Spontaneous Neonatal Pneumoperitoneum: Scalpel can be Avoided – A Case Series

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Abstract

The pneumoperitoneum is usually a surgical emergency in neonates. It may be idiopathic in some cases like in pre-term and low-birth-weight babies. These cases can be managed conservatively and surgery can be avoided. Prudent selection of cases can prevent surgical exploration of neonates. We present three neonatal cases, in which conservative management for pneumoperitoneum was done.

Keywords: Conservative, peritoneal drain, pneumoperitoneum, positive airway ventilation, pre-term

Introduction

Pneumoperitoneum or gas in the peritoneal cavity is usually a surgical emergency in paediatric age groups, especially in pre-term neonates. However, rarely, particularly in pre-mature neonates, no definite cause of pneumoperitoneum-like perforation and ischaemic bowel could be found. Idiopathic pneumoperitoneum has been reported in the literature, when it is diagnosed early and adequate conservative management done usually has a more favourable prognosis.[1] We found several reported cases supporting the watchful waiting of this entity with favourable outcomes regarding avoidance of unnecessary laparotomies with their related morbidity and mortality. It is necessary to differentiate between the surgical and non-surgical causes of pneumoperitoneum and act accordingly.[2] We report three neonates in this case series who were managed conservatively at AIIMS, Rishikesh.

Case Reports

Case 1

A 2-day-old full-term female neonate with a birth weight of 2.8 kg delivered by caesarean section because of meconium-stained liquor and foetal distress was brought to our emergency department with respiratory distress and delayed cry. On examination, the child was dyspnoeic, lethargic and dehydrated. The patient was admitted to the neonatal intensive care unit (NICU) and elective intubation was done, initially resuscitated with intravenous fluids and broad-spectrum antibiotics. On the next day, the child was extubated and kept on a non-invasive positive pressure ventilation device. On the same day, the child developed abdominal distension and an abdominal X-ray was done, which showed dilated bowel loops with free intra-abdominal air suggestive of pneumoperitoneum [Figure 1a]. On clinical examination, the patient had normal vitals with no symptoms of peritonitis. The glove drain insertion was done in the flank region. After insertion of drain, clear fluid was drained. The child clinically improved within 5th day and abdominal distension decreased. The upper gastrointestinal (GI) contrast study was done, which suggested no peritoneal leak [Figure 1b]. Oral feed was started and the child tolerated it well. The child is on regular follow-up.

Case 2

A 3-day-old pre-term male child, 35th weeks of gestation with a low birth weight of 1.7 kg delivered via lower segment caesarean section (LSCS) in view of non-progression of labour presented in the emergency with respiratory distress. On examination, the child was dyspnoeic and lethargic. The child was admitted to the NICU, initially resuscitated and put on mechanical ventilator support. On the 3rd day of

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ventilator support, the child developed abdominal distension. On physical examination, the abdomen was distended and soft. There was no sign of peritonitis. An abdominal X-ray was done, which showed free intra-abdominal air suggestive of pneumoperitoneum [Figure 2a]. A glove drain was put in the flank region, which did not drain any fluid. The child continued to be on mechanical ventilation and abdominal distension gradually settled in the next 3 days. The patient was slowly weaned off from ventilatory support. The upper GI contrast study was done, which suggested no peritoneal leak [Figure 2b]. Nasogastric (NG) feed was started and gradually reached full feeds. The child was discharged after the 24th day of NICU stay and is doing well in follow-up.

Case 3

A 10-day-old female, very pre-term, 29th weeks of gestation with twin pregnancies with a low birth weight of 1.3 kg was born via LSCS because of pre-mature rupture of membrane. Both twins were resuscitated and put on mechanical ventilator support.

The 1st twin died at the 3rd day of life. The 2nd twin was still on ventilatory support and the child developed abdominal distension on the 10th day, but no sign of peritonitis. The abdominal X-ray revealed free gas in the peritoneal cavity [Figure 3a]. A glove drain was put in the flank region, which slightly drained fluid and gaseous distension decreased. Though she continued to be on mechanical ventilation, and ionotropic support for the next 5 days. The abdominal distension settled. She was slowly weaned off from ventilatory support and observed for a few more days. Once the NG aspirates were nil and she started passing stools adequately, we dis upper GI contrast study was which suggested no peritoneal leak [Figure 3b]. We started NG feed slowly that gradually increased up to full feeds. She was discharged after the 38th day of NICU stay with a weight of 1.4 kg and is doing well in follow-up.

Discussion

Pneumoperitoneum is most often caused by perforation of the gastrointestinal tract, the respiratory tract, or iatrogenic factors. In the neonate, the most common cause of a surgical pneumoperitoneum is necrotising enterocolitis (NEC) with perforation.[1] The most common causes of non-surgical pneumoperitoneum are peritoneal dialysis, endoscopic GI procedures, pneumatosis cystoides intestinalis and mechanical ventilation.[3] In the paediatric age group, pneumoperitoneum occurs in 1%–3% of infants who are mechanically ventilated.[4] A neonate with a pneumoperitoneum requires immediate evaluation and treatment, as early recognition is important in successful management. The key points that suggest conservative management may be effective include: [A] There may be a history of peripartum stress, such as delayed crying, cyanosis, or the use of positive pressure during delivery. [B] The patient's overall condition shows no signs of sepsis, and abdominal X-rays reveal a significant amount of free air without signs of fluid collection in the abdomen. [C] After inserting a drain, the output is minimal and consists of clear peritoneal fluid. [D] The pneumoperitoneum tends to decrease within one to two days of drain insertion and the abdominal distension also resolves.[5] In neonates, a perforation can be near the greater curvature, due to mechanical injury during positive pressure ventilation. The perforation is usually small, so the chances of self-sealing are high. When neonates cry or when on positive airway ventilation, large amount of air enters the stomach. This collected air in the stomach expelled through the perforation due to gastric peristalsis into the peritoneal cavity, leading to pneumoperitoneum. As the

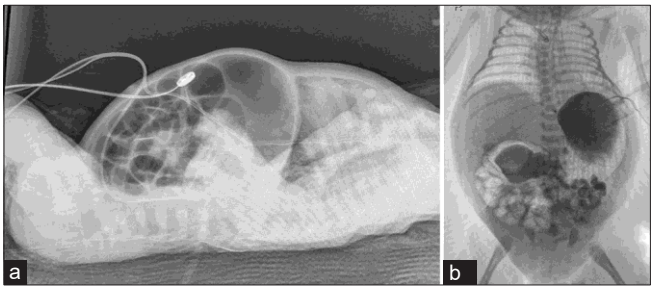


Figure 1: (a) Lateral abdominal X-ray showing pneumoperitoneum, (b) Gastrografin follow-through; showing no evidence of contrast extravasation from the gastrointestinal tract

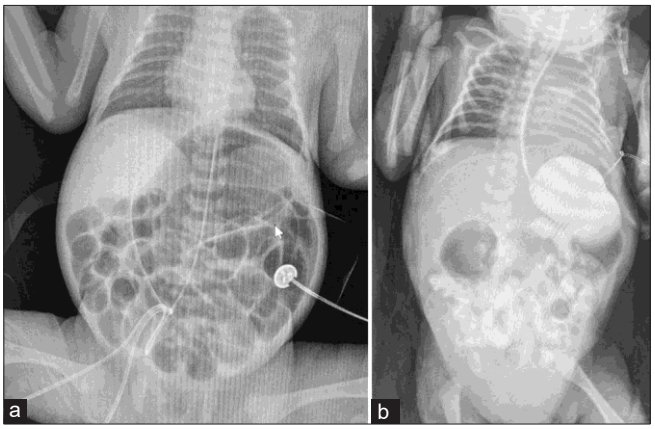


Figure 2: (a) Abdominal X-ray showing pneumoperitoneum, (b) The Gastrografin follow-through showed no signs of contrast leaking from the gastrointestinal tract

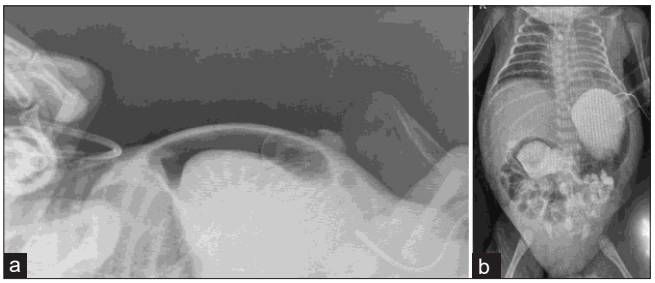


Figure 3: (a) Lateral abdominal X-ray showing pneumoperitoneum, (b) The Gastrografin follow-through showed no leaks from the gastrointestinal tract

neonate usually lies in a supine position, the gastric juices collect at the bottom of the stomach and do not leak into the peritoneal cavity; thus, there is no peritonitis. The absorbed air in the peritoneal cavity is gradually taken in by the peritoneum and surrounding organs. Typically, the cause of this air leakage is post-positive pressure ventilation (using Ambu or continuous positive airway pressure or under ventilatory support), leading to the rupture of the stomach wall.[6] In our series, reported cases have developed pneumoperitoneum following positive pressure ventilation or Ambu bagging, which was done before intubation for about 30 s as per the neonatal resuscitation protocol, which we believe was the most likely because of their pneumoperitoneum, given that no evidence of perforation was identified. Plain chest or abdominal radiography is the most common imaging modality for the diagnosis of intra-peritoneal free air, but abdominal computed tomography is a more sensitive method of diagnosing pneumoperitoneum. Karaman *et al*. developed an algorithm for the evaluation of pneumoperitoneum; it includes clinical history with cardiopulmonary resuscitation, intubation and ventilator use.[4] It is difficult to avoid emergency surgical exploration, once pneumoperitoneum is found because it is needed to rule out visceral perforation, especially when the patients show signs of sepsis and clinical findings suggest NEC. However, the decision to go for operative exploration cannot be made solely on the mere presence of pneumoperitoneum, when there were no signs of peritonitis or laboratory findings that suggest a much gravid aetiology. Some studies suggested the insertion of a peritoneal drain as a bridging procedure for surgery to gain some stability in the newborn, especially in low-birth-weight and very low-birth-weight neonates who cannot tolerate the impact of surgery.[7]

Conclusion

In spontaneous pneumoperitoneum, conservative management should be considered in every neonate, especially in pre-term and low birth weight, when there are no signs of peritonitis and the neonate is clinically stable. We recommend every treating physician: consider conservative management when the patient's condition allows and not rush for unnecessary surgery. Special attention should be paid to neonates because negative laparotomies would jeopardise their already precarious conditions.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the legal guardians have given their consent for images and other clinical information to be reported in the journal. The guardians understand that names and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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