

## Idiopathic Perforated Appendicitis in Neonates and Infants

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**Background:** Neonatal appendicitis is a very rare condition and has a high mortality rate in premature babies. The diagnosis of acute appendicitis is mainly clinical and the accuracy of clinical diagnosis approach 90%. Although acute appendicitis is a common diagnosis in the pediatric population, it is rare in neonates and infants.

**Objective:** To present the clinical picture of three cases of acute appendicitis in neonate and infants.

**Design:** A Retrospective Study.

**Setting:** Pediatric Surgical Unit, Salmaniya Medical Complex, Bahrain.

**Method:** Two neonates and one infant with acute perforated appendicitis were managed in our unit. The first was ten days old; the second was one month of age and the third was five months of age. The clinical presentations were different.

**Result:** The first case was a female term baby, a product of Caesarean section. On the ninth postnatal day, the patient developed abdominal distention. Abdominal plain X-ray showed a pneumoperitoneum, but no pneumatosis or bowel thickening. During laparotomy, the appendix was noted to have perforated at the base. Appendectomy was performed and the patient was treated with intravenous antibiotic and supportive measures postoperatively.

The second case was a 5-month-old male term baby. The patient had abdominal distention. A plain abdominal X-ray revealed dilated bowel loops. Laparotomy revealed a perforated appendix. Appendectomy was performed and patient was treated with intravenous antibiotic for one week postoperatively.

The third case was a 29-day-old male term baby presented with abdominal distention, constipation and bile stained vomiting. Plain abdominal radiograph revealed dilated bowel loops with absent air in the rectum. Laparotomy revealed a perforated appendix with segmental ileal loop volvulus. Appendectomy and ileostomy were performed.

**Conclusion:** Vascular insufficiency secondary to cardiac defect or perinatal hypoxia was the most likely cause in our first and third cases. The second case could possibly have been idiopathic.

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Acute appendicitis is one of the most common surgical emergencies, both in adults and pediatric age group; most children with acute appendicitis present with abdominal pain, but many children could not describe the pain, which may lead to a delay in the diagnosis with the consequences of perforation and sepsis<sup>1</sup>.

Acute appendicitis in neonates is rare and is not thought of in the differential diagnosis in a neonate or infant presenting with irritability or sepsis; it is a forgotten diagnosis<sup>2</sup>.

The presentation of acute appendicitis in neonates and infants may be as abdominal distension, fever, feeding intolerance, vomiting and/or sepsis. The cause of acute appendicitis in neonates and infants could be due to

secondary pathologies, such as necrotizing enterocolitis, aganglionosis or bowel ischemia<sup>2</sup>.

One hundred forty-one neonatal appendicitis were diagnosed from 1901 to 2000. The mortality rate of neonatal appendicitis had decreased from 78% in 1901-1975 to 28% in 1985-2000<sup>3</sup>.

The diagnosis of acute appendicitis is mainly clinical; the accuracy of clinical diagnosis is approaching 90% in adults<sup>1</sup>. Acute appendicitis, although a common diagnosis in the pediatric population, it is rare in neonate and infants<sup>2</sup>. Neonatal appendicitis is rare and has a high mortality rate due to comorbidities<sup>3-6</sup>.

The aim of this study is to present the clinical picture of three cases of acute appendicitis in neonates and infants.

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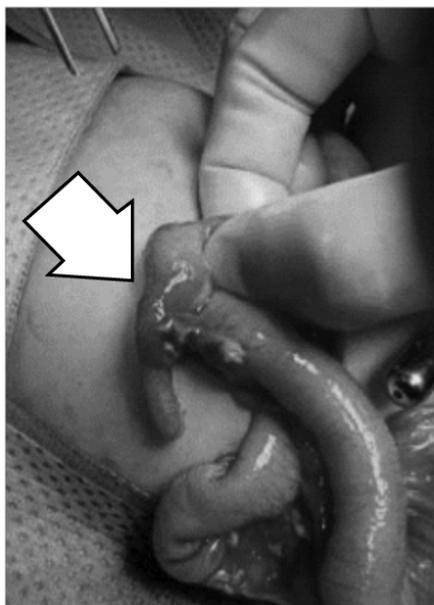
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## THE CASE

The first case is female term baby, product of Cesarean section with birth weight 3,018 gram, the baby gasped but did not cry; suctioning of the oral and nasal cavity was attempted but failed; therefore, the baby was intubated immediately and transferred to the neonatal intensive care unit, diagnosed as bilateral choanal atresia later confirmed by CT scan and was treated on the second postnatal day.

On the ninth postnatal day, the patient developed abdominal distention, but no vomiting. The abdominal distention increased on the tenth postnatal day and the abdomen became tender on palpation. Her blood count was  $11.7 \times 10^9/L$  with 75% neutrophils. Abdominal plain X-ray revealed a pneumoperitoneum, but no pneumatosis or bowel thickening.

Laparotomy was performed because of suspected perforated viscus. During laparotomy, the whole bowel was inspected and no evidence of necrotizing enterocolitis was found. The appendix was perforated at the base, see figure 1. Appendicectomy was performed and the patient was treated with intravenous antibiotic and supportive measures postoperatively. The patient had an uneventful postoperative recovery and was discharged after three weeks. Ultrasound was not performed because the patient was having pneumoperitoneum which necessitated urgent surgery.



**Figure 1: Perforated Appendicitis**

The second case was a 5-month-old male term baby, a product of normal delivery with no known medical problems presented to the accident and emergency department with a history of fever and irritability of two-day duration. On the next day, the patient had abdominal distention and the baby became sick looking, febrile and had abdominal tenderness. The white cell count was  $16 \times 10^9/L$  (neutrophil 75%); the electrolytes and liver function tests were normal. The patient was diagnosed as acute abdomen and laparotomy revealed perforated appendix. Appendicectomy was performed and the

patient was treated with intravenous antibiotic for one week postoperatively. A plain abdominal X-ray revealed dilated bowel loops. Ultrasound was not performed because the patient had peritonitis which necessitated laparotomy. The patient had uneventful postoperative recovery and was discharged after ten days.

The third case was a 29-day-old male term baby with a known case of congenital heart disease on Inderal presented with a history of abdominal distension of two-days duration, constipation and bile stained vomiting. On examination, the baby was sick looking, with a tender and distended abdomen. Plain abdominal radiograph revealed a dilated bowel loop with absent air in the rectum. The white cell count was  $19 \times 10^9/L$  (neutrophils 75%) and the arterial blood gas, electrolytes and liver function tests were normal. The patient was suspected to have intestinal obstruction. Laparotomy revealed perforated appendix with segmental ileal loop volvulus. No signs of necrotizing enterocolitis or Hirschsprung disease. Appendicectomy and ileostomy were performed, but no resection was needed. Ultrasound was not performed because patient had intestinal obstruction which necessitated laparotomy. Patient had uneventful postoperative recovery and was discharged after two weeks.

## DISCUSSION

Acute appendicitis, although common in adults and pediatrics, it is rare in neonates and infants. The rarity of appendicitis in neonates is due to the broad orifice (funnel-shape) of the appendix and a soft diet<sup>7,8</sup>. Patients below two years of age have three-times the risk of perforated appendix than an adult; the progression of the disease is rapid, and the presentation is atypical<sup>9,10</sup>. The diagnosis of appendicitis is mainly clinical, laboratory tests, such as white blood cell count and C-reactive protein do not add much to the diagnosis of acute appendicitis; abdominal US is an excellent screening tool in acute appendicitis<sup>11,12</sup>.

Many theories of the cause of acute appendicitis have been postulated; one of the theories suggests that appendicitis in the first two weeks of life may be an isolated form of necrotizing enterocolitis. This theory does not explain the finding in the first case, where no radiological or gross finding could be seen, such as necrotizing enterocolitis<sup>13,14</sup>. Meconium ileus and Hirschsprung disease have been reported to be a cause of appendiceal perforation<sup>15</sup>. Therefore, Hirschsprung disease and meconium ileus have to be ruled out<sup>16</sup>. Vascular insufficiency secondary to cardiac defect or perinatal hypoxia is believed to be a cause of perforated appendicitis; this theory is the most likely cause in our first and third cases<sup>17</sup>. Approximately 60% of neonatal appendicitis occurs in premature babies<sup>18,19</sup>.

The symptoms of appendicitis in infants is non-specific, including irritability and abdominal distention and/or fever; therefore, abdominal radiography should be obtained, which is of benefit when it shows pneumoperitoneum and an abdominal ultrasonography is the best assessment for evaluating infants with these symptom<sup>18-20</sup>.

**CONCLUSION**

**Acute perforated appendicitis in neonates and infants is extremely rare. The findings of physical examination of neonates and infants with acute appendicitis are non-specific and the diagnosis is usually confirmed during surgical intervention. Ultrasound is one modality for diagnosis of these cases. The outcome of these cases depends on the comorbidities.**

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**Competing Interest:** None.

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