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Spontaneous Colonic Perforation in a Four-Month-Old Infant: A Rare Case Report

Zaky Davidia Rifaldi*, Galih Widiyanto
Rumah Sakit K.R.M.T Wongsonegoro, Indonesia
Email: zakydavidia24@gmail.com

ABSTRACT

Spontaneous colonic perforation is a rare clinical entity in infants beyond the neonatal period, generally classified into stercoral and idiopathic types, with the latter being sporadic and challenging to diagnose due to nonspecific presentations. This report aims to highlight diagnostic challenges and surgical management strategies in non-neonatal spontaneous colonic perforation, with emphasis on the role of histopathological evaluation in establishing etiology. We report the case of a four-month-old female infant, born preterm at 36 weeks and 6 days, who presented with progressive abdominal distension, absence of stool and flatus, and clinical signs of peritonitis. Exploratory laparotomy revealed a laceration-type perforation extending from the left transverse to descending colon, with surrounding necrosis and no history of trauma or prior abdominal procedures, initially suggesting an idiopathic etiology. Surgical management included resection of the affected segment with end-to-end anastomosis and ileostomy, while laboratory findings demonstrated anemia, hypocalcemia, mild hyperglycemia, and leukocytosis. Histopathological examination, however, revealed diffuse transmural necrosis and inflammatory infiltration characteristic of necrotizing enterocolitis (NEC), establishing the diagnosis of NEC-associated colonic perforation. This case emphasizes the importance of early recognition of spontaneous colonic perforation in infants, as delayed intervention is associated with high morbidity and mortality, and highlights the need for prompt surgical management and comprehensive histopathological evaluation to improve outcomes in this rare but life-threatening condition. To our knowledge, this represents one of the few documented cases of NEC-associated colonic perforation beyond the neonatal period, contributing to the limited literature on late-onset NEC presentations.

Keywords: *Spontaneous Colonic Perforation; Infant; Idiopathic; Surgical Management*

INTRODUCTION

Spontaneous colonic perforation in infants and children beyond the neonatal period is an exceptionally rare surgical emergency associated with significant diagnostic challenges. Unlike colonic perforation in neonates, commonly linked to necrotizing enterocolitis (NEC), spontaneous cases in older infants typically occur without preceding trauma, abdominal surgery, or identifiable gastrointestinal pathology (Huerta & Perez, 2022). Recent retrospective studies have highlighted that patients often present with nonspecific clinical manifestations such as abdominal distension, vomiting, fever, or altered bowel habits, which may contribute to delays in diagnosis and management, thereby increasing morbidity and mortality rates (Huerta & Perez, 2022; Tan et al., 2021).

The etiology of spontaneous colonic perforation in previously healthy infants is frequently unclear. Contemporary evidence indicates that while some cases may be associated with infectious enterocolitis, colitis, foreign body ingestion, or iatrogenic causes, a substantial proportion remain idiopathic (Tan et al., 2021). This condition has been classified into stercoral and idiopathic types, with the stercoral variant associated with chronic constipation and fecaloma, and the idiopathic type occurring sporadically without clear predisposing factors. Idiopathic perforation tends to present abruptly and can progress rapidly to life-threatening peritonitis (Chu et al., 2022).

The clinical implications of spontaneous colonic perforation are profound, as delayed recognition and intervention are strongly correlated with adverse outcomes (Chu et al., 2022; Kim et al., 2016). Timely surgical management, whether through resection with primary anastomosis, suture repair, or diversion with ostomy, has been shown to be critical for survival and recovery (Tan et al., 2021; Gawlick & Nirula, 2012). Radiological findings such as pneumoperitoneum may aid in early diagnosis but are not always evident at presentation, underscoring the importance of maintaining a high index of suspicion in infants presenting with unexplained abdominal distension and obstructive symptoms. Therefore, reporting such rare cases contributes to a better understanding of etiology, clinical presentation, and optimal surgical strategies, while emphasizing the need for early recognition and prompt intervention to improve patient outcomes.

Despite increasing recognition of spontaneous colonic perforation in pediatric populations, significant gaps persist in the literature regarding late-onset presentations of NEC beyond the neonatal period. While several studies have documented spontaneous intestinal perforation (SIP) and idiopathic perforations in older infants (Shinde & Rajendaran, 2023; Hu et al., 2024), there remains limited documentation of histopathologically confirmed NEC-associated colonic perforation occurring at four to five months of age. A recent case series by Tan et al. (2021) described various etiologies of pediatric colonic perforation but included predominantly older children, with few cases occurring in the post-neonatal infant period. Similarly, Kim et al. (2016) reported spontaneous colonic perforation in previously healthy children but did not specifically address NEC as an underlying cause in late infancy. Hu et al. (2024) provided comprehensive guidelines on NEC prevention and management but focused primarily on typical neonatal presentations, leaving a knowledge gap regarding atypical late presentations and their diagnostic challenges. This lack of detailed case documentation makes it difficult for clinicians to recognize and appropriately manage such rare presentations.

The novelty of this case lies in three key aspects: first, it represents a rare documentation of NEC-associated colonic perforation occurring at four months of age, well beyond the typical neonatal period in which NEC is most observed. Second, the initial clinical and radiological presentation mimicked idiopathic spontaneous colonic perforation, and only through comprehensive histopathological evaluation was the true etiology of NEC definitively established, highlighting the critical role of tissue diagnosis in determining underlying pathology. Third, this case demonstrates successful surgical management with segmental resection and diversion in the context of extensive colonic necrosis, providing valuable insights into operative strategies for late-onset NEC complications.

The aim of this case report is twofold: first, to document the clinical presentation, diagnostic workup, surgical management, and histopathological findings of this rare case of NEC-associated colonic perforation in a four-month-old preterm infant; and second, to emphasize the importance of maintaining NEC in the differential diagnosis of acute abdominal emergencies in preterm infants beyond the neonatal period. The benefit of reporting this case extends to enhancing clinical awareness among pediatric surgeons, neonatologists, and emergency physicians regarding atypical presentations of NEC, thereby potentially reducing diagnostic delays. The implications of this report are significant for clinical practice, as it underscores the necessity of comprehensive histopathological examination in establishing definitive diagnoses, reinforces the importance of timely surgical intervention, and contributes

to the limited but growing body of literature documenting late-onset NEC complications, ultimately improving recognition and management of this life-threatening condition in vulnerable preterm infants.

METHOD

Case Report

Written informed consent was obtained from the parents for publication of this case report and accompanying images, in accordance with ethical standards for medical case reporting. A four-month-old female infant was born preterm at 36 weeks and 6 days of gestation to a 35-year-old G5P3A1 mother with a history of premature rupture of membranes. Delivery occurred on March 26, 2025, at 05:30, with Apgar scores of 8, 9, and 10 at one, five, and ten minutes, respectively. The pregnancy was complicated by *partus prematurus imminens*. The infant had no notable history of abdominal surgery or trauma prior to admission.

The patient presented to the emergency department with progressive abdominal distension that had developed over the preceding 24 hours. This complaint was associated with the absence of stool and flatus, with the last bowel movement described as explosive prior to complete cessation of defecation. On admission, the infant was irritable and showed clinical signs consistent with peritonitis, including marked abdominal tenderness, rigidity, and progressive distension.

Laboratory investigations revealed hemoglobin 8.6 g/dL, hypocalcemia (1.20 mmol/L), leukocytosis (WBC 44.1 $\times 10^3/\mu L$), and mild hyperglycemia (112 mg/dL). Electrolyte analysis showed hyponatremia (129 mmol/L) and decreased hematocrit (36.8%), consistent with systemic inflammatory response and fluid-electrolyte imbalance. Coagulation parameters (APTT 29.4 sec, INR 1.14, PT 12.6 sec) were within normal range.

Radiological evaluation with plain abdominal X-ray (supine and left lateral decubitus positions) demonstrated multiple short air-fluid levels and dilated bowel loops, consistent with small bowel obstruction. Free intraperitoneal air was identified, creating the continuous diaphragm sign and subdiaphragmatic lucency, suggestive of pneumoperitoneum. Additional findings included fecal material in the right hemithorax due to overlapping shadows and multiple gas-filled loops in the abdominal cavity. The overall impression favored pneumoperitoneum secondary to bowel perforation, most consistent with necrotizing enterocolitis stage 3B.

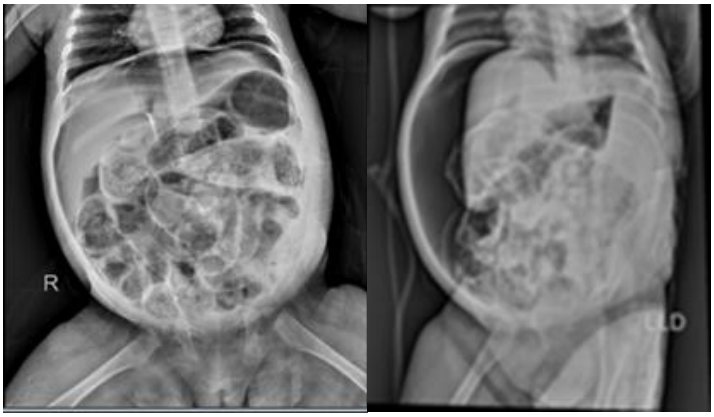

Figure 1 and Figure 2. X-ray plain abdominal of the patient's

Exploratory laparotomy confirmed a laceration-type perforation extending from the left transverse to the descending colon, accompanied by extensive necrosis of the surrounding bowel wall. The operative procedure included resection of the affected colon segment, end-to-end anastomosis, ileostomy, and appendectomy. Postoperatively, the patient was admitted to the pediatric intensive care unit for intensive monitoring and supportive management.

Histopathological examination of the resected colon provided further diagnostic insights. Grossly, the specimen weighed approximately 16 grams, with the largest tissue fragment measuring 5 × 3 × 1.5 cm and the smallest 2 × 0.7 × 0.5 cm, tan-white to brown in color with firm consistency. Microscopic evaluation revealed colonic mucosa lined by columnar epithelium with goblet cells, and lamina propria infiltrated by lymphocytes, histiocytes, and neutrophils. Areas of hemorrhage and diffuse necrosis were identified, accompanied by marked inflammatory infiltrates including foam cells, extending into the muscularis layer and pericolic adipose tissue. No evidence of malignancy was detected. The overall histomorphological findings supported a diagnosis of necrotizing enterocolitis (NEC)**.** These histopathological findings suggest that the colonic perforation in this patient was most likely secondary to NEC rather than idiopathic perforation. The presence of diffuse necrosis, transmural inflammation, and extension of the inflammatory process into the serosa and surrounding adipose tissue are characteristic of NEC, which can rarely present beyond the immediate neonatal period.

RESULTS AND DISCUSSION

This case illustrates a rare presentation of necrotizing enterocolitis (NEC) with colonic perforation in a four-month-old preterm infant, a clinical entity that is infrequently observed beyond the neonatal period. The patient presented with acute abdominal distension, obstipation, and clinical signs of peritonitis. Laboratory investigations revealed anemia, marked leukocytosis, electrolyte imbalance, and systemic inflammatory response, all consistent with severe intra-abdominal sepsis.

Radiological findings supported the clinical suspicion, demonstrating multiple short air-fluid levels, bowel dilatation, and free intraperitoneal air, consistent with pneumoperitoneum and small bowel obstruction. These findings were highly suggestive of NEC stage 3B. Exploratory laparotomy confirmed a large laceration-type perforation extending from the left transverse to the descending colon, with surrounding necrosis.

Definitive management included segmental colectomy with end-to-end anastomosis, ileostomy, and appendectomy.

Histopathological evaluation of the resected colon confirmed the diagnosis, showing diffuse transmural necrosis, hemorrhage, and dense inflammatory cell infiltration, extending into the muscularis and pericolic adipose tissue, without evidence of malignancy. These findings are characteristic of advanced NEC. In conclusion, while NEC is most commonly encountered in premature neonates, this case underscores that it can rarely present in late infancy with severe complications such as colonic perforation. The combination of clinical features, imaging findings, operative exploration, and histopathological confirmation was crucial in establishing the diagnosis. This case highlights the importance of maintaining a high index of suspicion for NEC in preterm infants presenting with unexplained abdominal distension, regardless of age, and emphasizes the need for prompt surgical intervention to reduce morbidity and mortality.

Colonic perforation in infants beyond the neonatal period is a rare but life-threatening event.(Shinde & Rajendran, 2023) The differential diagnosis includes necrotizing enterocolitis (NEC), Hirschsprung's disease (HD), spontaneous intestinal perforation (SIP), and other less common conditions.(Hu et al., 2024; Wei et al., 2021) Traditionally, idiopathic perforation has been reported when no clear etiology is identified; however, histopathological examination remains essential to determine the underlying cause. In the present case, histology revealed diffuse necrosis, transmural inflammatory infiltrates, and extension into the muscularis and pericolic adipose tissue, findings that are strongly supportive of NEC.(Hu et al., 2024; Palleri et al., 2024)

Necrotizing enterocolitis (NEC) is the most common gastrointestinal emergency in neonates and infants, characterized by varying degrees of intestinal inflammation, ischemia, and necrosis, with perforation representing the most severe form of the disease.(Bethell & Hall, 2023; Ofek Shlomai et al., 2025) Although NEC predominantly occurs in premature neonates within the first weeks of life, late presentations have been reported, particularly in preterm infants who remain physiologically vulnerable.(Bethell & Hall, 2023) In this case, a preterm infant at five months of age developed extensive colonic perforation confirmed to be secondary to NEC by both radiological and histopathological findings, underscoring the potential for delayed or atypical presentations.

Radiological imaging plays a crucial role in the diagnosis of advanced NEC. The presence of pneumoperitoneum, continuous diaphragm sign, and multiple short air-fluid levels on plain abdominal radiographs is strongly suggestive of perforation and advanced disease.(Lu et al., 2025; Thompson & Bizzarro, 2008) In our case, the abdominal X-ray demonstrated both pneumoperitoneum and bowel obstruction, findings consistent with NEC stage 3B. These imaging features, combined with the acute clinical deterioration, strongly indicated the need for surgical exploration.

Histopathological examination remains the gold standard for confirming NEC. Classic features include mucosal ulceration, transmural coagulative necrosis, hemorrhage, and infiltration of the intestinal wall with polymorphonuclear leukocytes, histiocytes, and lymphocytes.(Fathima et al., 2023; Lu et al., 2025; Thompson & Bizzarro, 2008) The resected colon in this patient showed diffuse necrosis, hemorrhage, and inflammatory infiltration extending into the muscularis and pericolic adipose tissue, findings pathognomonic for NEC.8

Importantly, the absence of malignant or specific infectious changes excluded alternative causes of colonic perforation.

Differential diagnoses for colonic perforation in infants include Hirschsprung's disease (HD), spontaneous intestinal perforation (SIP), and idiopathic perforation. Hirschsprung-associated enterocolitis (HAEC) can lead to perforation proximal to the aganglionic segment, typically presenting earlier with delayed meconium passage and chronic constipation.(Liu et al., 2024; Thompson & Bizzarro, 2008) These features were not observed in our patient, and histology did not support aganglionosis. SIP is primarily a condition of very-low-birth-weight neonates, presenting with isolated ileal or proximal colonic perforation without diffuse necrosis, making it unlikely in this case.(Cuna et al., 2018; Hu et al., 2024; Lu et al., 2025)

Idiopathic perforation, though reported, remains a diagnosis of exclusion and could not be supported here due to the strong histological evidence of NEC (Cuna et al., 2018). The term "idiopathic" should be reserved for cases where comprehensive histopathological examination fails to reveal any specific underlying pathology. In this case, the definitive histological features of NEC preclude an idiopathic diagnosis, highlighting the critical importance of tissue examination rather than relying solely on clinical or radiological criteria (Kim et al., 2016).

Table 1. Comparison of Previously Published Non-Neonatal NEC Perforations

Study/Author	Patient Age	Gestational Age	Site of Perforation	Management	Outcome
Current Case (2025)	**4 months**	**36+6 weeks**	**Left transverse to descending colon**	**Segmental resection + anastomosis + ileostomy**	**Survived, PICU admission**
Hu et al. (2024)	2-6 months	28-34 weeks	Various (ileum, colon)	Resection ± diversion	Variable, high mortality in delayed cases
Bethell & Hall (2023)	6-12 weeks	26-32 weeks	Primarily ileum	Primary resection or peritoneal drainage	Improved with early intervention
Palleri et al. (2024)	4-16 weeks	<32 weeks	Mixed sites	Surgical resection	Mortality 15-30% in stage III
Ofek Shlomai et al. (2025)	8-20 weeks	24-30 weeks	Predominantly terminal ileum	Resection with/without ostomy	Better outcomes with early recognition

This comparative analysis demonstrates that late-onset NEC beyond the typical neonatal period, while rare, has been increasingly recognized in the literature. However, colonic involvement specifically, as seen in our case, remains exceptionally uncommon, with most late presentations affecting the ileum. The successful outcome in our patient, despite extensive colonic involvement, underscores the importance of timely surgical intervention and intensive postoperative support.

This case emphasizes that NEC, although rare beyond the neonatal period, must remain a consideration in preterm infants with abdominal distension and signs of peritonitis. The combination of radiological pneumoperitoneum, intraoperative findings of extensive colonic necrosis, and histological confirmation of transmural inflammation strongly support NEC as the etiology. Prompt recognition and surgical management are essential, as delay significantly increases mortality in advanced NEC.(Tan et al., 2021) This report adds to the limited literature describing colonic NEC in late infancy, highlighting the importance of comprehensive diagnostic evaluation to distinguish NEC from other causes of spontaneous colonic perforation.

The surgical approach in this case—segmental colectomy with primary anastomosis and proximal diversion—represents current best practice for NEC with perforation and extensive necrosis. While peritoneal drainage has been advocated for extremely low-birth-weight infants as a temporizing measure, definitive resection with removal of necrotic tissue remains the gold standard for hemodynamically stable patients with localized disease (Gawlick & Nirula, 2012; Hu et al., 2024). The decision to perform ileostomy rather than relying solely on anastomosis reflects appropriate surgical judgment given the degree of contamination and the patient's systemic inflammatory state, allowing for fecal diversion during the healing phase and reducing the risk of anastomotic leak (Wei et al., 2021).

The postoperative course and ultimate outcome of this patient (survival with PICU support) align with contemporary literature suggesting that outcomes in NEC depend heavily on three factors: timing of surgical intervention, extent of bowel involvement, and quality of postoperative intensive care. Studies have demonstrated that mortality rates for perforated NEC range from 15-30%, with higher rates associated with delayed diagnosis and extensive necrosis (Palleri et al., 2024; Ofek Shlomai et al., 2025). The successful outcome in this case validates the importance of aggressive early surgical intervention when perforation is suspected.

This case reinforces that NEC-related colonic perforation should remain in the differential diagnosis for any preterm infant beyond the neonatal period presenting with acute abdomen. The clinical message is clear: clinicians must maintain a high index of suspicion for NEC even in older infants with a history of prematurity, as delayed or atypical presentations can occur. Comprehensive diagnostic evaluation including histopathological examination is essential to establish definitive diagnosis and guide appropriate management. Early surgical consultation and prompt intervention when indicated are critical to optimizing outcomes in this rare but potentially fatal condition.

CONCLUSION

This case illustrates a rare instance of colonic perforation secondary to necrotizing enterocolitis (NEC) in a four-month-old preterm infant, emphasizing that NEC can manifest beyond the neonatal period with severe, life-threatening complications. Diagnosis was achieved through the combined assessment of clinical, radiological, intraoperative, and histopathological findings, confirming extensive colonic necrosis and transmural inflammation. The report highlights the necessity for clinicians to maintain a high index of suspicion for NEC in preterm infants presenting with unexplained abdominal distension and to prioritize early surgical intervention to improve outcomes. Comprehensive histopathological evaluation remains vital for differentiating NEC from idiopathic or spontaneous colonic perforation. Future research should focus on elucidating the pathophysiological mechanisms

and risk factors underlying late-onset NEC to enhance early detection, prevention, and tailored treatment strategies.

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