

Gastric Perforation in Newborns: Analysis of 14 Cases

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ABSTRACT

OBJECTIVE: Neonatal gastric perforation is a rare entity with poor prognosis. Etiology of this anomaly is unknown but prematurity, low birth weight and hypoxia is considered as contributing factors. The purpose of this study is to share our experience regarding the etiology, clinical features and surgical outcome of neonatal gastric perforation.

METHODOLOGY: We reviewed the data of all newborn with gastric perforation in Liaquat University Hospital as well as in private practice, from July 2003 to June 2010 with respect to age, sex, weight, parity, mode of delivery, clinical presentations, investigations, associated anomalies and surgical outcome.

RESULTS: There were 14 patients, 9 males and 5 females. Birth weight ranged from 1.6 kg to 3 kg with mean of 2.3 kg. Out of 14 babies 11(87.57%) were full term and 3(21.42%) preterm. Clinical features observed were abdominal distension, respiratory distress, vomiting and hematemesis. Associated anomalies were found in three patients, which were Down's syndrome, talipes equinovarus and bilateral inguinal herniae with hypospadias. Most of the patients had spontaneous gastric perforation and few might had ischemic cause. Nine had perforation on posterior wall of body of stomach and three on posterior wall of greater curvature of stomach while two had on anterior wall of body of stomach and anterior wall of greater curvature of stomach respectively. All the patients had primary closure of perforation along with intraperitoneal placement of drain. Complications observed in 4 (28.57%) cases, three term low birth weight and one preterm baby; wound dehiscence in two patients, who were re-operated, wound infection in one and pneumonia in one which were treated conservatively. Three patients 21.4% (two term low birth weight and one preterm) expired in this series due to septicemia.

CONCLUSION: Prominent features in this study were low birth weight and perforation on the posterior surface of stomach. There is need to evaluate the correlation of these findings.

KEY WORDS: Neonates, Gastric perforation, Prematurity, Surgery.

INTRODUCTION

Neonatal gastric perforation (NGP) is a rare catastrophic surgical emergency¹. It accounts for 7% of all neonatal gastrointestinal perforations². Etiology of this condition is unclear, but three mechanisms; spontaneous perforation, trauma and ischemia are acceptable reasons for NGP. New emerging factor for neonatal gastric perforation is an association with primary pathology such as (trachea-esophageal fistula, necrotizing enterocolitis, duodenal atresia, gastroschisis and omphalocele)¹. Spontaneous gastric perforation is generally seen in full term newborn, but cases have been reported in premature babies as well, so prematurity is considered as predisposing factor for NGP.

Neonatal gastric perforation usually present within first week of life with clinical features that includes distension of abdomen, vomiting and lethargy/sepsis. Pneumoperitoneum is one of the pertinent radiological finding in NGP³. Principal mode of treatment is surgical repair, although spontaneous healing of gastric perforation has also been observed in newborn after con-

servative management.

Good surgical outcome could be achieved by early diagnosis, resuscitation and early surgical intervention. Despite every effort mortality in this entity is very high ranging from 27-83%⁴ but few studies have shown excellent results without any mortality⁵. Being the rare entity there is paucity of local literature regarding the newborn gastric perforation. One of the reasons to conduct this study was to share our experience in local literature. Therefore the main purpose of this study was to share our experience of NGP in our set-up with regard to etiology, clinical presentation and surgical outcome.

METHODOLOGY

This retrospective study of neonatal gastric perforation was conducted at Liaquat University Hospital Hyderabad, as well as in private practice from July 2003 to June 2010 with respect to age, sex, weight, parity, mode of delivery, clinical presentations, investigations, associated anomalies and surgical outcome. Newborns with clinical findings suggestive of surgical

abdomen under went x-ray abdomen. With x-ray finding of gastrointestinal perforation all the patients had pre-operative resuscitation; including triple antibiotic (cefotaxime/ceftriaxone, amikacin and metronidazole) for gram positive, gram negative and anaerobes, temperature maintained by warmer or incubator, blood transfusion if anemic, fresh frozen plasma if PT and APTT were altered. Peritoneal cannulation was applied when intraperitoneal free gas was causing respiratory distress.

Investigations performed were; complete blood count, serum electrolytes and urea, PT, APTT, blood culture and ultrasound.

Patients with neonatal gastric perforation were included in this study, while other gastrointestinal perforations were excluded. Primary closure of perforation after debridement of dead tissue and peritoneal cavity washout with warm saline and placement of drain were opted in all patients. Post operatively all patients were kept in neonatal intensive care unit, especially for temperature maintenance, oxygen inhalation and intravenous fluid. Post operative complications and mortality were recorded on proforma.

Neonates were classified as preterm (<37 weeks), term (37-42 weeks) and post term (>42 weeks) gestation. Normal weight of full term newborn is 2.5 to 3.5 kg, less than 2.5kg is low birth weight while less than 1.5 kg is extremely low birth weight-Results were analyzed on SPSS version16 in relation to frequency and percentage.

RESULTS

Fourteen patients, 9 males and 5 females, with male-female ratio of 1.85:1 were included in this study. Patient treated at government hospital were 11 and at private hospital were 3(two low birth weight full term and one preterm baby). After birth weight ranged from 1.6 to 3 kg with mean of 2.3kg and mean time of presentation was 3.78 days. Eleven neonates were full term and three preterm. Among these 11 term babies, two had normal birth weight and nine with low birth weight. Out of 14 newborns 4 were born with LSCS and 10 with normal vaginal delivery, four at hospital and 6 at home. Only four mothers having LSCS had regular antenatal follow –up and none of them had any significant illness. Clinical presentations observed were distension of abdomen and vomiting as shown in **Table I**. Pneumoperitoneum was consistent radiological finding in all patients. Associated anomalies were found in three patients, which were Down's syndrome and talipes equinovarus in term babies and bilateral inguinal herniae with hypospadias in preterm baby

respectively. Causes of perforation might be spontaneous or ischemic while none had associated primary pathology as shown in **Table II**.

After resuscitation all patients underwent laparotomy. Two patients had associated midgut malrotation. Regarding the site of gastric perforation, nine had perforation on posterior wall and one on anterior wall of body of stomach, while four had perforation on anterior and posterior surface of greater curvature of stomach. All the patients had excision of necrotic tissues and primary closure of perforation along with placement of drain. Complications observed in three term low birth weight and one preterm 4 (28.57%) patients such as wound dehiscence in two patients, who were re-explored, wound infection in one and pneumonia in one which were treated conservatively. Mortality observed in two term low birth weight and one preterm newborn 3 (21.4%) patients in this series due to septicemia. Post operative mean hospital stay was 8 days.

TABLE I: CLINICAL FEATURES OF NEONATAL GASTRIC PERFORATION

Clinical features	Number of neonates	Percentage
Abdominal distension	10	71.4
Vomiting	2	14.2
Respiratory distress	7	50
haematemesis	1	7.1
Feature of sepsis	8	57.14

TABLE II: NEONATAL GASTRIC PERFORATION REVIEW OF LITERATURE – SPONTANEOUS VERSUS PRIMARY PATHOLOGY

Author	Number of Cases	Preterm Babies	Primary Pathology	Spontaneous Cases
Holderson et al ¹⁷ 1981	28	16	1	27
Rosser et al ⁶ 1982	16	6	NIL	16
Leone et al ⁸ 2000	7	3	5	2
Jawad et al ⁵ 2002	5	5	4	1
Kara et al ⁷ 2004	13	4	1	12
Present study 2011	14	3	NIL	14

DISCUSSION

Neonatal gastric perforation (NGP) is a rare surgical emergency associated with high morbidity and mortality¹. It was first reported by Siebold in 1825.⁷ Its reported incidence is 1 in 5000 live birth.² Newborn gastric perforation is higher in black than white and at least four times higher in male than female⁸ while in our study male to female ratio was 1.85:1.

Etiopathogenesis of neonatal gastric perforation is unclear but three mechanisms for gastric perforation in neonates were postulated; traumatic, ischemic and spontaneous.⁴ Most of the gastric perforations are caused by iatrogenic trauma either due to the vigorous nasogastric or orogastric tube placement or due to positive pressure ventilation or bag-mask resuscitation.⁹ None of our case had traumatic perforation.

Ischemic gastric perforation mechanism has not been fully understood because it is associated with conditions causing severe physiological stress in newborn: hypoxia, prematurity and sepsis.¹⁰ It has also been reported in necrotizing enterocolitis. High gastric acid secretion in 2nd day of life and stress ulcers in the critical ill patients was also reported² and they are supposed to cause perforation due to transmural necrosis of these ulcers. In this study there were three preterm and few septic neonates, perforation in these cases may be due to this entity, but none has enterocolitis.

Primary pathologies such as duodenum obstruction, gastroschisis, and trachea esophageal fistula may increase the risk of gastric perforation by rise in intra-gastric pressure².

Twenty percent of cases are not related to any underlying risk factor are considered as spontaneous/idiopathic. The reported incidence of spontaneous perforation was 1 in 2900 live births¹¹. A number of theories have been suggested to explain the causes in spontaneous gastric perforation including; congenital absence of muscular mucosa in greater curvature of stomach¹², non communication of right and left gastropiploic arteries causing localized ischemia leading to perforation at greater curvature¹³. Pneumatic dilatation of stomach due to in coordination or immaturity of vomiting mechanism in infants causing increase in intragastric pressure during vomiting also cause gastric perforation.^{14,6} Recent study showed that absence/lack of cajal cell is one of the risk factor for spontaneous gastric perforation¹⁵.

It is believed that spontaneous gastric perforation is commonly found in term babies with out any significant pathology^{11,12}, but cases have also been reported in premature, hypoxic, and low birth weight babies. Neonatal stress consequent to preterm birth is

a determining factor in the etiopathogenesis. Preterm infants and low birth weight shows a predisposition to gastric perforation². In this study 11 newborn were term among which 9 had low birth weight, so we can assume that some of the cases might had spontaneous gastric perforation.

Most common cause of gastrointestinal perforation in preterm infants is necrotizing enterocolitis. Prematurity has been accepted as a common feature of NGP by Kara et al.¹¹. While in this study only 3(21.4%) patients with prematurity were observed but none of them had features of enterocolitis as shown in Table II.

Kuremu¹ and Leone¹² suggested that NGP is associated with primary pathology including trachea-esophageal fistula, duodenal atresia, gastroschisis etc, while they believe that prematurity, low birth weight, hypoxia and steroid during pregnancy are risk factors for prognosis, but not for gastric perforation. In this study no case has association with primary pathology.

Clinical features of gastric perforation are usually those of an acute abdomen. The abdominal distension was a prominent feature on clinical examination described by Desouki et al¹⁶ while in this study 71.4% patient had this finding. Severity of respiratory distress depends upon the distension of abdomen and maturity of patients. Preterm and septic patients are more prone to early distress. In this study it was observed in 50% of cases which is almost same as described by Ozturk et al¹⁷. Vomiting was insignificant as suggested by Desouki while we had almost same 14%. Septicemia was a pertinent finding and main cause of death in NGP suggested by other studies.^{10,17,18} while in this study it was 57%. Hematemesis and pneumoscrotum are Occasional presentation in neonatal gastric perforation.

Gastric perforation generally occurs on the fundus and greater curvature of stomach; while we have 9 (64.28%) patients with perforation on posterior wall of body of stomach and 4(28.5%) on greater curvature of stomach (3 on posterior surface and one on anterior surface). Only one patient had perforation on anterior surface of body of stomach. While previous studies^{11,19} showed perforation on anterior surface and lesser curvature of stomach, which does not match our results.

It is believed that NGP is a catastrophic condition so aggressive resuscitation followed by surgical intervention may curtail the morbidity and mortality in newborn. All patients in this series underwent gastrotomy with excision of necrotic tissue and placement of drain which is also done by other authors.^{11,13} Post opera-

tive management consists of balanced fluid and electrolytes, temperature maintenance because these septic and preterm babies are more prone to hypothermia. Broad spectrum antibiotics for gram positive, gram negative and anaerobes are required. Ventilator support may be required in few cases. All our patients were kept in intensive care with special focus on fluid, antibiotic and oxygenation.

Despite advances in peri-operative management Kara et al¹¹ and Durhan et al¹⁹ reported high mortality (55-60%) rate in gastric perforation, while Chung et al²⁰ and Jawad et al⁶ suggested that mortality was low in full term neonate with spontaneous gastric perforation. In this study mortality was 21.4%, while complication occurred in 4(28.5%) patients might be due to intensive care or early surgical intervention.

Degree of maturity, hypoxia and peritoneal contamination and duration of illness are risk factors for high mortality. Preterm babies are more prone to respiratory distress and septicemia and leading to very high mortality. Septicemia was main killer in this series. For improvement in survival rate in NGP early diagnosis, early surgery and proper pre and post operative care are main parameters, while pre and post operative management needs skilled staff and modern facilities. There is controversy that spontaneous NGP is an old concept and it is always associated with some primary pathology²¹. In this study no association with primary pathology was found as shown in Table II. So we support that concept of spontaneous perforation as suggested by Kara et al¹¹. Prominent feature in this study was low birth weight. There is need to work-up the relation between gastric perforation and low birth weight.

CONCLUSION

Prominent features in this study were low birth weight and perforation on posterior surface of stomach. Low birth weight neonates are at increased risk of NGP as well as mortality resulting from it, so they should be managed cautiously. Key point to curtail the mortality is definitive therapy and early surgical intervention

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