pneumoperitoneum and tiny focus of pneumopericardium near pericardial drain tip (red arrow).



Figure 4. High resolution computed tomography showing pericardial drain traversing transverse colon.

The following morning, his abdomen became markedly distended. A repeat non-contrast-enhanced CT abdomen (**Figure 2**) revealed fecal loading and significant colonic dilatation consistent with ACPO. The gastroenterology team advised conservative management with nasogastric decompression, rehydration, and monitoring, reserving neostigmine for persistent symptoms.

Based on the echocardiography findings, he underwent urgent pericardiocentesis, without ultrasonographic assessment of bowel interposition prior to puncture. Under fluoroscopic guidance, 400 mL of bloody fluid was aspirated via the sub-xiphoid approach, and a 6-Fr catheter was inserted. The approach was selected to visualize the “halo phenomenon” of the catheter outlining the heart within the pericardial space.

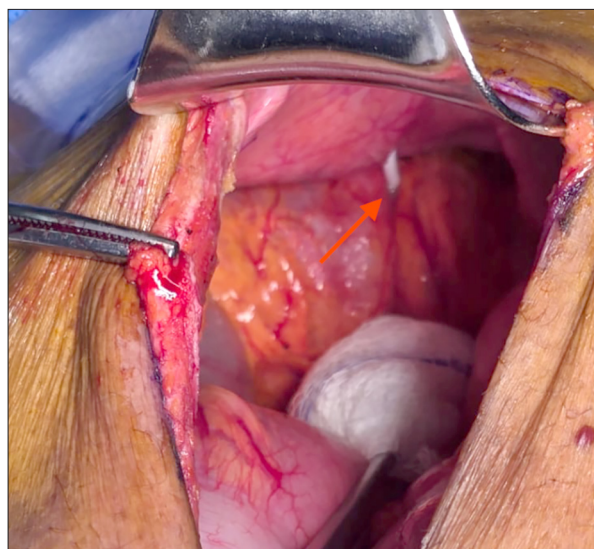


Figure 5. Pericardial drain traversing the transverse colon into the diaphragm (red arrow).

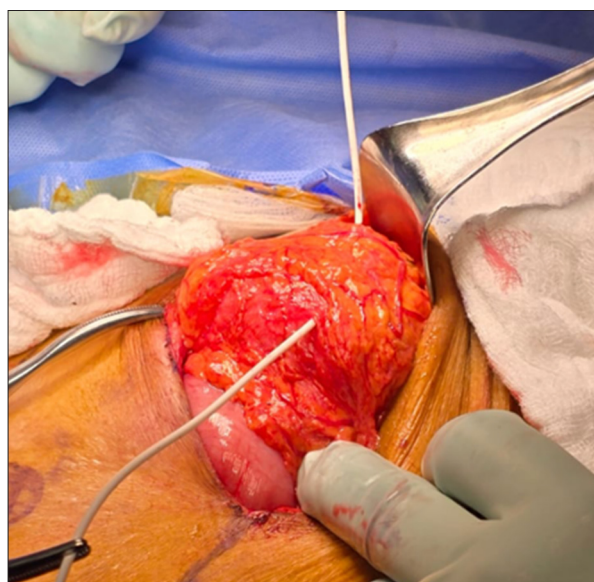


Figure 6. Pericardial drain causing through-and-through injury to the transverse colon.

Echocardiography after the procedure documented resolution of the effusion, although no images were available for publication.

Within hours, the drain stopped functioning, and the patient developed mild tachycardia, prompting further workup. A high-resolution CT scan of the chest revealed the catheter traversing the transverse colon, with significant pneumoperitoneum, a small focus of pneumopericardium, and a left pleural effusion (**Figures 3, 4**).

On surgical review, the patient had tachycardia but was otherwise stable, with a soft, non-tender but grossly distended

abdomen. Laboratory test results showed mild leukocytosis (white blood cell count, $11.6 \times 10^9/L$), elevated C-reactive protein (13.6 mg/dL), increased creatinine (1.91 mg/dL), and normal lactate levels. Blood cultures were sent, and broad-spectrum antibiotics and antifungals were initiated empirically, due to concern for immune compromise given the patient's age and chronic kidney disease.

Given the risk of sepsis and ongoing pericardial fluid accumulation, a combined thoracic and abdominal approach was undertaken. Through a left anterolateral thoracotomy, a pericardial window was fashioned, evacuating 100 mL of straw-colored fluid. Fibrinous adhesions were present between the pericardium and myocardium. Inspection revealed proper placement of the drain within the pericardial cavity and no myocardial injury. The catheter was removed, and new pericardial and intercostal drains were placed. After thoracotomy closure, an upper midline laparotomy revealed a massively dilated colon with a through-and-through perforation of the transverse colon (**Figures 5, 6**). There was no gross fecal contamination. Both defects were closed primarily with interrupted polyglactin sutures. To protect the repair and mitigate postoperative dysmotility from Ogilvie syndrome, a diverting colostomy was created. Rectal disimpaction was also performed.

The patient made steady progress postoperatively. He remained hemodynamically stable, without recurrent fevers. By postoperative day 2, he had stool output via the colostomy and adequate urine output. By day 3, he tolerated nasogastric feeds. Echocardiography done on day 3 confirmed a small, stable residual effusion. He was transferred to the general ward on day 4, and both drains were removed on day 10. He was discharged home in stable condition on day 11, with normalization of the white blood cell count and C-reactive protein level and return of creatinine to baseline. Cultures from the initial pericardiocentesis grew *Escherichia coli*, for which he received an 11-day course of piperacillin-tazobactam. His blood cultures were negative. Fluid analysis revealed an elevated protein and white blood cell count, with negative cytology. The bloody drain output and fibrinous material observed intraoperatively in the setting of known kidney disease with acute oliguria retrospectively lead the authors toward a diagnosis of uremic pericarditis. Post-discharge follow-up was not available.

Discussion

ACPO, also known as Ogilvie syndrome, usually occurs in older adult patients or debilitated patients, often with critical illness, acute cardiac events, or medication-induced dysmotility. It carries a risk of ischemia or perforation, exceeding 25% when the cecal diameter exceeds 12 cm or symptoms persist beyond 5 to 6 days. Diagnosis is often confirmed by CT

imaging. Management targets colonic decompression, which can be achieved conservatively, with targeted medical therapies, or endoscopically. Management aims to achieve colonic decompression and ranges from conservative measures, such as bowel rest, to targeted medical therapy and endoscopic decompression. Surgical management is generally reserved for refractory cases or those complicated by ischemia or perforation. A diverting colostomy relieves the distention in 73% of cases [5].

Pericardiocentesis has a high success rate when guided by imaging, yet complications including myocardial laceration, vascular injury, pneumothorax, and infection are reported in up to 1% to 3% of patients. Blind pericardiocentesis, on the other hand, carries a 20% morbidity risk. Bowel perforation is exceedingly rare [1-3].

Our patient had a large, circumferential pericardial effusion. He underwent fluoroscopy-guided pericardiocentesis for the benefit of observing the guidewire trajectory. Although imaging was not retrievable for publication, **Figure 5** demonstrates the catheter exiting the transverse colon into the diaphragm. The pericardium is accessed through the subxiphoid approach in up to 93% of cases performed under fluoroscopic guidance, and is often considered the standard of care in circumferential effusions [3,6]. The apical approach is more readily accessible under ultrasound guidance [3]. A recent study on 199 participants found no difference in overall survival or complication rate between the subxiphoid or apical approach; however, recurrent pericardial effusion was significantly lower following the subxiphoid approach. The subxiphoid space is considered the safest approach in the absence of image guidance, as it carries a lower risk for pneumothorax and left ventricular puncture. However, its longer needle trajectory and steeper angle of entry increase the risk of inadvertent entry into the peritoneal cavity and associated organ injury [6]. In the setting of cardiac tamponade, Simeunović et al concluded that while ultrasound guidance was often simpler and more readily available in the urgent setting, it carried a slightly higher rate of complications than fluoroscopy-guided drainage, including pleural puncture and pneumothorax, although this was not statistically significant [3].

Schulte-Hermes et al reported pneumoperitoneum following removal of a pericardial drain in a patient with Chilaidditi syndrome. This patient was treated conservatively with nil per os and broad-spectrum antibiotics. The authors recommend a pre-procedure ultrasound of the subxiphoid space [1]. Nyatanga reports a patient who developed severe chest pain and persistent pericardial effusion following pericardiocentesis, and a CT scan of the abdomen revealed a through-and-through transverse colon injury. This case was managed with operative removal of the drain and primary bowel repair [7]. Satyavolu et al described a case of transverse colon perforation,

pneumoperitoneum, and cardiac tamponade secondary to pneumopericardium in a patient with bowel dysmotility following drain removal, necessitating drain exchange and laparoscopic primary bowel repair. They emphasized the risks of the subxiphoid approach in patients with elevated diaphragms [8]. Uluçam reports the earliest known case of pneumopericardium and pneumoperitoneum following surgical pericardiocentesis, in which the causative factor was positive pressure from the catheter's drainage system [9].

Our patient was at increased risk for bowel dysmotility secondary to anticholinergic medication and chronic kidney disease. His bowel distention and elevated hemidiaphragm was detected on initial chest X-ray. ACPO placed him at a higher risk for bowel perforation given increased intraluminal pressure. Cessation of output from the drain prompted further imaging, leading to the early recognition of bowel injury. The functional bowel obstruction, tachycardia, and elevated inflammatory markers made conservative management less favorable.

While prior reports highlight a potentially increased risk of iatrogenic bowel injury in patients with elevated hemidiaphragms, to our knowledge, the present case is the first to link injury with ACPO as diagnosed prior to the procedure. The patient required multidisciplinary surgical management, with a concurrent diverting colostomy performed in consideration of the patient's underlying dysmotility. Due to the lack of patient follow up, only short-term postoperative outcomes were observed and recorded.

This patient developed iatrogenic transverse bowel injury during urgent fluoroscopy-guided pericardiocentesis for impending cardiac tamponade through the subxiphoid approach. Literature suggests that the apical approach is non-inferior and more readily accessible with ultrasound. As such, we recommend that patients presenting with abdominal distention or dilated bowel loops on initial chest X-ray may benefit from an ultrasound-guided pericardiocentesis or a preprocedural ultrasound of the subxiphoid space to

exclude bowel interposition before fluoroscopy-guided drainage. Abrupt changes in drain output must be addressed with prompt utilization of imaging. Management of the iatrogenic bowel injury should be individualized to the stage after the procedure when the perforation is detected, such as before or after drain removal, as well as the patient's overall clinical status. Appropriate and timely surgical management was paramount in our patient's recovery.

Conclusions

This case presents a rare but serious complication of image-guided pericardiocentesis. In patients with abdominal distention or colonic pseudo-obstruction, the subxiphoid approach may pose an increased risk of iatrogenic bowel injury. Pre-procedural imaging and alternative pericardial access, as through the apical approach, may mitigate this risk, and the decision is best tailored to the individual patient presentation and the shortest, safest trajectory to the site of largest effusion. Clinicians should maintain a high index of suspicion when confronted with sudden cessation of drain outflow and utilize early imaging to identify potential complications.

Department and Institution Where Work Was Done

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Patient Consent

Patient's next of kin provided informed consent for the publication of this article.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

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