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Neonatal Appendicitis Complicated by Polymicrobial Sepsis in a Growth- Restricted Term Infant: A Case Report

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Abstract

Background: Neonatal appendicitis is an exceptionally rare entity, with a reported incidence of 0.04%–0.2% among all cases of pediatric appendicitis. The diagnosis is challenging due to nonspecific clinical signs and overlapping features with more common neonatal conditions such as necrotizing enterocolitis (NEC). Delayed recognition frequently leads to perforation, diffuse peritonitis, and high mortality.

Case Report: We present the case of a preterm newborn who developed progressive abdominal distension, apnea, and clinical deterioration consistent with septic shock. Laboratory findings demonstrated elevated inflammatory markers, metabolic acidosis, and neutrophilia with bandemia. Abdominal radiography showed signs of pneumoperitoneum. Surgical exploration revealed a perforated retrocecal appendix with localized peritonitis. Appendectomy was performed, and histopathological analysis confirmed acute suppurative appendicitis. The postoperative course was complicated by polymicrobial sepsis but ultimately favorable.

Results: Early surgical intervention allowed for identification of an uncommon but severe cause of neonatal acute abdomen. The diagnosis, confirmed intraoperatively and histologically, underscores the importance of considering appendicitis even in this age group, particularly when clinical and radiologic findings raise suspicion for intestinal perforation without evidence of NEC.

Conclusions: Neonatal appendicitis, although rare, should be included in the differential diagnosis of neonatal sepsis and acute abdomen. High clinical suspicion, timely surgical intervention, and histopathological confirmation are essential for reducing morbidity and mortality associated with this condition.

Keywords: Anti-infective agents; Appendicitis; Fetal growth restriction; Neonatal sepsis; Newborn; Shock.

Introduction

Acute appendicitis in the neonatal period is an exceptionally rare clinical entity, with a reported incidence ranging from 0.04% to 0.2% among hospitalized neonates, accounting for less than 1% of all pediatric appendicitis cases [1, 2]. Its diagnosis remains particularly challenging due to the nonspecific nature of i t s c l inical manifestations, symptomatic overlap with other severe neonatal conditions; such as necrotizing enterocolitis, meconium ileus, or neonatal sepsis; and the limited capacity of the neonate to exhibit localized symptoms [2, 3].

The clinical presentation is typically characterized by progressive abdominal distention, feeding intolerance, lethargy, apnea, and systemic signs of inflammation, which collectively delay the timely recognition of the condition and increase the risk of serious complications such as perforation, diffuse peritonitis, and septic shock. As a result, the associated mortality

remains high, ranging between 20% and 30%, particularly in cases of delayed diagnosis [1].

In this context, we report the case of a full- term female neonate with asymmetric intrauterine growth restriction who developed perforated acute appendicitis evolving into late-onset neonatal sepsis of polymicrobial etiology. The outcome was favorable following early surgical intervention and targeted antimicrobial therapy.

Case Report

Term newborn, third pregnancy of a 24- year-old mother, with a history of threatened abortion during the first trimester. The mother reported no use of harmful

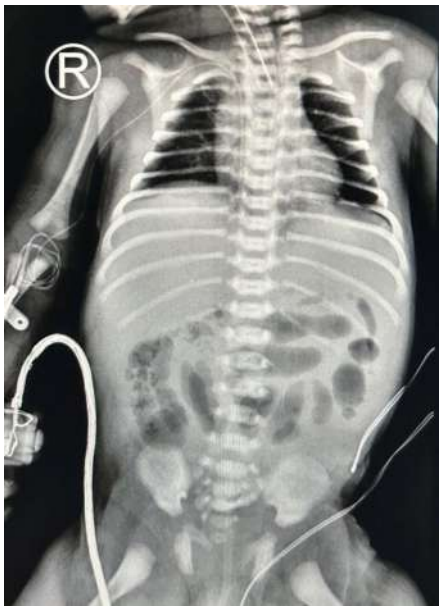
substances and received adequate prenatal care, with six consultations starting in the first trimester. The pregnancy was complicated by a urinary tract infection in the third trimester, which was appropriately treated. Delivery was a singleton, cephalic presentation, at 38 weeks of gestation, with clear amniotic fluid. Initial neonatal resuscitation was required, with Apgar scores of 8/9. Capurro assessment classified the newborn as full-term, and Silverman- Anderson score was 0/0.

Anthropometric evaluation revealed a weight of 2330 g, length of 46 cm, head circumference of 32 cm, chest circumference of 30 cm, abdominal circumference of 30 cm, and foot length of 7 cm. The newborn was classified as full-term with low birth weight for gestational age, secondary to asymmetric intrauterine growth restriction.

During her stay in the rooming-in unit, the newborn developed progressive abdominal distension, bilious vomiting, and an absence of bowel movements; prompting transfer to the intermediate care unit. Subsequently, she experienced sudden episodes of apnea, compromising her hemodynamic status, and requiring advanced airway management. An endotracheal tube (3.5 Fr) was placed at 10 cm depth with the following ventilatory settings: tidal volume (VT) 20 ml, programmed respiratory rate (RR) 25 breaths/min, PEEP 3 cmH_2O, PIP 0 cmH_2O, inspiratory time 1 second, and inspiration: expiration ratio of 1.5:1.

On abdominal examination, increased abdominal girth and clinical signs of acute abdomen were observed. An abdominal AP radiograph was obtained, showing findings consistent with meconium ileus (Figure 1). Given the clinical picture, surgical abdomen was suspected, and exploratory laparotomy was indicated.

Figure 1. Anteroposterior abdominal radiograph showing findings suggestive of meconium ileus.



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Intraoperatively, a retrocecal appendix was found to be hyperemic and perforated in its middle third, with the base preserved. Dilated intestinal loops with fibrinopurulent membranes were also observed. An open appendectomy was performed (Figure 2). The final diagnosis was acute appendicitis, DSS stage IV, with perforation and no fecalith (Table 1).

Figure 2. Macrocosmic view of a cecal appendix measuring 1.8 cm in length and 0.3 cm in diameter.

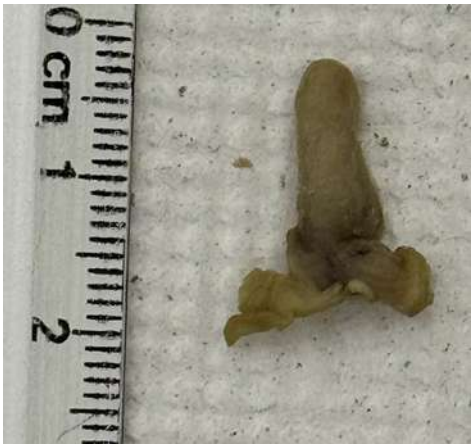

Table 1. Disease severity (DSS) for surgically treated acute appendicitis.

Grade I	Inflamed without perforation.
Grade II	Gangrenous, without perforation.
Grade III	Perforated with localized fluid (defined as fluid confined within a 10 cm radius around the appendix and directly contiguous to the appendix perforation).
Grade IV	Perforated with a regional abscess (defined as a collection of purulent material grater that 5 cm directly to the appendix perforation).
Grade V	Perforated with diffuse peritonitis.

Postoperatively, the patient developed clinical and laboratory signs suggestive of late-onset neonatal sepsis, progressing to septic shock. Empirical antimicrobial therapy with ampicillin and amikacin was initiated due to elevated acute-phase reactants (Table 2). However, persistent fever, leukocytosis, and

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progressive elevation of procalcitonin and C-reactive protein led to escalation of the antibiotic regimen.

Escherichia coli sensitive to carbapenems was isolated from a central blood culture, prompting targeted t reatment with meropenem. Due to continued elevation of inflammatory markers and new blood culture sampling, coinfection with Klebsiella pneumoniae and Candida spp. was documented. The antimicrobial regimen was further adjusted, adding vancomycin, levofloxacin, and amphotericin B according to sensitivity reports.

D u r i n g t h e c l i n i c a l c o u r s e , thrombocytopenia, leukocytosis with left shift, and transient elevations of CRP and procalcitonin were observed. These findings gradually resolved as antimicrobial therapy

was optimized. Additionally, a urine culture yielded Candida spp., supporting the diagnosis of fungal urosepsis.

A f t e r c om p l e t i ng t he a ppr opr i a t e antimicrobial courses, documenting negative inflammatory markers, sterile cultures, and sustained clinical stability, the patient was discharged in favorable clinical condition, with no signs of ongoing systemic inflammatory response or need for additional support.

Discussion

With an incidence of 0.05 to 0.2%, we can confirm neonatal appendicitis is an extremely rare disease, with a high mortality rate [4, 5]. Low incidence of this condition makes a difficult diagnosis; protection factors such as liquid diet, broad orifice into the cecum (“funnel shaped appendix”), and a recumbent supine position have been identified, contributing to the rarity of the affection [3]. Lymphatic hyperplasia is the most common etiology of appendicitis in children, but in neonates it does not occur often even though respiratory and gastrointestinal infections can happen frequently [4].

There are not defined risk factors other than male sex as it affects twice its counterpart, and prematurity. Perforation is a common complication, having rates up to 85% of the patients involved; this can be attributed to a late diagnosis and fetal anatomy, as the appendiceal wall is thinner and the cecum does not have the same capacity to distend in comparison to an adult patient [1, 4].

Physiopathology is yet uncertain, but it has been associated with other conditions including necrotizing enterocolitis, vascular insufficiency, and Hirschsprung disease. Poor immunity could contribute to a localized form of necrotizing enterocolitis in the appendix. On the other hand, a hypoxic state due to vascular insufficiency led to eventual perforation; on this context, we include cardiac abnormalities, perinatal asphyxia, or an incarcerated inguinal hernia involving the appendix (Amyand) can become strangulated, and posteriorly perforated. Lastly, Hirschsprung disease produces cecal distention secondary to its obstruction; this also happens with a meconium ileus, a finding on this case report. As a part of the diagnostic evaluation, Hirschsprung must be ruled out with a rectal biopsy [1, 4, 6].

Neonatal appendicitis with largely nonspecific symptomatology. In this age group, the classic features observed in older children, such as localized abdominal pain, anorexia, or peritoneal signs, are typically absent. More frequently, the presentation includes progressive abdominal distention, feeding intolerance, apnea, lethargy, and hemodynamic instability, all of which complicate the differential diagnosis with other severe neonatal conditions such as sepsis and necrotizing enterocolitis [1].

Recent multicenter case series, including a cohort of 69 patients, have identified similar clinical presentations, with abdominal distention (52.2%), fever (27.5%), refusal to feed or decreased feeding (23.2%), and vomiting (21.7%) being the most prevalent findings [2]. Furthermore, a high incidence of perforation at the time of diagnosis has been reported, reaching 75–85%, attributed to the immaturity of the immune system, structural fragility of the appendiceal wall, and diagnostic delays [1, 2].

Suspicion of neonatal appendicitis is primarily based on clinical criteria, supported by laboratory and imaging findings. Abdominal radiographs may reveal bowel loop distention, air-fluid levels, or pneumoperitoneum; however, these are indirect and nonspecific signs. In a recent series, only 34% of neonates demonstrated visible free intraperitoneal air on radiography [3].

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Conversely, abdominal ultrasound has proven useful in identifying an inflamed appendix (≥ 6 mm diameter), periappendiceal fluid, or mesenteric fat stranding, with a reported sensitivity of 62– 68% and specificity exceeding 95%. In a review of ultrasound findings in neonates with suspected appendicitis, abnormalities were detected in 66 % of cases 3 . Nevertheless, direct ultrasound visualization of the appendix in neonates remains technically challenging due to the small anatomical size of the patient, operator dependence, and locations such as retrocecal, which may obscure clear imaging [1,3].

Definitive diagnosis is most achieved through exploratory laparotomy, where an inflamed or perforated appendix and fibrinopurulent peritonitis are typically observed. Recent studies have reported such findings in up to 80% of surgically managed cases [2].

Given the rarity of neonatal appendicitis and the overlap in clinical signs with other life- threatening conditions, a high index of clinical suspicion is essential, especially in neonates with risk factors such as low birth weight, intrauterine growth restriction, or a history of perinatal hypoxia.

The treatment of neonatal appendicitis continues to represent a clinical challenge, given its low incidence, high perforation rate at the time of diagnosis, and poor infection containment due to the immaturity of the omentum. Most cases require urgent surgical management, as reported by Bence and Densmore, with up to 85% of neonates already presenting with perforated appendicitis at the time of surgical intervention, making conservative management a limited option in this population [5].

In the present case, following clinical and radiological suspicion, empirical treatment with broad-spectrum antibiotics was initiated, including ampicillin, amikacin, and later cefotaxime and metronidazole. This approach is consistent with the recommendations proposed by Zavras and Vaos, who suggest that antimicrobial treatment should begin early when complicated appendicitis is suspected, and that combined regimens (such as third- generation cephalosporins with metronidazole or piperacillin/tazobactam) are effective and may optimize the length of hospital stay and reduce complications [7].

The subsequent clinical course of the patient, with positive cultures for gram- negative bacilli and the need for antibiotic adjustment to meropenem and vancomycin, aligns with the stepwise approach to antimicrobial therapy recommended for neonatal intra-abdominal infections. Likewise, the use of antifungal agents such as amphotericin B reflects the need to broaden antimicrobial coverage in critically ill patients with prolonged stays in intensive care units. From a surgical standpoint, open appendectomy via laparotomy remains the standard approach in neonates, as the clinical condition of these patients often precludes minimally invasive techniques. Although some centers have reported successful experiences with laparoscopy in stable neonates, this technique is still reserved for hospitals with high expertise and specialized resources [5].

In critically ill neonates, the priority remains the rapid control of the septic focus through open surgery. The meta-analysis by Fugazzola et al. distinguishes between different types of complicated appendicitis. In older children, conservative treatment with antibiotics and percutaneous drainage can be effective in cases of appendiceal abscess or phlegmon. However, in cases of free perforation, such as the one reported here, early surgery is associated with lower rates of complications and hospital readmissions, and therefore remains the recommended strategy [8].

Finally, although up to one-third of neonatal appendicitis cases may present in the context of an Amyand hernia, in which surgical treatment may be performed via an inguinal approach, this variant was not observed in our patient. Nonetheless, awareness of this entity is key for the differential diagnosis of acute scrotal presentations or incarcerated hernias during the neonatal period [5,8].

The findings from the systematic review by The et al. on appendicitis in infants ≤ 3 months of age reveal an overall mortality rate of 8%, with complications such as sepsis, diffuse peritonitis, and multiple organ failure. Although premature infants have traditionally been considered more vulnerable to fatal outcomes, the analysis showed that 70% of the deaths occurred in full-term neonates. The authors attribute this to the fact that preterm newborns are typically under close monitoring in neonatal intensive care units from birth,

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which facilitates earlier diagnosis and intervention. This finding suggests that the level of monitoring and early access to specialized care may be more decisive for prognosis than gestational age itself [9].

Zhang et al., for their part, analyzed a case series of children with septic shock secondary to complicated appendicitis, where they found that diagnostic delays (4– 5 days), combined with e l evated inflammatory markers (CRP ~119 mg/L, procalcitonin ~130 ng/mL) and factors such as low or high body weight, were associated with severe progression, including perforation, diffuse peritonitis, and fatal outcomes. They also note that in young children, the clinical presentation is nonspecific and easily mistaken for other conditions such as gastroenteritis, mesenteric lymphadenitis, respiratory infection, or constipation. Additionally, the limited ability of the patient to express themselves and cooperate during physical examination significantly increases the risk of delayed diagnosis and serious complications, such as diffuse peritonitis and fatal outcomes [2].

Conclusion

Neonatal appendicitis remains an extremely rare and often under-recognized surgical emergency, characterized by nonspecific clinical manifestations and frequent diagnostic delays that predispose to high rates of perforation and systemic complications. This case illustrates the diagnostic and therapeutic challenges posed by this condition, particularly in full-term neonates with additional risk factors such as intrauterine growth restriction and hemodynamic instability. Despite an initial misdiagnosis as meconium ileus, the patient benefited from timely surgical intervention and appropriately escalated antimicrobial therapy, resulting in a favorable clinical outcome.

This case highlights the importance of maintaining a high index of suspicion for neonatal appendicitis in the presence of progressive abdominal distension and signs of systemic deterioration, especially when initial imaging is inconclusive and clinical evolution is unfavorable. Prompt surgical management combined with targeted a n t i m i c r o b i a l t h e r a p y t a i l o r e d t o microbiological findings remains essential to improving survival and reducing morbidity. Ultimately, early recognition and multidisciplinary care are key to optimizing outcomes in this rare but potentially life- threatening neonatal condition.

References

1. Ivanova E, Garunkštienė R, Liubšys A. Appendicitis in a Newborn: Case Report and Review of the Literature. Acta Med Litu. 2022;29(1):131-135. doi:10.15388/ AMED.2021.29.1.3
2. Zhao Y, Tang C, Huang J, Liao J, Gu Y, Hua K, Zhang Y, Chen Y, Li S. Clinical characteristics and prognosis of 69 cases of neonatal appendicitis. Pediatr Investig. 2023 J u n 7 ; 7 (2) : 9 5 - 1 0 1 . d o i : 1 0 . 1 0 0 2 / ped4.12384.
3. Lv C, Xie C, Wang X, Liu Y. Ultrasonographic characteristics of neonatal appendicitis: a case series. BMC Pediatr. 2024 Nov 14;24(1):736. doi: 10.1186/ s12887-024-05192-1.
4. Herrera Ojeda D, Vidales-Nieto E, Medina Vega A, Damián Cuellar V, Carvajal HG, Cavazos Castro AJ. Neonatal perforated appendicitis. Case report. Int J Surg Case Rep . 2024 ; 126 : 110748 . doi:10.1016/J.IJSCR.2024.110748
5. Bence CM, Densmore JC. Neonatal and Infant Appendicitis. Clin Perinatol. 2 0 2 0 ; 4 7 (1) : 1 8 3 - 1 9 6 . d o i : 1 0 . 1 0 1 6 / J.CLP.2019.10.004
6. Eze A, Chime C, Eze O, Kwon G, Moris D, Tracy E. Perforated appendicitis without peritonitis in a premature newborn- A case report. J Pediatr Surg Case Rep. 2023;99. doi:10.1016/J.EPSC.2023.102743
7. Zavras N, Vaos G. Management of complicated acute appendicitis in children: Still an existing controversy. World J G a s t r o i n t e s t S u r g . 2 0 2 0 A p r 2 7 ; 1 2 (4) : 1 2 9 - 1 3 7 . d o i : 1 0 . 4 2 4 0 /wjgs.v12.i4.129.
8. Fugazzola P, Coccolini F, Tomasoni M, Stella M, Ansaloni L. Early appendectomy v s . c o n s e r v a t i v e m a n a g e m e n t i n complicated acute appendicitis in children: A meta-analysis. J Pediatr Surg. 2019 Nov;54(11):2234-2241. doi: 10.1016/j.jpedsurg.2019.01.065. Epub 2019 Feb 25.PMID: 30857730.
9. The SML, The AMH, Derikx JPM, Bakx R, Visser DH, de Meij TGJ, Ket JCF, van Heurn ELW, Gorter RR. Appendicitis and its associated mortality and morbidity in infants up to 3 months

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of age: A systematic review. Health Sci Rep. 2023 Sep 5;6(9):e1435. doi: 10.1002/hsr2.1435.

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