

Complicated Sigmoid Diverticular Disease Presenting as Extensive Retroperitoneal and Thigh Necrotizing Soft-Tissue Infection: A Case Report

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Case Report

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Abstract

Introduction:

Necrotizing soft-tissue infection (NSTI) is a rare, rapidly progressive, and potentially fatal surgical emergency. Early diagnosis is challenging due to its nonspecific presentation, and prompt recognition followed by urgent imaging and surgical intervention is essential to improve outcome.

Case presentation:

A 57 year old woman presented with generalized weakness, poor oral intake, lower abdominal pain, and oliguria. She was hypotensive, hypoxic, and in acute kidney injury with metabolic acidosis. Non-contrast CT revealed complicated sigmoid diverticulitis with extensive extraluminal gas extending through the left retroperitoneum, psoas, pelvis, and thigh, consistent with an extensive necrotizing soft-tissue infection. Emergency laparotomy with resection of the diseased sigmoid colon, upper rectum, distal ileum, and cecum, followed by end ileostomy and colostomy, was performed along with extensive left thigh exploration and debridement. Despite initial improvement following source control and intensive care, she developed wound infection with carbapenem-resistant Enterobacteriaceae and progressive hemodynamic deterioration, ultimately dying of cardiac arrest on postoperative day 19.

Conclusion

This case highlights the challenges of recognizing deep necrotizing infection from an intra-abdominal source, emphasizing the importance of early imaging and surgical source control.

Introduction

Necrotizing soft-tissue infection (NSTI) is a life-threatening medical and surgical emergency, with an estimated incidence of 0.4 per 100,000 persons per year in the United States[1]. It is characterized by rapidly progressive necrosis involving the deep fascia and subcutaneous tissues [2]. NSTIs may be caused by gas-forming organisms and can occur as either monomicrobial or polymicrobial infections [2, 3]. Early diagnosis can be challenging because the initial clinical presentation may resemble cellulitis, an abscess, or other common sources of sepsis [1]. Clinical features such as severe pain, progressive edema, systemic toxicity, hypotension, skin discoloration, crepitus, or tenderness extending beyond the area of visible inflammation should raise suspicion for a necrotizing process [2, 3].

Here, we present a rare case of extensive necrotizing soft-tissue infection of the left retroperitoneum, iliopsoas region, hemipelvis, and thigh secondary to complicated sigmoid diverticular disease.

Case presentation

A 57 year old woman with a history of hypertension, atrial fibrillation, and obstructive sleep apnea presented to the emergency department with a 3 days history of generalized weakness, reduced exercise tolerance, poor oral intake, and increased somnolence. These symptoms were preceded by lower abdominal pain and decreased urine output.

On arrival, the patient appeared ill. Her blood pressure was 94/57 mmHg, heart rate 104 beats/min, and oxygen saturation 85% on initial assessment. She had dry mucous membranes. Cardiovascular examination revealed an irregular rhythm with an ejection systolic murmur. Coarse crepitations were auscultated over the right lung. Abdominal examination revealed suprapubic tenderness. Examination of the lower extremities at this stage was not remarkable.

Initial laboratory investigations demonstrated marked systemic inflammation, acute kidney injury, and metabolic acidosis (Table 1).

Table 1
serial laboratory parameters during the patient's hospital course.

Parameter	Admission	Pre-op	POD 1	POD 3	POD5	Final deterioration
Creatinine(mg/dL)	5.1	3.86	3.69	3.4	2.91	2.66
BUN (mg/dL)	91.4	82.3	83.6	98	97.4	48.6
WBC ($\times 10^9/L$)	9.18	15.8	9.7	17.1	21.8	11.7
CRP (mg/L)	450		317	112	46.3	66.3
Lactate (mg/L)		2.03	2			
PH	7.28	7.07	7.2	7.27	7.27	7.29
HCO ₃ ⁻ (mEq/L)	17.1	13	13	16	19	22
PCO ₂ (mmHg)	36.3	52	33	29	36	45
Vasopressor requirements (mcg/min)		15–20	4	2	6.6	19

The patient was initially managed as septic shock of an unclear source, with pulmonary and urinary sources considered. She received intravenous fluid resuscitation, broad spectrum antibiotics, hydrocortisone, and norepinephrine for persistent hypotension. Despite initial resuscitation, she remained hemodynamically unstable and continued to require vasopressor support.

A non-contrast computed tomography (CT) scan of the chest, abdomen, and pelvis demonstrated complicated sigmoid diverticulitis with extensive extraluminal gas involving the left retroperitoneum and psoas muscle, extending into the left hemipelvis and thigh musculature. Mild left hydronephrosis and pneumomediastinum were also noted. The findings were highly concerning for an extensive necrotizing infectious process involving the retroperitoneum and left thigh (Fig. 1).

The CT findings prompted urgent surgical evaluation. Although the abdomen remained relatively soft, with only mild left lower quadrant tenderness, further examination of the lower extremities revealed marked swelling, warmth, and tenderness of the left thigh. The circumference of the affected thigh was approximately 62 cm compared with 54 cm on the contralateral side. In view of the extensive intramuscular and retroperitoneal gas on CT and the clinical findings, an emergency surgical intervention was undertaken.

Surgical management

Exploratory laparotomy revealed a severe inflammatory process involving the lower abdomen and left iliac fossa, centered on the sigmoid colon and upper rectum, with involvement of the distal ileum and cecum. Extensive adhesions were present, with further dissection revealing perforation and fistulization associated with an inflammatory mass involving these structures.

The diseased sigmoid colon and upper rectum were resected together with the involved distal ileum and cecum. An end ileostomy and end colostomy were subsequently fashioned. The abdominal cavity was thoroughly irrigated, and drains were placed, including a drain directed toward the pelvic and upper-thigh region. Two units of packed red blood cells were transfused intraoperatively.

Given the extensive involvement of the left thigh, surgical exploration and debridement were performed during the same operative setting. A lateral incision was made over the greater trochanter and extended distally. Upon opening the fascia, an unhealthy watery fluid with a foul odor was encountered, with continuous discharge from the deeper tissue planes. Extensive dissection revealed multiple deeper pockets of infection involving the thigh compartments (Fig. 2).

Purulent material was obtained and submitted for aerobic and anaerobic microbiological cultures. Samples of necrotic muscle and soft tissue were also obtained for tissue culture and subsequently debrided. The deeper anterior and posterior compartments were explored and drained. A drain was inserted, and the wound was dressed with limited skin approximation to allow ongoing drainage.

Postoperative course

The patient was subsequently transferred to the intensive care unit in critical condition, remaining intubated and mechanically ventilated and requiring norepinephrine support at approximately 15–20 µg/min. Shortly after surgery, she developed severe mixed metabolic and respiratory acidosis, with a pH of 7.2, pCO₂ of 33 mmHg, and bicarbonate of 13 mmol/L. During her ICU stay, she improved gradually following surgical source control and intensive care management, with improvement in her laboratory parameters (Table 1).

Intraoperative cultures from pus, deep tissue, and wound specimens subsequently grew *Escherichia coli* and *Pseudomonas* species, while histopathological examination of the resected bowel confirmed complicated diverticular disease with acute and chronic inflammation, focal perforation and abscess formation, and no evidence of malignancy. Meropenem had been initiated empirically at the time of admission and was continued.

On postoperative day (POD) 8, she was extubated. By POD 11, she developed recurrent hypotension requiring reinitiation of norepinephrine.

On POD 12, the surgical team noted black discoloration of the lower aspect of the abdominal wound extending toward the umbilicus, associated with purulent discharge. A wound swab was obtained for microbiological analysis. Subsequent wound cultures grew carbapenem resistant Enterobacteriaceae (CRE), with moderate growth of yeast species, and antimicrobial therapy was continued with meropenem and fluconazole.

By POD 19, the patient's condition had deteriorated significantly, with escalating vasopressor requirements. She developed multiple episodes of nonsustained ventricular tachycardia, which were initially self-terminating. Later that day, she became unresponsive with an unrecordable blood pressure. Cardiac arrest was recognized, and

cardiopulmonary resuscitation was immediately initiated. Ten cycles of high-quality CPR were performed, but return of spontaneous circulation was not achieved, and the patient was pronounced deceased.

Discussion

This case illustrates an unusual presentation of complicated sigmoid diverticular disease with extensive necrotizing soft-tissue infection involving the retroperitoneum, iliopsoas region, and left thigh.

Necrotizing soft-tissue infection (NSTI) is a life-threatening medical and surgical emergency[1]. Necrotizing fasciitis is associated with a high mortality rate, reported to range from 15% to 40%[4, 5]. Patients may present with nonspecific features such as pain, fever, and erythema, and the condition can be mistaken for more common infections such as cellulitis or abscess[1, 5, 6]. Delayed diagnosis and treatment are associated with worse outcomes, with mortality strongly influenced by the time to definitive surgical intervention[5]

In our case, the initial presentation was dominated by generalized weakness, altered mental status, hypotension, acute kidney injury (AKI), metabolic acidosis, and hypoxemia. The relatively limited abdominal findings initially led to consideration of pulmonary and urinary sources of sepsis. But the subsequent identification of marked swelling, warmth, and tenderness of the left thigh, together with extensive intramuscular and retroperitoneal gas on CT, was critical to recognizing the severity and extent of the infection. This discrepancy between the relatively benign abdominal examination and the extensive deep infection is an important lesson. In patients with severe sepsis of unclear source, a high index of suspicion for a deep soft-tissue source is warranted.

Several differential diagnoses could be considered in a patient presenting with extensive retroperitoneal and thigh gas. A primary necrotizing soft-tissue infection was a possible consideration given the extensive intramuscular gas, however, the presence of severe sigmoid inflammation with perforation and fistulization provided a more likely intra-abdominal source. A retroperitoneal abscess could also produce extension into the iliopsoas, pelvis, and thigh, although no discrete retroperitoneal collection was identified on CT to suggest an isolated abscess as the primary process. Perforated sigmoid malignancy was another consideration given the segmental sigmoid wall thickening and perforation; however, histopathological examination demonstrated complicated diverticular disease without evidence of dysplasia or malignancy. Taken together, the radiological, operative, and pathological findings supported complicated sigmoid diverticular disease as the most likely source of the extensive necrotizing infection.

CT is the imaging modality of choice in patients with suspected NSTI, particularly for identifying soft-tissue gas and to assess the anatomical extent of disease[2, 5]. Typical CT findings include asymmetric fascial thickening, subcutaneous edema and fat stranding, fluid collections or abscesses, and soft-tissue gas, which may track along fascial and intermuscular planes. It can also help identify an underlying infectious source, and demonstrate the spread of infection across fascial and muscular planes[2, 7]. Visualization of the deep fascia may be improved with intravenous contrast; however, AKI is common in these patients which make IV contrast contraindicated[4]. In the present case, CT was particularly important because it demonstrated extensive extraluminal gas extending from the sigmoid region through the left retroperitoneum and psoas muscle into the pelvis and thigh, thereby revealing the extent and likely anatomical pathway of the infection. However, CT findings should complement clinical assessment and should not delay definitive surgical evaluation when necrotizing infection is suspected[7].

From a microbiological perspective, literature supports the classification of NF into monomicrobial or polymicrobial subtypes, traditionally categorized into distinct etiologic groups: Type I (polymicrobial, typically involving the trunk, perineum, and retroperitoneum secondary to enteric perforations), Type II (monomicrobial, usually streptococcal/staphylococcal), Type III (gas gangrene secondary to trauma), and Type IV (fungal, typically affecting (immunosuppressed or critically ill patients))[2, 8]

Our patient's infection was consistent with a Type I polymicrobial NSTI. Intraoperative cultures from pus and deep tissue grew *Escherichia coli* and *Pseudomonas* species, consistent with an enteric source associated with the perforated sigmoid colon, reflecting the typical enteric-derived flora characteristic of complicated lower gastrointestinal perforations. Empirical broad-spectrum antimicrobial therapy with meropenem was initiated at admission and continued following surgical source control, with early postoperative stabilization, a marked reduction in CRP (from 450 mg/L to 46.3 mg/L), and successful extubation on post operative day 8.

The cornerstone of NSTI management is prompt and aggressive surgical debridement, which is associated with reduced mortality[8]. This should be combined with appropriate systemic antimicrobial therapy and comprehensive supportive care. Intensive care management, including fluid resuscitation, vasopressor support, continuous cardiac monitoring, mechanical ventilation, and management of organ dysfunction are usually required[2].

The development of a wound infection with isolation of carbapenem-resistant Enterobacterales (CRE) wound infection further complicated the patient's clinical course[9, 10]. CRE is an increasing global concern because of its high level of antimicrobial resistance and limited therapeutic options. CRE has been reported in approximately 12% of patients in Bangladesh, with higher prevalence among older patients (14.4%) and hospitalized patients (18.4%), while CRE has been identified in 20.9% of wound swabs in some settings[10]. CRE was isolated from the wound following prolonged critical illness and broad-spectrum antibiotic exposure, highlighting the challenges of treating secondary infections caused by multidrug-resistant organisms in critically ill surgical patients.

Ultimately, on POD 19, the patient developed progressive hemodynamic deterioration with escalating vasopressor requirements, followed by multiple episodes of nonsustained ventricular tachycardia and cardiac arrest. Although the precise mechanism of the terminal cardiac arrest cannot be established from the available clinical information, the overall course was consistent with progressive multisystem deterioration following recurrent severe infection and septic shock.

Similar cases of necrotizing infection secondary to complicated diverticular disease or other intra-abdominal pathology have been reported. Table 2 summarizes selected similar cases and compares their presentation, imaging findings, management, and outcomes with the present case.

Table 2

Comparison of reported cases of necrotizing soft-tissue infection secondary to intra-abdominal pathology.

Main presentation/	Examination	CT findings	Underlining disorder	Management	Outcome
51-year-old man with 4-day history of painful, swollen left knee[11].	--	The left thigh was markedly enlarged, with gas involving all muscle compartments, extending through the gluteal muscles and along the left psoas into the retroperitoneum.	Perforated diverticulitis	Initial extensive debridement with left hip disarticulation, gluteal excision and partial psoas excision. Later, a laparotomy and Hartmann's procedure for perforated distal sigmoid diverticulitis.	He recovered sufficiently, and the wound was managed by regional plastic surgery team.
88-year-old woman with a progressively worsening abdominal and left leg pain[12].	Mild tenderness to palpation of the left lower quadrant, and for pain in her left hip and thigh.	Left retroperitoneal air extending from the diaphragm to the obturator foramen and femoral canal, with extension into the adductor fascia of the leg; air was also present in the anterior mediastinum.	Perforated sigmoid diverticulitis	Surgical treatment for the perforated diverticulitis and necrotizing infection. Exact operative details should be verified from the full article before publication.	The patient developed hypotension and pulseless electrical activity and then died.
70-year-old man with a 3-day history of acute-onset left calf and knee associated with fever and reduced mobility[13].	Erythema, tenderness, and crepitus left calf and posterior aspect of the knee extending superiorly into the lateral aspect of the thigh.	Perforated sigmoid diverticulitis communicating with the left hip through the iliopsoas fascia. X-Ray: subcutaneous and intramuscular gas extending from the posterior lower limb into all compartments of the thigh.	Perforated sigmoid diverticulitis	Sigmoid colectomy and transverse loop colostomy. And, a 4 debridement and irrigation procedures were performed.	Successfully discharged 13 months after initial presentation with normal bowel function and mobility.
80-year-old woman with fever and difficulty moving[14].	Subcutaneous emphysema over the left lower abdomen and	Thickened wall of the descending colon and	Descending colon adenocarcinoma	Left hemicolectomy and open drainage of the	The drainage site was closed on POD 22, and the patient

Main presentation/	Examination	CT findings	Underlining disorder	Management	Outcome
	the left femoral region.	retroperitoneal abscess.		left femoral region.	was transferred to another hospital on POD 26, achieving 6-month relapse-free survival.
70-year-old man with a one-day history of lower abdominal pain and chills[15].	Severe tenderness and crepitus over the lower abdomen and the groin.	Extensive gas extending from the left abdominal wall and retroperitoneum into the left thigh muscles and anterior pubic region.	Perforated descending colon	Adhesiolysis followed by left hemicolectomy with double-barrel ileostomy was performed.	He was transferred to a rehabilitation facility on POD 40 after confirmation of abscess resolution and removal of the retroperitoneal drain.

Conclusion

The case highlights several important diagnostic and therapeutic challenges, particularly the potential for an intra-abdominal source to extend beyond the abdominal cavity, the limitations of physical examination in detecting deep necrotizing infection, the importance of early imaging and surgical source control, and the potential for recurrent infection and antimicrobial resistance during prolonged critical illness.

Declarations

Ethical approval:

Ethical approval was not required for this case report in accordance with local institutional guidelines.

Consent to publication:

Written informed consent was obtained from the patient and her family for the publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

Availability of data and materials:

Data sharing is not applicable to this case report as no datasets were generated or analyzed during the current study.

Competing Interests:

The authors have no conflict of interest.

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Author contribution:

The study concept was developed by M.S and M.M, the manuscript was written by M.S and S.R, while review and editing were carried out by Y.K, Y.D and O.A.Z, interpretation of images was done by Y.D, and data collection was conducted by M.S, S.R, All authors have approved the final version of the manuscript.

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Figures

Figure 1A

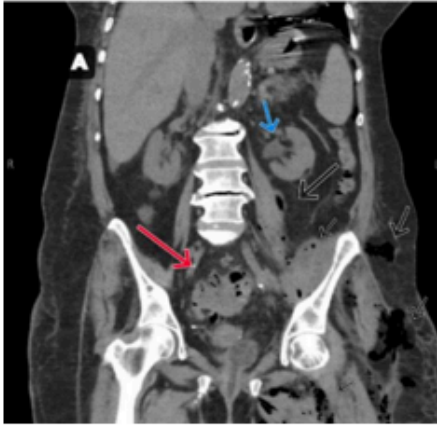


Figure 1B

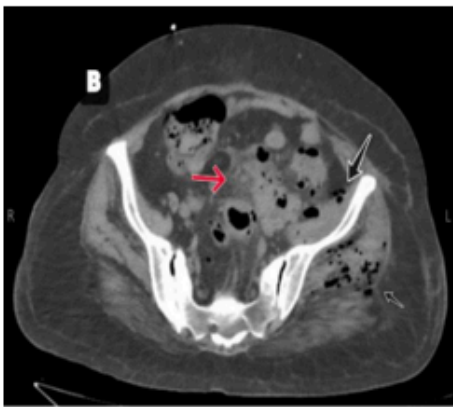


Figure 1C

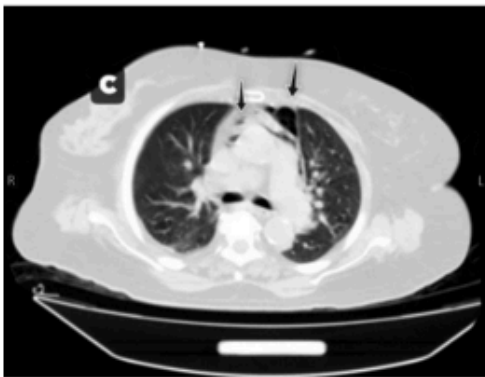


Figure 1

Extensive extraluminal gas associated with complicated sigmoid diverticulitis.

(A) Coronal non-contrast CT image demonstrating segmental sigmoid colonic wall thickening with surrounding inflammatory fat stranding, highly suspicious for acute diverticulitis (red arrow). Extensive extraluminal gas is present within the left retroperitoneum and psoas muscle, with extension into the left hemipelvic and thigh musculature (black arrows). Mild left hydronephrosis is also noted (blue arrow).

(B) Axial non-contrast CT image demonstrating inflammatory changes involving the sigmoid colon, highly suspicious for diverticulitis (red arrow), with extensive extraluminal gas within the left retroperitoneum and psoas muscle and extension into the left hemipelvic and thigh musculature (black arrows), accompanied by pneumoperitoneum.

(C) Axial CT image demonstrating mediastinal gas concerning for pneumomediastinum (black arrows).

Figure 2A



Figure 2B



Figure 2

(A) Intraoperative view of the left thigh during surgical exploration, showing incision of the fascia that revealed unhealthy fluid discharge from deeper tissue planes.

(B) Extensive surgical dissection of the left thigh, displaying multiple pockets of infection involving the thigh compartments.