



Neonatal Gastric Perforation: A Report of Three Cases

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Authors' contributions

This work was carried out in collaboration between all authors. Author AA involved with the patients during admission and surgery and also involved with the revision of article (Revision no. 1 and 2). Author FE involved with the patients at time of surgery and during admission and wrote the first draft of the manuscript. Author MBZ involved with the patients during admission and read through the manuscript and made corrections. Author SMT involved with the writing and revision of the article (Revision no. 1, 2 and 3). Author MB involved with the revision of article (Revision no. 1, 2 and 3) and made language corrections. All authors read and approved the final manuscript.

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Case Study

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ABSTRACT

Gastric perforation in neonates is an unusual, serious and catastrophic condition. Although ischemic, traumatic and spontaneous mechanisms have been proposed for gastric perforation, the exact etiology is not clear. Both early diagnosis and treatment is very important to improve survival. We hereby report three cases of neonatal gastric perforation managed successfully by early resuscitation efforts and prompt laparotomy.

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1. INTRODUCTION

Pneumoperitoneum in the newborn generally signals gastrointestinal perforation. Immediate surgical intervention is usually required [1]. Moreover, pneumoperitoneum is not essentially indicator of gastrointestinal perforation. Pneumoperitoneum can occur without any gastrointestinal leak in rare cases [2]. Neonatal gastric perforation (NGP) is an uncommon condition [3]. The exact etiology of NGP is not clear, however ischemic, traumatic and spontaneous mechanisms have been proposed for gastric perforation [4]. Some contributing factors to the development of NGP are prematurity, dexamethasone administration, necrotizing enterocolitis (NEC), asphyxia, mechanical and nasal ventilation, gastric trauma, esophageal atresia and tracheoesophageal fistula [5]. Herein, we report three cases of NGP managed by prompt resuscitation and laparotomy.

2. CASE 1

A 2-day-old premature boy with 30 weeks gestational age, cesarean section delivery, weighing about 1450 g at birth, was transferred to the neonatal intensive care unit (NICU) because of abdominal distention. The patient did not pass meconium after birth. The neonate was the first child of his family.

On physical examination, tachypnea was present in the patient. Erythematous change was not noted on the abdominal wall. The abdomen was soft. Bloody nasogastric tube drainage was observed.

Abdominal X-Ray revealed intra-abdominal free air extending to bilateral scrotum. (Fig. 1) Laboratory tests were normal - except an increase of the total number of white blood cells. Arterial blood gas analysis was above the upper limit of normal. After primary assessment, the patient underwent laparotomy.

On exploration, intra-abdominal free fluid was not present. Mild edema and inflammation existed around the stomach. There was not obvious perforation in the bowels. The bowels were not dilated.

A Perforation, 4 cm in length, with necrotic margins was found at the greater curvature of stomach.

The perforation of the stomach was sutured in two layers. Nasogastric (NG) tube feeding was started 6 days after surgery in absence of sucking reflex. After 20 days, the patient tolerated food and was discharged from the hospital.



Fig. 1. Abdominal X-Ray in case 1 shows intra-abdominal free air extending to bilateral scrotum

3. CASE 2

A 2-day-old boy with 37 weeks gestational age, cesarean section delivery, weighing about 2550 g at birth, was admitted to the hospital with respiratory distress.

The primary diagnosis was hyaline membrane disease (HMD). The patient received exogenous surfactant therapy in NICU. The neonate underwent mechanical ventilation because of respiratory distress, respiratory acidosis and hypoxia. On the Fourth day of admission, the abdomen became distended without abdominal wall erythema. The abdomen was soft. The patient did not pass feces and gas. Gastric tube drainage was bilious.

Abdominal X-Ray demonstrated pneumoperitoneum (Fig. 2). There was no evidence of pneumothorax,

pneumomediastinum, subcutaneous emphysema in Chest X Ray (CXR). The patient underwent laparotomy.

On exploration, a perforation, 3 cm in length, with necrotic margins was found at the lesser curvature of stomach. No obstruction, free fluid or inflammation was founded in GI system. Debridement was performed and the perforation of stomach was sutured in two layers. The gastrostomy tube was inserted by the surgeon. Feeding was started four days after admission to hospital, After 10 days, the patient was discharged from the hospital with good condition. After 20 days, gastrostomy tube was removed.



Fig. 2. Abdominal X-Ray in case 2 demonstrating intra-abdominal free air

4. CASE 3

A 2-day-old premature girl with 30 weeks gestational age, cesarean section delivery, weighing about 1250 g at birth, was transferred to our hospital because of abdominal distention. There was not exact and available data about mother's medical background history except a prior caesarean section delivery. The patient did not pass meconium after birth. As severe abdominal distention and respiratory distress were present, endotracheal tube (ETT) was

inserted and the patient underwent ventilation. In abdominal X-Ray, there was a large volume of free air around the liver (Fig. 3).

Laboratory tests showed a leukocytosis (WBC=18500). Coagulation tests were as follow: PT=16 s, PTT=55 and INR=1.5. Other routine laboratory tests were normal. After correcting the coagulation test and primary assessment, the patient underwent laparotomy. Inflammation was not present around stomach. Perforation of stomach with necrotic margins was seen at the lesser curvature of stomach. Other visceral organs were normal. The perforation of stomach was sutured in two layers and gastrostomy tube was inserted. Board-spectrum antibiotics were administrated. On the seventh day after surgery, feeding was started. On twentieth day, gastrostomy tube was removed.



Fig. 3. Abdominal X-Ray in case 3 showing a large volume of free air around the liver

5. DISCUSSION

NGP has been described as an unusual, serious and life-threatening problem [3]. The exact etiology of gastric perforation is unclear. However, Ischemic, traumatic and spontaneous mechanisms have been suggested for gastric perforation [4]. Spontaneous gastric perforation

has been reported in the newborn with asphyxia, prematurity, NEC, steroid usage, maternal use of cocaine and volvulus. Leon et al. [6] reported 7 cases of gastric perforation which 2 of them were found to be spontaneous and remaining 5 had some predisposing factors including NEC, tracheoesophageal fistula and meconium ileus. Although there was not exact information about the mothers' background medical history in our cases. Traumatic NGP can occur as a result positive pressure ventilation during bag-mask resuscitation or mechanical ventilation [3,7,8]. The usual site is near the greater curvature of the fundus. The most common time for the perforation is within the first week of life especially first 2 and 7 days after birth [9].

Ghribi et al. [9] reported total of 8 cases of neonatal gastric perforation. The site of perforation was at the lesser curvature of the stomach in 4 cases, at the greater curvature in 3 cases and at the anterior antrum surface of the stomach in only 1 case. The perforation occurred at the first week of birth in the patients. Of their cases, 3 neonates had distal obstruction and 1 neonate had tracheoesophageal fistula.

In our two cases, there was no history of mask ventilation. Ventilator- induced trauma was ruled out as the cause of perforation and pneumoperitoneum. Only one case due to HMD diagnosis underwent ventilation prior to abdominal distension. Ventilation was proposed as cause of perforation in this case before surgical intervention. On operation, all 3 patients had large gastric perforations with nectoric margins which ruled out trauma. The first and third case were born premature but the second case was born full- term. Previously, it was hypothesized that asphyxia is a major factor in the perforation of neonatal gastrointestinal tract

in infants [3]. However, perforations in our cases were not compatible with this hypothesis.

Srivastava et al. [3] reported 2 cases of gastric perforations. The perforation was on the anterior surface of the stomach in 1 case and was at the greater curvature in another case. They sutured the perforations in layers. There was no history of any prematurity, intubation or asphyxia in their cases. In most of the previous case reports mortality rate in gastric perforation was more than 50% [3] but all of our cases survived.

Kshirsagar et al. [4] reported 3 cases of neonatal gastric perforation. The site of perforation was along the greater curvature of the stomach in all cases and was sutured in two layers. Surgical repair of most perforations includes debridement and two layer suture of the stomach.

The most common radiographic finding in gastric perforation is pneumoperitoneum which was found in our three cases. Congenital defects have been proposed as cause of spontaneous gastric perforation, too [10]. Clinical manifestations of gastric perforation are usually those of an acute abdomen presentation, even sepsis and respiratory failure [11]. Vomiting is a variable symptom. The most common features is abdominal distension [9] such as in our cases.

Massive pneumoperitoneum is usually confirmed by radiography. Early diagnosis and immediate surgery is very important to improve survival. Prior to operation, during the assessment and resuscitation efforts of the infant, decompression of the abdomen may be required. A nasogastric tube should be inserted while early resuscitation is undertaken. Surgery is recommended if free air persists or acidosis continues [7,8].

Table 1. The three new-borns data

Case no.	Gender	Birth weight	Gestational age	Type of delivery	Site of perforation	Type of surgery performed
1	M	1450 gr	30 weeks	C/S	At greater curvature of stomach	Suturing of the perforation in two layers
2	M	2550 gr	37 weeks	C/S	At lesser curvature of stomach	Suturing of the perforation in two layers
3	F	1250 gr	30 weeks	C/S	At lesser curvature of stomach	Suturing of the perforation in two layers

(C/S: Cesarean section, M: Male, F: Female)

Surgery is the treatment of choice in abdominal viscous perforation. The posterior wall of the stomach should be explored and multiple areas of injury must be excluded [9]. Post-operative treatment with broad-spectrum antibiotics is necessary [7].

6. CONCLUSION

Gastric perforation can present with abdominal distention and respiratory distress. Our cases presented with these clinical manifestations and the ultimate diagnosis was gastric perforation. Neonatal gastric perforation is a rare condition and should be kept in mind to achieve better outcomes. Although ischemic, traumatic and spontaneous mechanisms have been proposed for gastric perforation, the exact etiology is not fully recognized. The key point to curtail the mortality is early recognition and surgical intervention.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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