



## Ultrasound findings guided a successful hemicolectomy in a leukemic patient with neutropenic enterocolitis

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### KEYWORDS

Neutropenic;  
Enterocolitis;  
Leukemia;  
Ultrasound sonography;  
Hemicolectomy.

**Abstract** *Introduction:* Neutropenic enterocolitis (NEC) can be a life-threatening complication of chemotherapy in leukemic patients. Early diagnosis and treatment is therefore crucial. *Methods:* A 38-year-old woman with acute lymphoblastic leukemia and chemotherapy-induced neutropenia suddenly developed symptoms suspicious of NEC. Transabdominal ultrasound showed features consistent with NEC, later confirmed by computed tomography (CT) scan. *Results:* The patient was scanned using portable ultrasound (US) equipment (Esaote My Lab 25). US findings showed involvement of the cecum, appendix, ascending colon and proximal middle transverse colon, with features resembling gas containing fissures within the colon wall itself. The risk of colon rupture was confirmed by CT scan. The patient underwent successful hemicolectomy after intravenous treatment with broad spectrum antibiotics, granulocyte-colony stimulating factor (G-CSF), platelets and fresh frozen plasma transfusion. *Discussion:* A prompt bedside US examination upon development of symptoms allowed an early diagnosis of NEC and identified features consistent with imminent colon wall rupture, shifting the management of this life-threatening complication from medical to surgical. Multidisciplinary intervention was crucial for a successful hemicolectomy in a severely affected neutropenic patient.

**Sommario** *Introduzione:* La tiflite (Neutropenic enterocolitis, NEC) può essere una complicanza fatale in pazienti affetti da leucemia e sottoposti a chemioterapia. Una precoce diagnosi e terapia sono essenziali.

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**Metodi:** Una donna di 38 anni affetta da leucemia linfoblastica acuta durante la neutropenia indotta dalla chemioterapia improvvisamente ha sviluppato segni e sintomi compatibili con NEC. Una ecografia addominale ha mostrato segni di NEC confermati successivamente con la TC.

**Risultati:** È stato utilizzato un ecografo portatile (Esaote My Lab 25). Segni ecografici di coinvolgimento intestinale sono stati trovati a carico del cieco, appendice, colon ascendente e della parte prossimale del colon trasverso, con aspetti compatibili con presenza di gas nella parete stessa. Il rischio di perforazione del colon è stato confermato con l'esame TC. La paziente è stata sottoposta con successo a una emicolectomia dopo aver ricevuto antibiotici per endovena, G-CSF, e trasfusione di granulociti, piastrine e plasma fresco congelato.

**Discussione:** Una ecografia eseguita precocemente al letto del paziente appena sono comparsi i sintomi ha permesso non solo di identificare segni compatibili con NEC, ma di identificare segni di possibile imminente rottura della parete, cambiando il trattamento da medico a chirurgico. Un intervento multidisciplinare è stato essenziale permettendo alla paziente di essere sottoposta con successo a una emicolectomia durante neutropenia.

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## Introduction

Neutropenic enterocolitis (NEC) is a life-threatening complication in patients affected by leukemia and solid tumors treated with chemotherapy [1]. It can also develop in patients with aplastic anemia or cyclic neutropenia who have not received cytotoxic treatment [2]. It is a necrotizing inflammatory disease of the ileocecal region. Clinically it is characterized by neutropenia, fever and abdominal pain with or without diarrhea. The pathogenic mechanisms leading to NEC are probably multifactorial such as neutropenia, destruction of the normal mucosal architecture due to chemotherapy and/or radiotherapy, possible coexistent leukemic or lymphomatous infiltrates, thrombocytopenia related intramural hemorrhage and shift in the normal gastrointestinal microbial flora due to antibiotics, antifungals and nosocomial colonization by hospital flora [3]. The cecum is almost always affected, but the terminal ileum as well as other parts of the small bowel and right and left colon can also be involved in NEC. Macroscopically the involved bowel segments show edematous and thickened walls, with varying degrees of ulceration and hemorrhage. Perforation occurs in 5–10% of cases. Early diagnosis is crucial in order to start conservative medical management which seems to be the best strategy in most cases [4].

## Materials and methods

A 38-year-old woman with acute lymphoblastic leukemia was admitted to our hematology division to receive chemotherapy-based treatment for the disease. The patient's induction chemotherapy regimen was a daunorubicin, vincristine, prednisone and L-asparaginase based Italian multicenter protocol approved by the institutional review board of our university.

The patient was affected by chemotherapy-induced neutropenia, and she suddenly overnight developed fever (axillary temperature 38.5 °C) and abdominal pain and had two episodes of diarrhea. She complained of abdominal tenderness especially in the right upper and lower quadrants and in the epigastrium. The patient's vital signs were normal but the abdominal pain and fever did not resolve after intravenous paracetamol treatment. Two hours later, early in the morning, the patient's temperature was still 38.5 °C and the abdominal pain was worse particularly at the

level of the right-side colon with exacerbation of pain upon palpation. Vital signs were still normal but the patient looked poor. Physical examination revealed abdominal distension with abdominal tenderness and rebound tenderness. Transabdominal real-time US scanning of the bowel was performed using a 3.5–5 MHz convex probe and a 7 MHz linear transducer. Portable US equipment was used (Esaote model My Lab 25), and both axial and transverse scans were performed on the colon [5].

Ethical approval for this study was granted by the Medical Research Ethics Committee of our university, and informed consent was obtained from the patient.

## Results

At US scanning the colon wall appeared severely hypoechoic, non-stratified and thickened (11 mm) with loss of the haustral pattern. The lumen was distorted (not hyperechoic linear shaped) and there were highly echogenic lines running through the thickened wall that could be consistent with gas containing fissures [5]. The surrounding fat appeared homogenous and hyperechoic. Also the appendix (which was closely attached to the cecum) presented a thickened wall and was increased in size with fluid surrounding the viscera and with inflamed periappendicular fat. The colon appeared firm with no peristalsis, and the described pattern regarded only the cecum and ascending colon up to the proximal middle transverse colon. Small amounts of free periappendicular and perihepatic fluid were detected in the abdomen along the right paracolic gutter.

The rest of the colon (distal middle transverse, left colic flexure, descending colon and sigmoid colon) did not show any abnormal US features (Fig. 1).

The patient had been afebrile until that morning and was being administered ciprofloxacin and fluconazole prophylactic therapy as per the internal protocol for afebrile neutropenic patients.

Right after the transabdominal US examination, conservative medical management was started, such as bowel rest, parenteral nutrition, hydration and intravenous broad spectrum antibiotic treatment including appropriate anaerobic coverage and antifungal drugs. The patient's surveillance blood cultures were all negative (neutropenic afebrile

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