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Chemotherapy-Induced Neutropenic Enterocolitis in Acute Myeloid Leukaemia Patient: A Case Report

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Abstract

This case report details a 53-year-old woman with newly diagnosed acute myelogenous leukaemia (AML) who developed neutropenic enterocolitis (typhlitis) following induction chemotherapy. Initially presenting with mild respiratory symptoms and blood abnormalities, her condition worsened after chemotherapy, leading to severe gastrointestinal issues and pancytopenia. Diagnostic imaging and blood cultures confirmed neutropenic enterocolitis caused by Escherichia coli. The patient was successfully treated with broad-spectrum antibiotics, G-CSF, blood transfusions, and supportive care, resulting in a full recovery. This case highlights the importance of early diagnosis and prompt treatment of neutropenic enterocolitis in AML patients undergoing chemotherapy to improve outcomes and reduce mortality.

Keywords: *Acute Myelogenous Leukemia, Chemotherapy, Early Diagnosis, Escherichia Coli, Neutropenic Enterocolitis.*

Introduction

Chemotherapy-induced neutropenic enterocolitis (NE), also known as typhlitis, is a rare but serious complication primarily seen in patients undergoing intensive chemotherapy, particularly those with haematological malignancies such as Acute Myeloid Leukemia (AML) [1]. NE is characterized by inflammation and necrosis of the bowel, predominantly affecting the cecum but potentially extending throughout the gastrointestinal tract [2]. The condition is associated with a high morbidity and mortality rate, often due to the neutropenic state induced by chemotherapy, which compromises the immune system and makes patients more susceptible to severe infections [3].

AML is a clonal disorder of hematopoietic stem cells characterized by the accumulation of myeloid blasts in the bone marrow and peripheral blood, leading to hematopoietic failure [4]. The treatment for AML typically involves intensive chemotherapy regimens aimed at achieving complete remission.

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However, these regimens often result in prolonged periods of neutropenia, increasing the risk of infections and other complications such as NE [5]. The pathogenesis of NE in AML patients undergoing chemotherapy is multifactorial, involving mucosal injury due to cytotoxic agents, bacterial translocation, and subsequent inflammatory responses [6].

This case report discusses a patient with AML who developed chemotherapy-induced neutropenic enterocolitis, highlighting the clinical presentation, diagnosis, and management of this life-threatening condition. The report underscores the importance of early recognition and prompt intervention to improve outcomes in such cases.

Neutropenic enterocolitis remains a challenging diagnosis due to its nonspecific symptoms, which may include abdominal pain, fever, and diarrhoea [7]. It predominantly occurs in neutropenic patients, particularly those with hematologic malignancies such as AML, where the aggressive nature of chemotherapy predisposes patients to mucosal injury and subsequent infection [8].

The incidence of NE varies widely in the literature, with estimates ranging from 5% to 26% among neutropenic patients receiving chemotherapy [9]. However, the actual incidence is likely underreported due to difficulties in diagnosis and the often rapid progression of the disease. The pathophysiology of NE is complex, involving multiple factors including direct mucosal damage from chemotherapy, bacterial invasion due to neutropenia, and a dysregulated immune response leading to necrosis of the bowel wall [10].

Management of NE is primarily supportive, including bowel rest, broad-spectrum antibiotics, and aggressive fluid resuscitation. Surgical intervention is reserved for cases with complications such as bowel perforation, peritonitis, or uncontrolled sepsis [11]. Despite advancements in supportive care, NE remains a condition with a high mortality rate, particularly when diagnosis and treatment are delayed [12].

In this report, we present a case of a patient with AML who developed NE following induction chemotherapy, providing insights into the clinical course and management strategies for this severe complication.

Case Details

A 53-year-old woman, with no prior medical history, presented with generalized weakness, fatigue, low-grade fever, dry cough, sore throat, and difficulty swallowing, all persisting for about a week. She did not experience any shortness of breath, no blood in her sputum, and no foul odour. Additionally, she had no abdominal pain, bloody diarrhoea, or burning sensation during urination and no signs of abnormal bleeding. Upon admission, her vital signs were stable with a blood pressure of 130/70 mmHg, heart rate of 84 beats per minute, respiratory rate of 18 breaths per minute, and oxygen saturation of 99% on room air. A physical examination revealed a congested posterior pharyngeal wall, indicative of pharyngitis. Her ECG showed a normal sinus rhythm and her chest X-ray did not reveal any significant abnormalities. Renal function tests, liver function tests, and serum electrolytes were all within normal limits, though inflammatory markers ESR and CRP were elevated. Laboratory tests also indicated leukocytosis, anaemia, and thrombocytopenia (Table 1).

Table 1. Laboratory Parameters

Laboratory parameters	**Test Result**	**Standard value range**
Complete blood count		
White blood cell count (10^3 /uL)	23.2	4.2-10.6
Neutrophils (%)	58	40-70

Lymphocytes (%)	50	20-40
Monocytes (%)	6	04-Dec
Eosinophils (%)	1	0-6
Bands (%)	7	05-Nov
Blasts (%)	80	<=0
RBC Count (10^6/uL)	1.64	4.4-5.8
Hemoglobin (g/dl)	3.2	Oct-14
Hematocrit (%)	10	40-52
MCV (fl)	103	80-100
MCH (pg)	33	26-34
Platelet count (10^3/ul)	12	150-450
Reticulocytes (%)	0.6	0.8-2.5
Biochemical parameters		
Blood urea (mg/dl)	14	15-40
Serum creatinine (mg/dl)	4.8	0.6-1.2
Inflammatory markers		
Erythrocyte sedimentation rate (mmHg)	54	Less than 15
C-reactive protein (mg/dl)	1.8	<0.9

A peripheral blood smear revealed numerous blasts with heterogeneous, scant cytoplasm, raising concerns for acute myelogenous leukaemia (AML). Peripheral blood flow cytometry shows positive for CD13+, CD33+ and MPO+ myeloid blast cells (Figure 1). This diagnosis was confirmed through a bone marrow biopsy, which showed hypercellular marrow with blasts making up 80% of the aspirate (Figure 2).

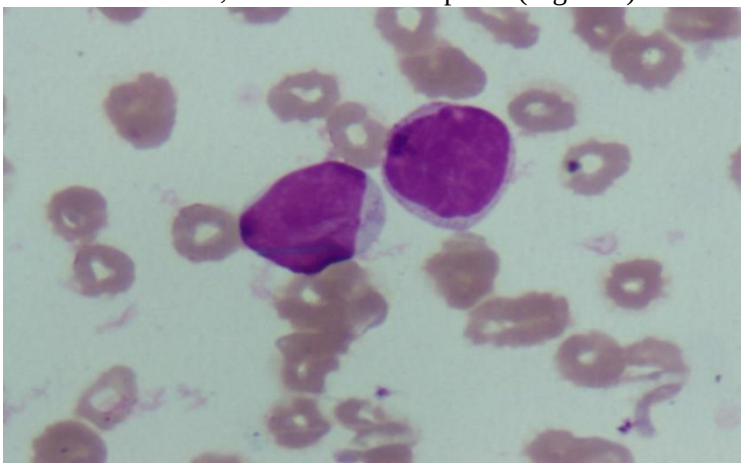

Figure 1. Bone Marrow Aspirate

Bone Marrow Aspirate Showing Myeloid Blast Cells

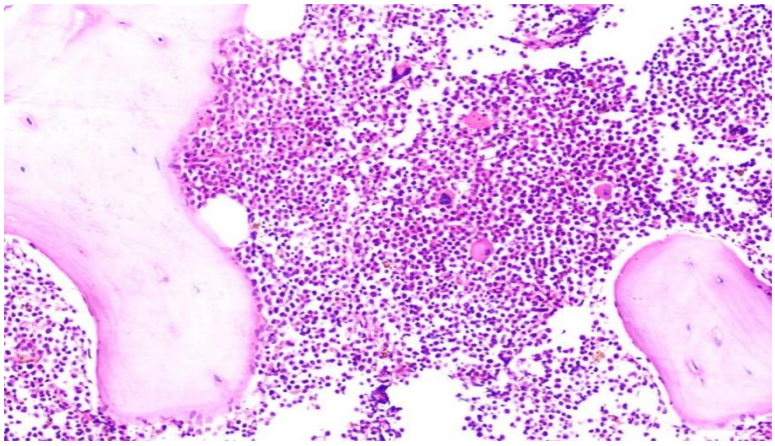

Figure 2. Bone Marrow Biopsy

Trephine Core Shows Hypercellular Bone Marrow with Sheets of Blast Cells

The patient was promptly started on induction chemotherapy, including a BCR-ABL targeting agent, Cytosine Arabinoside, and Daunorubicin, following the 7+3 regimen with a prophylactic cover of Acyclovir and Fluconazole. She tolerated the chemotherapy well, without any complications or anaphylactic reactions during treatment.

However, seven days after completing the first cycle of chemotherapy, the patient began experiencing recurrent vomiting, high-grade fever, right lower quadrant abdominal pain, and multiple episodes of non-bloody diarrhoea. She was found to be severely dehydrated, and laboratory investigations indicated pancytopenia, likely a consequence of the chemotherapy. Blood cultures identified *E. coli*, sensitive to Meropenem. An arterial blood gas analysis revealed severe uncompensated metabolic acidosis. On physical examination, her abdomen was distended, with diffuse tenderness, involuntary guarding, rigidity, and hypoactive bowel sounds on auscultation. A CT scan of the abdomen and pelvis showed acute small bowel obstruction, primarily involving the cecum, due to diffuse circumferential mural thickening. Stool cultures tested negative for Clostridium difficile toxin (Figure 3).

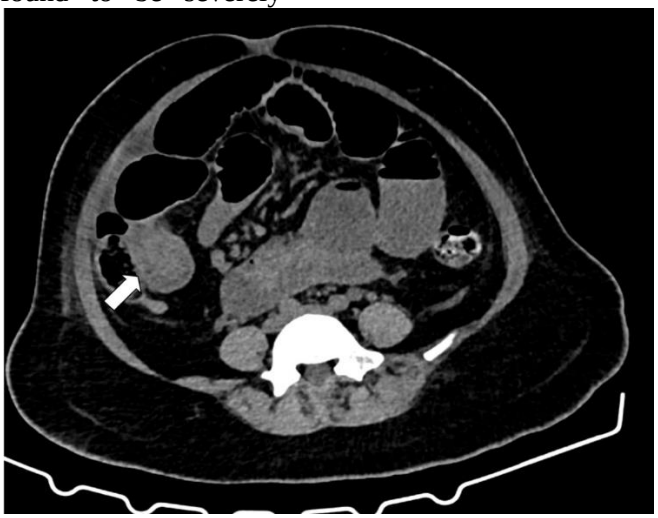

Figure 3. CT Abdomen

CT Abdomen Showing Marked Wall Thickening Involving the Cecum, Consistent with Neutropenic Enterocolitis (White Arrow)

Given the clinical and radiological findings, the diagnosis of neutropenic enterocolitis (typhlitis) was made. The treatment approach was conservative and included broad-spectrum antibiotics (Meropenem and Metronidazole), granulocyte-colony stimulating factor (G-CSF), transfusion of 4 units of packed red blood cells (PRBCs) and 6 units of random donor platelets (RDPs), along with hydration, bowel rest, and parenteral nutrition. The patient was closely monitored in the ICU to prevent intravascular volume depletion. After 2 weeks of continuous parenteral Antibiotic therapy, the patient showed gradual improvement; her neutrophil count began to rise, the fever subsided, and the abdominal distension reduced. The patient responded well to the therapy, with complete resolution of symptoms, allowing for the reintroduction of an oral diet and continued supportive care.

Discussion

This case highlights the rare and life-threatening complication of neutropenic enterocolitis (typhlitis) in a patient with newly diagnosed acute myelogenous leukaemia (AML) who was undergoing induction chemotherapy. Neutropenic enterocolitis is a condition characterized by inflammation and necrosis of the bowel, often seen in patients with haematological malignancies who are undergoing intensive chemotherapy. The clinical course observed in this patient, with symptoms manifesting shortly after the initiation of chemotherapy, aligns with the well-documented risk of gastrointestinal complications due to the profound immunosuppression and mucosal damage induced by cytotoxic agents [2].

The patient's presentation with recurrent vomiting, high-grade fever, and right lower quadrant abdominal pain, along with radiological evidence of bowel wall thickening and obstruction, is characteristic of neutropenic enterocolitis. The diagnosis was further supported by the presence of pancytopenia and positive blood cultures for *E. coli*, a common pathogen in such cases. The subsequent development of severe metabolic acidosis highlighted the critical nature of her condition, necessitating prompt and aggressive treatment.

The conservative management approach employed in this case, which included broad-spectrum antibiotics, granulocyte-colony stimulating factor (G-CSF), blood product transfusions, bowel rest, and parenteral nutrition, was effective in stabilizing the patient. Notably, the early intervention and close monitoring in the intensive care unit (ICU) likely contributed to the favourable outcome, as timely recognition and treatment are crucial in reducing mortality associated with neutropenic enterocolitis [11].

Similar cases have been documented in the literature, shedding light on the diverse clinical presentations of neutropenic enterocolitis and the critical importance of timely diagnosis and intervention. One notable case reported by Cross et al. involved a patient with acute myeloid leukaemia (AML) who, like the current case, developed neutropenic enterocolitis after receiving induction chemotherapy [13]. In their report, the patient presented with abdominal pain, fever, and diarrhoea approximately one week following the initiation of chemotherapy. Despite aggressive treatment with broad-spectrum antibiotics, granulocyte-colony stimulating factor (G-CSF), and supportive care, the patient faced severe complications, highlighting the precarious nature of this condition. Cross et al. emphasized the role of early identification and the prompt initiation of appropriate therapies to improve patient outcomes, mirroring the management approach seen in the present case [14-18].

Another case described by Becker et al. focused on the diagnostic challenges posed by neutropenic enterocolitis, particularly in the context of haematological malignancies such as AML [6]. The patient in their study exhibited nonspecific symptoms, including abdominal discomfort and fever, which initially led to a delay in the diagnosis. The rapid progression of the disease in this patient underscores the difficulty in distinguishing neutropenic enterocolitis from other potential causes of gastrointestinal symptoms in neutropenic patients. Becker et al. highlighted the importance of maintaining a high index of suspicion for neutropenic enterocolitis in any neutropenic patient presenting with abdominal symptoms, given the condition's potential for swift deterioration and high mortality.

These cases illustrate the variability in the clinical presentation of neutropenic enterocolitis, ranging from mild symptoms to severe, life-threatening complications. They also reinforce the necessity for vigilance in monitoring patients undergoing chemotherapy, particularly those with haematological malignancies, for early signs of gastrointestinal complications. Early diagnosis, supported by imaging and laboratory investigations and the prompt initiation of treatment are crucial to improving outcomes in these patients. The experiences reported by Cross et al. and Becker et al. emphasize the need for a proactive approach to managing such high-risk patients, aligning with the management strategies employed in the current case.

Conclusion

This case reinforces the critical need for prompt recognition and appropriate management of neutropenic enterocolitis in patients with AML undergoing chemotherapy. The successful outcome in this patient, achieved through conservative management and intensive monitoring, aligns with existing literature and serves as a reminder of the potential severity of this condition. Early intervention, supportive care, and multidisciplinary management are key to improving outcomes in similar cases.

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Conflict of Interest

The authors hereby declare that there is no conflict of interest in this study.

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