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Case Report

# Complicated diverticulitis: Diagnostic precision and surgical solutions in a patient with chronic kidney disease ☆

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ABSTRACT

Diverticulitis, an inflammation of diverticula in the colon, can lead to severe complications such as perforation and abscess formation. A 42-year-old female with polycystic kidney disease and chronic kidney disease stage III presented with severe abdominal pain, fever, and inability to tolerate oral intake. The patient was a previous smoker who smoked 0.5 packs per day for 25 years. Initial evaluation revealed leukocytosis and elevated creatinine. A CT scan identified pneumoperitoneum and mild sigmoid diverticulitis, suggesting a perforated viscus. She underwent urgent exploratory laparotomy, which confirmed the CT findings and resulted in an appendectomy, sigmoid colon resection, and ostomy creation. Postoperatively, the patient faced complications, including recurrent pneumoperitoneum and subcutaneous emphysema, detected through follow-up CT scans, leading to further surgical interventions. CT imaging was pivotal in diagnosing, monitoring, and guiding treatment, with noncontrast CT being beneficial given her renal impairment. Early diagnosis and CT imaging are crucial in managing complicated diverticulitis. Postoperative monitoring with CT scans is essential for detecting complications. Follow-up care should include regular colonoscopies to assess diverticular disease and dietary modifications to prevent recurrence. Combining clinical, surgical, and radiologic data ensures effective management and improves patient outcomes.



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## Introduction

Complicated diverticulitis involves inflammation of diverticula within the colon and can lead to severe outcomes such as perforation, abscess formation, and generalized peritonitis [1]. The incidence of diverticulitis has been increasing, particularly in Western countries, and is correlating with aging populations and lifestyle factors [2]. Management requires acute care and long-term strategies to prevent recurrence and manage comorbid conditions [3].

Imaging plays a pivotal role in diagnosing and managing complicated diverticulitis [4]. Computed tomography (CT) is the preferred imaging modality due to its high sensitivity and specificity in detecting diverticulitis-related complications [5]. CT scans can accurately identify pneumoperitoneum, abscesses, fistulas, and bowel perforations, guiding initial and ongoing management decisions [6]. Advances in CT imaging have significantly improved the ability to monitor postoperative progress and detect early signs of complications, which is crucial for timely interventions [7,8].

Effective management of complicated diverticulitis involves a combination of medical, surgical, and radiologic strategies [9]. Initial management typically includes broad-spectrum antibiotics and supportive care, with CT imaging guiding the need for surgical intervention [10]. Surgical options range from minimally invasive techniques, such as laparoscopic lavage, to more extensive procedures, like resection with colostomy or primary anastomosis [11,12]. The choice of surgical method depends on the patient's overall health, the extent of the disease, and intraoperative findings [13]. Accurate and timely radiologic evaluation is essential in optimizing treatment outcomes and ensuring comprehensive care [14].

## Case presentation

A 42-year-old female with a significant medical history of polycystic kidney disease, chronic kidney disease (CKD) stage III (baseline creatinine ~2.0 mg/dL), prior extended-spectrum beta-lactamase (ESBL) urinary tract infections, and a history of cholecystectomy presented to the emergency department.

The patient reported a 4-day history of generalized and worsening abdominal pain, particularly severe in the right lower quadrant (RLQ). She denied any aggravating factors and mentioned attempting Cephalexin (Keflex) at home without relief. Additional symptoms included fever and an inability to tolerate oral intake due to pain and nausea. The pain initially awoke her from sleep, starting in the epigastric area and persisting throughout the day, prompting her to seek emergency care.

Upon admission to the emergency department, the patient was afebrile but tachycardic with heart rates in the 110s. She was hemodynamically stable and had normal oxygen saturation on room air. Laboratory results were significant for a creatinine level of 2.4 mg/dL, indicating worsening CKD, which contributed to the patient's American Society of Anesthesiologists (ASA) score of 3 (severe but not incapacitating systemic disease). Troponin levels were unremarkable. A complete blood count (CBC) revealed leukocytosis with a white blood cell (WBC) count 17,000, while hemoglobin and platelet counts were within normal ranges. An electrocardiogram (EKG) showed normal sinus rhythm. COVID-19, influenza, and RSV tests were negative.

A computed tomography (CT) scan of the abdomen and pelvis without contrast demonstrated significant pneumoperitoneum, mild sigmoid diverticulitis, and enteritis (Figs. 1 and 2). General surgery was consulted, and a few hours following admission, the patient underwent urgent exploratory laparotomy, which included an appendectomy, sigmoid colon resection, and creation of a colostomy (Hartmann's procedure).

Intraoperative findings revealed a mottled liver with multiple small abscesses. The stomach and duodenum appeared normal. Purulent peritoneal fluid was found in the colic gutters and pelvis. Inflammatory changes were noted in the small bowel adherent to the sigmoid colon. Upon separating the adhesions, a perforation in the sigmoid colon was identified as the source of the patient's symptoms. The perforated sigmoid colon was elevated and divided distally below all visible diverticula. The left colon was mobilized, and a colostomy was created in the left abdominal wall. The postoperative diagnosis was perforated diverticulitis with peritonitis. The patient tolerated the surgery well and was discharged five days postoperatively.

Four months postsurgery, the patient had an unremarkable colonoscopy and was re-admitted for colostomy reversal. She reported good healing and colostomy care for over 3 months without significant difficulties. She denied any abdominal pain, nausea, or vomiting and had good bowel function through the colostomy. The patient tolerated the robotic-assisted laparoscopic sigmoid colostomy reversal with sigmoidoscopy. During the robotic-assisted laparoscopic sigmoid colostomy reversal, a leak test was performed to assess the integrity of the colorectal anastomosis. This involved instilling fluid into the abdominal cavity and inflating the bowel with air, looking for any signs of bubbles that would indicate a leak. In this case, no leaks were detected, and the anastomosis appeared intact.

However, within 4 weeks postsurgery, she was re-admitted with sudden onset abdominal pain, primarily in the upper abdomen. A CT scan revealed a large amount of pneumoperitoneum and subcutaneous emphysema, suggesting a perforated abdominal viscus (Fig. 3). The patient underwent a repeat exploratory laparotomy with extensive lysis of adhesions. Findings included 2 abscesses in the loops of the terminal ileum, a densely adherent uterus over the anterior surface of the rectum, and colorectal anastomosis, but no signs of leak or abscess at the staple line. The abdomen was washed out, and a drain was placed.

Over the following days, the patient's postoperative course was complicated by persistent pain, distention, and leukocytosis. A gradual progression of diet was attempted, but she continued to experience significant discomfort and signs of infection, including fever and increased WBC counts. During her postop course, she developed sepsis. She was started on broad-spectrum antibiotics, including vancomycin and meropenem, following a sepsis workup that revealed infiltrate

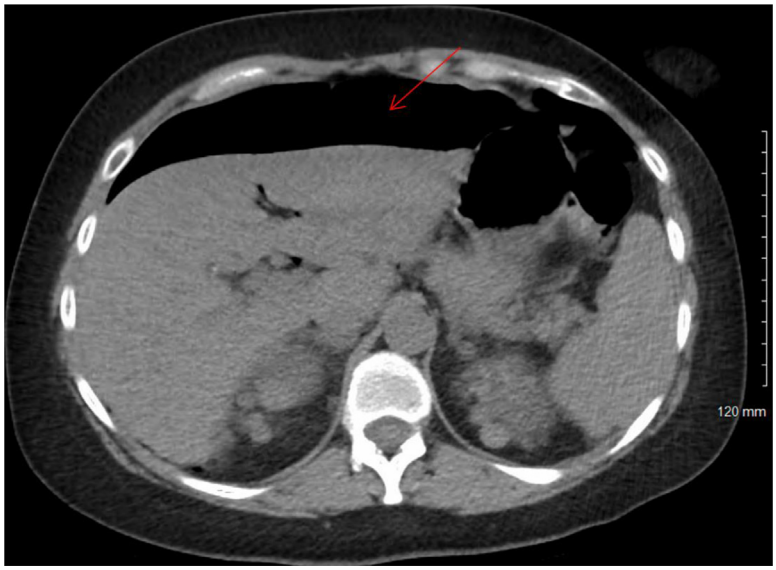


**Fig. 1 – CT scan of abdomen and pelvis without contrast (axial view) with pneumoperitoneum located within the upper abdomen (red arrow) concerning for a bowel perforation.**

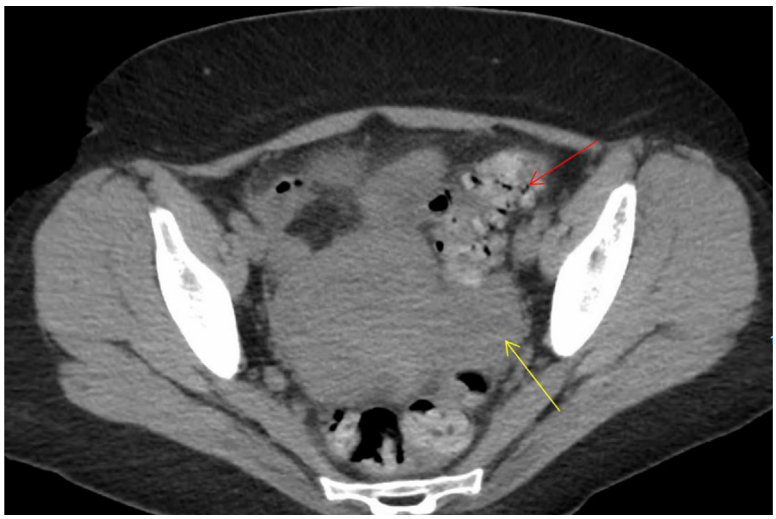

**Fig. 2 – CT scan of abdomen and pelvis without contrast (axial view) with diffuse diverticular disease and thickening of the sigmoid colon (red arrow). Free fluid was also detected along the sigmoid colon (yellow arrow).**

in the left lung base and significant free air and ascites in the abdomen.

The patient was transferred to the ICU due to persistent tachycardia and hypotension, requiring multiple fluid boluses and brief vasopressor support. Antibiotics were escalated, and an NGT was inserted due to bilious output. Following stabilization, she underwent an exploratory laparotomy that revealed more than 2 L of fluid within the peritoneal cavity and a perforation in the descending colon at the colorectal anastomosis. The abdomen was washed out, a diverting loop ileostomy was created, and additional drains were placed.

Postsurgery, the patient's condition showed significant improvement; she was extubated and began making urine after a previous day of anuria. However, she experienced complications, including persistent pain, leukocytosis, and purulent drainage from the drains. A wound VAC was applied, and she was placed on a clear liquid diet.

The patient remained afebrile and hemodynamically stable, although she required ongoing pain management and support for her ileostomy. Despite episodes of nausea and decreased stoma output, a repeat CT scan did not show new abdominal collections. Her condition improved with antibiotic therapy, and she began tolerating a regular diet.

The patient continued to progress, with improving leukocytosis and stable hemoglobin levels. Her drains remained purulent but had decreasing output. Discharge plans included continued ambulation and ongoing monitoring of her ileostomy and wound sites.

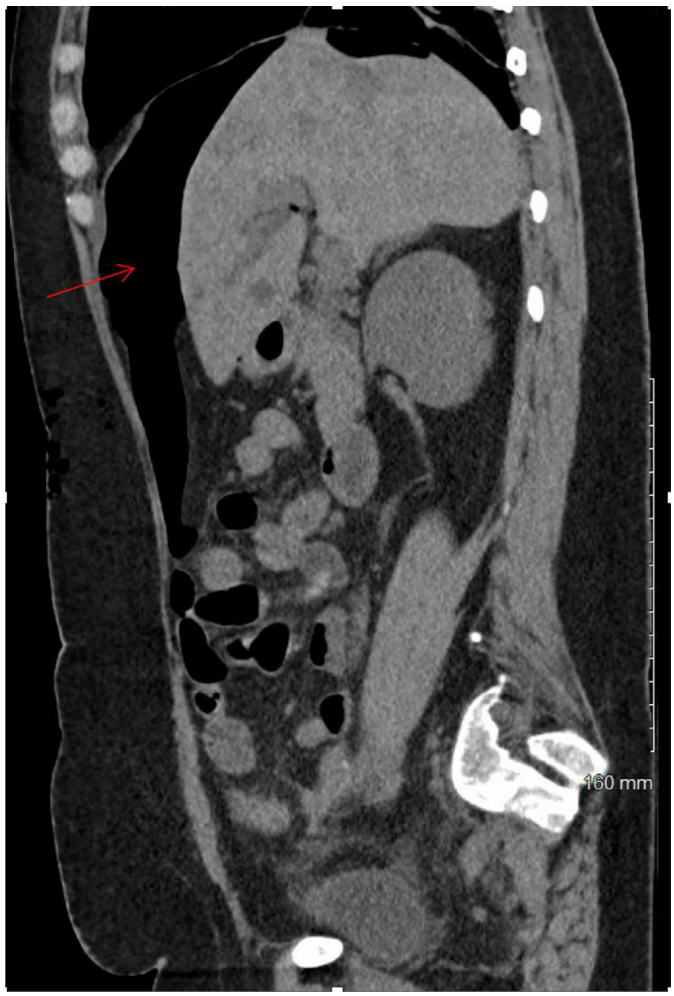


**Fig. 3 – CT scan of abdomen and pelvis without contrast (sagittal view) with recurrent subdiaphragmatic pneumoperitoneum suspicious for perforated bowel (red arrow).**

## Discussion

Diverticulitis occurs when diverticula, small pouches in the colon wall, become inflamed or infected [15]. It is thought to be caused by a low-fiber diet, which increases intracolonic pressure [1,15]. Symptoms include abdominal pain, fever, and altered bowel habits [16]. Complicated diverticulitis involves abscess formation, perforation, or fistula, presenting more severe symptoms [17]. Diagnosis is based on clinical presentation, laboratory tests showing leukocytosis, and imaging studies [7]. Initial management includes antibiotics and supportive care, with surgical intervention needed for complications [18]. The choice of a Hartmann's procedure over primary anastomosis was dictated by the patient's condition and the presence of peritoneal contamination, both of which increased the risk of anastomotic failure.

Radiology, particularly CT imaging, is crucial in diagnosing and managing diverticulitis [8]. CT scans provide detailed images of the colon and surrounding structures, identifying inflammation, abscesses, perforations, and pneumoperitoneum [19]. This imaging modality allows for accurate diagnosis and assessment of disease severity, guiding treatment decisions [3,19]. Additionally, CT-guided or ultrasound-guided drain placement can be employed to manage abscesses, providing a minimally invasive option to reduce the abscess size before or after surgery [20]. CT is also valuable in monitoring the progression of the disease and detecting postoperative complications, ensuring timely and appropriate interventions [21]. Leak tests are critical during colostomy reversal, and in this case, a leak test during the reversal surgery did not indicate any complications. ICG fluorescence imaging, which can assess perfusion during anastomosis, was not employed but may have been beneficial in evaluating tissue viability.

Surgical management of complicated diverticulitis includes procedures such as abscess drainage, resection of the affected colon segment, and stoma creation when necessary [22,23]. Surgery is indicated in cases of perforation, obstruction, fistula, or failure of medical management [9]. The choice of procedure depends on the patient's condition and the extent of the disease [12]. Laparoscopic techniques are preferred when feasible due to reduced recovery time and complications [24]. Postoperative care involves monitoring for signs of infection, ensuring proper wound healing, and managing stoma care if applicable [22].

Extensive literature has examined the risk factors associated with colostomy closure, with the timing of colostomy creation and reversal emerging as a critical factor [25]. Studies have demonstrated that in patients who underwent colostomy formation due to inraabdominal perforation of the colon, closure within 4 weeks was correlated with a higher rate of complications [26]. This increased risk is attributed to insufficient time for complete resolution of the underlying inflammatory process, potentially leading to immediate and late complications [27]. In contrast, our patient underwent an elective colostomy takedown approximately 3 months after her sigmoid colon resection, aligning with current best practices. It is notable that while delayed closure generally results in fewer complications, prolonged maintenance of a stoma can negatively impact a patient's quality of life [28]. Therefore, the optimal timing for colostomy reversal should be determined on an individual basis, balancing the risks of early closure against the psychosocial impact of a prolonged stoma [29].

Furthermore, research has identified several comorbidities associated with elevated complication rates following colostomy reversal [29]. These include a history of smoking, renal disease, and cardiac conditions [30]. Our patient presented with multiple risk factors: she was a former smoker and had chronic kidney disease (CKD) stage III. Additionally, her ASA score of III may contribute to a higher risk of postoperative complications, as literature has documented an increasing trend of complications as a function of ASA class. These factors necessitate a more cautious approach to patient selection and perioperative management [29].

Follow-up care for patients after discharge includes scheduled colonoscopy to evaluate the extent of diverticular disease and to screen for colorectal cancer [31]. Dietary modifications, such as increasing fiber intake, are recommended to prevent recurrence [31]. Patients are advised to avoid foods irritating the colon, increase dietary fiber, and maintain hydration [32]. Regular follow-up appointments are essential to monitor the patient's recovery and to manage any long-term complications or recurrence of diverticulitis [29].

## Conclusion

Early and accurate diagnosis of complicated diverticulitis using CT imaging is critical for effective management. CT scans guide surgical decisions and detect postoperative complications, ensuring timely interventions. Noncontrast CT is particularly valuable for patients with renal impairment. Postoperative monitoring with regular CT scans and follow-up care, including colonoscopies and dietary modifications, are essential to prevent recurrence and manage long-term outcomes. Combining clinical, surgical, and radiologic data optimizes patient care and improves outcomes.

## Patient consent

We confirm that we have obtained written, informed consent from the patient for the publication of this case report. The patient has been thoroughly informed about the details that will be published and understands the implications of the publication. The written consent is stored securely and is available for review by the editorial team upon request.

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