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Pediatrics & Neonatal Biology Open Access
ISSN: 2640-2726

# Suppurative Appendicitis in an Infant: Consequences of a Late Diagnosis

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**Case Report**
**Volume 6 Issue 1**
**Received Date:** May 10, 2021
**Published Date:** May 20, 2021
DOI: 10.23880/pnboa-16000157

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## Abstract

Suppurative appendicitis is an acute inflammatory reaction of the ileocecal appendix of an infectious etiology and it can result in complications and death if treatment is not started early. This pathology is rare in children under 2 years old. The present study aims to present the case of a one-year-old child who developed complicated suppurative appendicitis. Despite the efforts, the patient evolved to death with 15 days. Suppurative acute appendicitis is one of the differential diagnosis of acute abdomen in infants. The diagnosis is difficult due to the non-specific signs. It is necessary to have a high level of suspicion in order to make early diagnosis and promote treatment as early as possible to reduce mortality in this population.

**Keywords:** Infant; Pediatrics; Appendicitis; Diagnosis, Differential; Treatment Outcome

**Abbreviations:** CRP: C-reactive protein; PAS: Pediatric Appendicitis Score; pARC: Pediatric Appendicitis Risk Calculator.

## Introduction

Acute appendicitis refers to an inflammation of the ileocecal appendix and it's one of the most common surgical pathologies of childhood. However, this diagnosis has a higher incidence in the pediatric population between the first and second decades of life and it's rare in other age groups [1]. Pathophysiology usually involves obstruction of the lumen of the appendix by feces or lymphoid tissue and it can result in complications and death if treatment is not started early [2]. Researchers explain that appendicitis is less common in infants due to anatomic and physiologic considerations.

Aneiros B, et al. [3] in their observational study involving 1.736 pediatric patients aged 15 years and under, they identified that children under 2 years old correspond to only 2,9% of cases of acute appendicitis [3]. Other studies report a higher incidence of appendicitis in males than in females, however the results are not statistically significant [4]. In addition, the average time from the beginning of the clinical presentation until the diagnosis is longer in younger children and this may increase the risk of complications. The rate of perforated appendicitis in babies varies between 80-100%, while the incidence in older children is between 10-20% [2,5].

Therefore, despite scientific and technological advances in radiological images, there is still a high mortality rate in infants with suppurative appendicitis [1]. For this reason,

it is important to have a high level of suspicion of acute appendicitis to increase the likelihood of early diagnosis and appropriate treatment.

## Case Report

A previously healthy 1 year-old female patient started diarrhea (5 to 6 episodes a day) without mucus, blood or pus associated with fever (measured at 40,4°C), and episodes of vomit, 7 days prior to admission. During the period, the patient was seen in other pediatric emergency units, where gastroenteritis was diagnosed and antibiotic therapy and antipyretics were prescribed. However, clinical conditions worsened and she presented respiratory distress and groans, which motivated the family to look for the emergency room again.

Upon admission, the patient presented drowsiness, tachycardia, tachypnea and pallor, in addition to clinical signs of peritoneal irritation. Laboratory work reveals leukocytosis of 13,000 cell/$m^3$, C-reactive protein of 413mg/dL and severe acidosis in arterial blood gases. Abdominal ultrasound in the emergency room showed marked distension of the colonic segment of the pelvis to the epigastrium. The cecal appendix was not seen in the image. Then, septic shock of an abdominal cause was suspected.

Broad-spectrum antibiotics and fluid resuscitation with saline solution were started in the first hour of care. In addition, the patient required orotracheal intubation and use of vasoactive drugs. After initial clinical stabilization, the patient was immediately submitted to urgent exploratory laparotomy. During anesthetic induction, patient presented bradycardia followed by pulseless electrical activity cardiac arrest for 20 minutes. During the surgery, perforation of the cecal appendix was identified and a large amount of purulent fluid was drained from the abdominal cavity. After the surgery, patient was at the pediatric Intensive Care Unit.

On the fourth postoperative day, the patient had a worsening of its clinical condition and the pediatric surgery team opted for a new surgical procedure to revise the abdominal cavity. During the rest of the hospitalization, the patient had seizures, fever and refractory hypoxemia. Despite the efforts, the patient presented a new episode of cardiopulmonary arrest and died after 15 days of hospitalization.

## Discussion

Acute appendicitis is an uncommon condition in the pediatric population, with only 2-3% of cases of appendicitis occurring in children under the age of 2 years, and in infants less than 1 year old the incidence is even lower, around 0,4% [1]. Despite the rarity, this disease must be part of the differential diagnosis of acute abdomen in children, in order to make the diagnosis early [3,5].

Some anatomical features related to the cecal appendix in the pediatric population may be involved in the different clinical presentations of this pathology, including its variation with age [2]. The shorter and more cylindrical or funnel-shaped appendix than in adults, alongside with a predominantly liquid diet, such as breastfeeding, both contribute for the lower risk of appendicitis in children. However, the thinner wall of this structure increases the likelihood of perforation in the presence of a local inflammatory process. Furthermore, the omentum isn't fully developed to control the purulent secretion when perforation occurs. Therefore, it's easier to spread purulent content to the abdominal cavity with progression to diffuse peritonitis [1,2,4].

| Differential diagnosis of acute abdomen in infants |
|---|
| Gastroenteritis |
| Intussusception |
| Intestinal Malformation |
| Hypertrophic Pyloric Stenosis |
| Congenital Bridle |
| Volvulus |
| Incarcerated Hernia |
| Meckel Diverticulum |
| Ascaris Obstruction |
| Pancreatitis |
| Kidney stone |
| Urinary Tract Infection |
| Appendicitis |
| Inflammatory Bowel Disease |
| Cholecystitis |
| Pancreatitis |
| Gastroduodenal peptic ulcer |
| Mesenteric Adenitis |
| Other Systemic Diseases |

**Table 1:** Differential diagnosis of acute abdomen in infants.

Typical clinical manifestations of acute appendicitis in older children are pain in the periumbilical region or in the right iliac fossa associated with fever, nausea or vomiting. On the other hand, infants used to present diffuse abdominal pain, irritability, fever, diarrhea, groans and

drowsiness [3]. Management of acute abdomen in infants is difficult as children are unable to express symptoms objectively. When the child has these unspecified signs and symptoms, the diagnosis of gastroenteritis is usually the first hypothesis due to the high incidence of the disease [3]. However, other possible differential diagnoses should also be considered, such as volvulus, intussusception, intestinal malformation and other acute clinical conditions [6,7] (Table 1). Recurrent fever greater than 39°C is suggestive of an intense inflammatory process and the presence of oliguria, drowsiness, groans, respiratory effort and filiform pulse are signs of severity.

When proposing a hospital discharge after ruling out severe conditions, the pediatrician must clearly advise the parents regarding the main diagnosis, the importance of the proposed treatment and the need to return immediately to the emergency room if the child presents worsening of the condition. Hospital admission may be indicated in situations where the patient might have any impairments to return to seek medical attention, including low socioeconomical families that may have difficulties recognizing the clinical signs of severe disease progression.

Laboratory tests can help in the clinical management of the patient, especially those children with signs of sepsis, characterized as suspected or presumed infection associated with fever, leukocytosis, tachycardia and/or tachypnea. The presence of significant serum leukocytosis, neutrophilia, C-reactive protein (CRP) >80mg/dL or procalcitonin>0,5mcg/L has a high positive predictive value for bacterial infection [2]. Goldberg et al reported that the concomitant presence of leukocytosis and increased CRP has a sensitivity of 90% and a specificity of 40% for the diagnosis of appendicitis [6]. Thus, antibiotic therapy and extended investigation should be considered. Arterial blood gas analysis with metabolic acidosis and elevated serum lactate level>2 mmol/L is associated with hemodynamic shock. In critically ill patients, fluid resuscitation and vasoactive drugs should be used and the patient referred to the intensive care unit [8].

In association with physical examination and laboratory tests, the use of scores for the diagnosis of appendicitis may be useful if there is doubt about the clinical hypothesis, such as the Pediatric Appendicitis Score (PAS), the Low Risk Appendicitis Rule or the Pediatric Appendicitis Risk Calculator (pARC), but they are rarely used in clinical practice [9-11]. In general, patients at a high risk for appendicitis usually present rapid evolution with the development of hemodynamic instability, metabolic acidosis, leukocytosis and elevated inflammatory markers. The presence of signs of peritoneal irritation is indicative of late diagnosis [1,2].

Even though Computed tomography is the gold standard for the diagnosis of appendicitis, with high sensitivity and specificity, Monsonis B, et al. [12] suggests ultrasonography as a first-line image exam because it is more accessible, less expensive and has no radiation exposure [12]. The nuclear magnetic resonance is highly accurate, but it is more expensive than computed tomography and available in fewer hospitals [12,13]. To identify perforated appendicitis in any image exam, attention must be paid to the presence of air or the presence of fecalith outside the appendix [13]. In our patient, abdominal ultrasound did not show a cecal appendix and there were no signs of perforation. Preliminary examinations and clinical signs of physical examination were sufficient to indicate exploratory laparotomy.

## Conclusion

The diagnosis of acute appendicitis in infant patients is a challenge due to its rarity, its variety in clinical presentation, difficulty in obtaining information and the rapid progression of the condition to complications. A high level of suspicion is necessary to increase the detection of this pathology and institute the appropriate treatment as early as possible to reduce morbidity and mortality in this population.

## Indication of Authors Contribution

Borsato GS: writer and reviewer; Cordeiro JC: writer and reviewer; Pereira LF: writer and reviewer; Martins LAG: advisor, reviewer and final version; Almeida JP: advisor, reviewer and final version.

## Declaration of Conflict of Interest

No conflict of interest.

## Financial Support

No source of financial resources.

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