Spontaneous Perforation of the Stomach in the Newborn: *

Analysis of Thirteen Cases

LAURENCE M. LINKNER, M.D., CLIFFORD D. BENSON, M.D., F.A.C.S.

From the Surgical Service of the Children's Hospital of Michigan, Harper Hospital, and Wayne State University College of Medicine, Detroit

Introduction

IN 1825, Siebold reported a case of spontaneous rupture of the stomach in the newborn. Although many subsequent articles on this subject were written, it was not until 1950 [12] that the first reported survival of an infant operated upon for this disease appeared. Since that time ten other survivals following operation have been reported (Table 1), all one case citations except Vargus *et al.*[22] who reported two. We wish to present 13 newborn infants who have been operated upon for spontaneous rupture of the stomach in the past ten years, among whom there were six survivals.

It was hoped that by grouping these cases together, enough similarities would become apparent to establish a common etiology and, in addition, a common clinical picture. Although the etiology was not disclosed, a remarkably constant progression of symptoms was seen which should lead to earlier correct diagnosis and consequently a higher salvage of these newborn infants. This supports the similar finding of Vargus *et al.*[22]

Case Reports

Case 1 (W.R. 5-11-49). This 5-day-old white male was transferred to the Children's Hospital of Michigan because of vomiting and marked abdominal distention of sudden onset. The infant was of premature birth and in severe respiratory difficulty during its first 2 days of life. Birth weight 5 lbs. 5½ oz.

On the 5th postpartum day the infant began to vomit, and the abdomen became markedly distended and tympanitic. It was thought that the child had intestinal obstruction with perforation, and x-rays of the abdomen taken on admission revealed free air and fluid in the abdominal cavity. On exploration free air in the peritoneal cavity and purulent fluid mixed with fibrinous exudate were found. No perforation of any viscus was disclosed and the abdomen was closed. The child expired on the 1st postoperative day.

Autopsy revealed a large perforation of the cardia of the stomach along its greater curvature.

In this case the marked abdominal distention was correctly interpreted in part, as suggestive of perforation. Because of suspected perforation, x-rays of the abdomen were taken immediately and the diagnosis was confirmed. Perforation in the upper cardiac portion of the stomach was not detected and it is probable that the perforation extended further, postoperatively, causing the child's demise.

Case 2 (B.B.S. 3-14-51). This newborn colored male was transferred to the Children's Hospital of Michigan because of prematurity with an estimated period of gestation of seven months.

Prenatal and birth history were normal. Birth weight 3 lbs. 6½ oz.

Physical examination on admission revealed only a listless premature infant.

On the 5th post-partum day the infant began to vomit bile stained material; respirations were shallow and the color was poor. The abdomen was not remarkable. The following day x-ray films were taken and revealed considerable amounts of free air and fluid in the peritoneal cavity without evidence of obstruction. Exploration revealed a large perforation on the anterior surface of the stomach near the lesser curvature. The perforation was closed. The infant expired on the day of operation.

No autopsy was performed.

* Submitted for publication June 2, 1958.

TABLE 1. *Newborns Reported Surviving Spontaneous Perforation of the Stomach*

Author	Date	Number
Leger[12]	1950	1
Ross[19]	1951	1
Kellogg[10]	1951	1
Beattie[2]	1952	1
Braunstein[3]	1953	1
Northway[17]	1954	1
Arnold[1]	1955	1
Mann[14]	1955	1
Vargus[22]	1955	2
Whittico[23]	1956	1
	Total	11

This case is unusual in that the most common finding of marked abdominal distention was not present. Prematurity of the infant may have accounted for lack of abdominal findings. X-rays of the abdomen immediately solved the diagnostic problem.

Case 3 (B.G.S. 8-22-53). This newborn colored female was transferred to the Children's Hospital of Michigan because of the presence of a spina bifida and a minor skull defect involving the frontal bone.

The infant was delivered spontaneously after an uneventful full-term pregnancy. Birth weight, 5 lbs. 1 oz.

Physical examination revealed only a small skull defect that was continuous with the anterior fontanelle and a spina bifida with an associated meningocele.

Progress was uneventful until the 6th hospital day when the infant suddenly became distended and dysphagic. X-ray films of the abdomen taken soon after the child's condition changed revealed free air beneath both leaves of the diaphragm.

At operation a large portion of the greater curvature of the stomach appeared to be nonviable, and this area was resected and the defect reapproximated.

The infant expired on the 1st postoperative day.

At autopsy there was extensive peritonitis, the result of a further extension of the area of perforation on the greater curvature. The suture line was intact. Microscopically there was complete necrosis of the stomach wall without any inflammatory or vascular change noted. The central nervous system lesions were felt to be non-contributory to the spontaneous perforation of the stomach.

Although central nervous system anomalies were present, this case represents the typical course of a spontaneous perforation of the stomach in the newborn. Unlike the cases reported where there is extensive intracraineal injury associated with a perforation of a stress ulcer, this case demonstrated no ulceration of the gastric or duodenal mucosa.

Case 4 (9-4-53). This premature colored female was transferred to the Children's Hospital of Michigan on the 8th postpartum day because of fever, vomiting and jaundice.

On the 2nd postpartum day the infant was treated for gonococcal opthalmitis with an excellent response. On the 6th day the infant developed fever and vomiting. X-ray film of the abdomen was negative at this time. The child made no response to treatment and was transferred on the 8th day.

Examination on admission revealed a well developed but poorly nourished premature infant. The abdomen was markedly distended, tympanitic and tense. The patient's condition remained poor, and four days after admission x-ray films of the abdomen revealed a pneumoperitoneum.

The infant was operated upon the same day and a 1 mm. perforation on the antero-superior portion of the stomach, near the lesser curvature, was closed. Two superficial wound abscesses were drained on the 9th and 37th postoperative days. Improvement was gradual, and the patient was discharged on the 44th day after admission.

This case is remarkable in that although the perforation probably existed one to three days before surgical correction, survival was attained. The survival most probably was related to the small size of the perforation.

Case 5 (10-14-54). This 3-day-old white male was transferred to the Children's Hospital of Michigan because of constipation, abdominal distentions and anorexia of 2 days duration.

The infant was delivered by Caesarean section after 8 months gestation, and his immediate postnatal condition was good.

Physical examination on admission revealed a listless infant in poor condition with a markedly distended abdomen. X-rays of the abdomen taken on admission revealed a large collection of free air and fluid in the peritoneal cavity. At laparotomy the site of perforation could not be found, and the ab-

domen was closed after all free fluid had been aspirated. The child's condition deteriorated rapidly after operation, and he expired a few hours postoperatively.

The postmortem examination was not remarkable except for a perforation of the posterior wall of the stomach covered with a partially organized exudate. The final diagnosis was peritonitis secondary to a spontaneous rupture of the stomach.

This case emphasizes the importance of opening the lesser sac if the site of perforation is not apparent. The stomach should first be examined on all exposed surfaces; if no perforation is found the small bowel, from the ligament of Tritz to the terminal ileum is inspected. The colon is then examined if there are no positive findings. If the perforation is still not found, the lesser sac is opened and the entire posterior wall of the stomach inspected. Lastly, if exploration remains completely negative, the duodenum is completely mobilized in an effort to find the site of perforation. Such an exhaustive search must be made, for if an abdomen of a newborn is closed and a perforation of a hollow viscus remains, the infant will surely succumb.

Case 6 (1-31-56). This 4-day-old colored female was transferred to the Children's Hospital of Michigan because of abdominal distention and vomiting of one days' duration.

The birth weight was 4 lbs. The pregnancy, labor and delivery were uneventful.

Physical examination on admission revealed a well developed premature infant with good color and cry whose abdomen was markedly distended and tympanitic. X-rays taken on admission showed a large amount of free air in the peritoneal cavity.

At operation a ½ cm. prepyloric perforation on the anterior wall of the stomach was found and closed.

The child's postoperative course was uneventful and she was discharged on the 7th postoperative day weighing 5 lbs. ½ oz.

This case illustrates that a premature with a spontaneous rupture of the stomach offers no special difficulties. The prognosis, likewise, does not differ from that of a full term infant.

Case 7 (3-30-56). This two-day-old colored female was transferred to the Children's Hospital of Michigan because of progressive abdominal distention since birth without vomiting.

The infant was full term and the pregnancy, labor and delivery were uneventful.

A perforated viscus was suspected before transfer and x-rays confirmed this impression by demonstrating free air under the diaphragms.

Physical examination revealed a well developed infant in no distress with a protuberant, but soft abdomen. Repeated x-rays confirmed the diagnosis of ruptured intraperitoneal viscus. The child was prepared for operation at which a perforation of the stomach near the pylorus was closed.

Postoperatively the child made a slow recovery due to persistent vomiting, but her eventual recovery was complete and the patient was discharged well 32 days after admission.

This case demonstrates the satisfactory results of early recognition and treatment of a perforated viscus in the newborn.

Case 8 (5-31-56). This 1-day-old colored female infant was transferred to the Children's Hospital of Michigan for premature care. The birth weight was 4 lbs. 7 oz.

Pregnancy was complicated by toxemia and spotting; however, labor and delivery were uneventful.

On physical examination the abdomen was slightly distended. Initial work-up revealed an AO erythroblastosis; however, exchange transfusion was not necessary.

On the 4th hospital day the infant vomited mucus with coffee ground material, and the abdomen was more distended. Bowel sounds were present. X-rays were taken and showed free air in the peritoneal cavity.

At operation a sealed perforation on the posterior wall of the stomach was demonstrated. Nothing further was done and the abdomen was closed.

The patient was discharged 5 weeks after admission after an uneventful hospital course. The weight on discharge was 5 lbs. 1½ oz.

At operation there was no doubt in the surgeon's mind that the site of perforation had been found. The perforation seemed so adequately handled by the natural defense of the child that further attempts at closure were thought unwise.

Case 9. This 13-hour-old colored female infant was transferred to the Children's Hospital of

Michigan because of a generalized convulsion and cyanosis several hours after delivery.

The patient was delivered by breech extraction following an uneventful pregnancy. The child had to be resuscitated, but spontaneous breathing soon developed.

On physical examination the infant had intermittent generalized spasmodic twitching of the arms, legs and head. Although there was a cephalohematoma over the left parietal area, the fontanelles were normal. Horizontal nystagmus was present; no other neurologic abnormalities were found in an examination which included the neck, pupils and reflexes. The abdomen was normal and the skin color was good. Xanthrochronic cerebrospinal fluid was obtained by lumbar puncture.

Although the general condition of the patient improved, she began to vomit 6 hours after admission and her abdomen became distended.

X-rays taken at this time revealed free air beneath the leaves of the diaphragm and dilatation of the stomach and small bowel.

The child was operated upon 23 hours after admission. A 2 mm. perforation over the mid portion of the anterior stomach wall was found and closed.

Postoperatively the infant bled vigorously from the nose and throat and from the gastro-intestinal tract. Although visible bleeding was controlled, the patient's condition deteriorated, and she died on the 2nd postoperative day.

At autopsy there were 175 cc. of fluid blood in the peritoneal cavity. The area of perforation remained adequately repaired. Areas of focal necrosis and ulceration were found in the larynx, esophagus, ileum and rectum, and there were petechial hemorrhages throughout the gastro-intestinal tract, in the sub-endocardium, under the liver capsule, and throughout the kidneys and bladder.

There was no maldevelopment of the stomach wall to account for the perforation and although a pan-intracranial lesion with hemorrhage was suspected as the antecedent factor accounting for the gastric perforation, no such lesion was found.

The use of heparin to clean and lubricate syringes during operation and the subsequent post operative bleeding were thought to be directly related in this case. This use of heparin has since been discontinued.

In view of the normal gastric wall, grossly and histologically, and the absence of any acute central nervous system lesion, it was felt that this case fulfilled the criteria necessary for the diagnosis of spontaneous rupture of the stomach.

Case 10 (6-1-57). This 4-day-old colored female was transferred to the Children's Hospital of Michigan because of transient cyanosis and progressive abdominal distention of one days' duration.

The pregnancy, labor and delivery were normal except for premature rupture of the membranes, which necessitated prophylactic antibiotic therapy for the mother.

Physical examination revealed a lethargic infant with a distended tympanitic abdomen. Bowel sounds were absent. X-rays taken shortly after admission revealed free air in the peritoneal cavity and the patient was prepared for operation.

At laparotomy an anterior perforation of the stomach near the lesser curvature was closed. The patient's postoperative course was progressively down hill with peripheral edema, congestive heart failure, and death on the second postoperative day.

Autopsy was performed and the final diagnosis was spontaneous perforation of the stomach, adequately repaired, with milk peritonitis. The lungs were atelectatic and congested. There was 25 cc. of clear fluid in each pleural space.

In this case the perforation most likely existed for almost two days before closure. Even with adequate surgical correction, the long standing chemical peritonitis did not respond to vigorous management and the infant succumbed.

Case 11 (8-27-57). This 5-day-old colored male was transferred to the Children's Hospital of Michigan because of prematurity associated with progressive abdominal distention, ileus, and peripheral cyanosis of 16 hours' duration.

The pregnancy was complicated by toxemia; however, the labor and delivery were normal. Although the patient was delivered 1 month prematurely his birth weight was 5 lbs. 4 oz.

Physical examination revealed a critically ill infant with a tense tympanitic abdomen and absent bowel sounds. The skin was mottled, jaundiced and cyanotic at the periphery. X-ray of the abdomen, taken four and one-half hours after admission, revealed a large amount of free air and fluid in the peritoneal cavity.

The infant was considered well enough to withstand surgical exploration 4 hours later at which time a 3 cm. rupture of the stomach near the greater curvature was closed.

The patient did not respond to supportive measures taken postoperatively, and expired on the first postoperative day.

Autopsy revealed a spontaneous rupture of the stomach, adequately closed, and peritonitis.

As in Case 10, the prolonged interval from the estimated time of perforation until the surgical correction of the defect (over 24 hours) produced a generalized chemical peritonitis that was unresponsive to therapy.

Case 12 (B.G.W. 1-11-57). This 4-day-old white female was transferred to the Children's Hospital of Michigan because of abdominal distention and vomiting 12 hours prior to admission.

This infant was delivered spontaneously at term following an uneventful pregnancy. Birth weight 7 lbs. 3 oz.

Twelve hours before admission the child's abdomen was distended and when progression of symptoms and rapid deteriorization ensued, a plain film of the abdomen was taken which revealed free air under both diaphragms. The child was transferred to the Children's Hospital of Michigan with a diagnosis of a ruptured viscus secondary to intestinal obstruction.

On admission the child was icteric, lethargic, somewhat dehydrated with moderate abdominal distention. The abdomen was tender. X-ray films of the abdomen confirmed the presence of free air within the abdominal cavity and the child was prepared for operation.

At operation a 1¼ cm. perforation of the fundus of the stomach near the esophageal cardia junction was found and closed. No obstruction was found.

The postoperative course was uneventful and the child was discharged 8 days after admission.

In this case the time interval between estimated perforation and surgical correction was just over 12 hours. Recognition of the problem by the transferring institution was delayed; however, with knowledge that such a child was arriving all necessary arrangements were made. In this way, no additional time was lost from admission to laparotomy.

Case 13 (B.G.S. 3-9-58). This premature 4-day-old colored female was transferred from the newborn nursery of Harper Hospital to the pediatric ward for care because of listlessness, progressive abdominal distention, and vomiting. Birth weight 4 lbs. 6 oz.

TABLE 2. *Maturity*

Full term	5
Premature	8
Total	13

The infant was one of twins and was delivered by breech extraction after a full term pregnancy. Delivery was nontraumatic and the infant required no resuscitative measures.

On her 4th day, following a normal hospital course, she refused feedings, became restless, and vomited a small amount of bile stained material. Two hours later the abdomen distended progressively and x-ray films, taken to confirm the clinical impression of intestinal obstruction, revealed a massive pneumoperitoneum. A preoperative diagnosis of perforated stomach was made and the infant was prepared for operation.

At laparotomy a 3 mm. perforation of the cardia near the greater curvature was found and closed. There were no other positive findings.

The postoperative course was not remarkable and the child was discharged 22 days after admission.

The time from estimated perforation until surgical correction in this case was ten hours. It would seem from those surviving that a delay of more than 12 hours from perforation to surgical correction is often fatal. The single factor that speeded correct therapy was promptness with which the x-ray of the abdomen was taken.

Discussion

On reviewing the 13 cases presented certain clinical features are common to most infants while in others more isolated factors are evident.

The child will generally weigh between four and six pounds at birth; prematurity does not appear to be a significant factor (Table 2). Pregnancy, labor and delivery are usually normal; however, in two patients toxemia was noted in the mother. In this series the predominant sex was female (Table 3), and there were more negro infants than white (Table 4). The female predominance does not agree with reports

TABLE 3. *Sex Difference*

Male	4
Female	9
Total	13

TABLE 4. *Race Difference*

Negro	10
White	3
Total	13

of most authors, and its significance in our series cannot be determined. It is apparent, on reviewing the literature, that race is related only to local factors.

Most often progress was satisfactory until the third day when the child gradually became listless and the cry weaker. About one to two hours later the abdomen became progressively more distended, and an occasional small emesis of bile stained material was noted. The first diagnosis considered was usually septicemia, and much time was lost in confirming this presumptive diagnosis. With persistance of progressive abdominal distention, ileus, and vomiting, more attention was directed to the gastro-intestinal tract, and most often 12 to 24 hours after onset of symptoms x-rays of the abdomen were taken.

Unsuspected presence of free intraperitoneal air was readily apparent (Fig. 1 to 4). No time was now lost in preparing the infant for operation. Nasogastric suction was started if this had not previously been done. The greater saphenous vein at the ankle was isolated and cannulated. Whole blood was administered, and any abnormalities of serum electrolytes corrected. Antibiotics and Vitamin K were usually given intravenously as supportive adjuncts.

The infant was given endotracheal anesthesia and a right paramedian incision was usually chosen. The incision next most frequently used was through the upper midline. The only advantage to the latter approach was that it afforded a better exposure of perforations on the greater curvature of the stomach near the cardio-esophageal junction.

Closure of the gastric perforation in all cases was of two layers; interrupted chromic catgut through all coats for the first layer, followed by a second sero-muscular layer of silk. Frequently ophthalmic 6–0 suture material proved applicable. A wide closure was carried out in most cases because occasionally autopsy revealed further extension of the perforation after what was thought to be adequate closure. The abdomen was closed in all cases without drainage after evacuating as much gastric debris from the peritoneal cavity as possible. Generally no intraperitoneal antibiotics were used.

Postoperatively continuous suction was employed until bowel sounds were heard or stools were passed. This normally occurred between 36 and 48 hours after operation. Oral feedings by eye dropper of glucose water every hour in 2 cc. amounts were then started and gradually increased in volume. When normal feeding was assured, nipple feedings of formula were given. Using the above technics a survival rate of 46.1 per cent was obtained (Table 5). Previously the best survival rate reported where more than one case was cited was 25 per cent. As can be seen in Table 6, weight had little to do with ultimate survival.

The etiology of spontaneous rupture of the stomach in the newborn is obscure. Cases of perforation due to acute peptic ulceration are excluded. In this series, peptic ulceration could neither be palpated grossly at operation in the infants surviving, nor could ulceration of the gastric mucosa be demonstrated at autopsy.

In addition, no patients are included in whom perforation of the stomach is secondary to more distal intestinal obstruction. The gastro-intestinal tracts of all patients presented were free from any congenital anomaly.

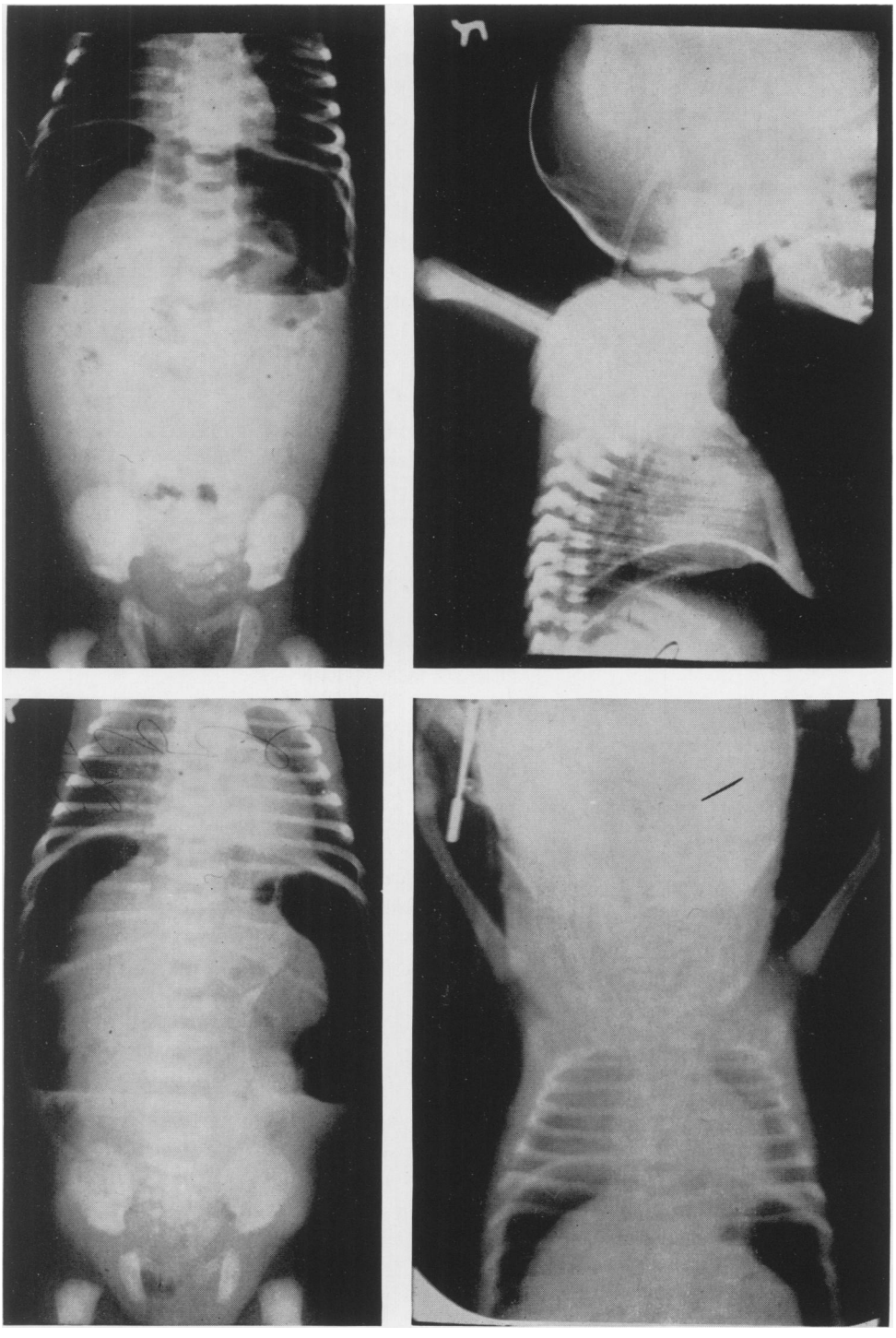

FIG. 1 to 4. The x-rays above all demonstrate the typical finding of massive pneumoperitoneum, associated with spontaneous perforation of the stomach in the newborn.

TABLE 5

Total cases	13
Deaths	7
Survival rate = 46.1%	

The most commonly accepted theories relative to the etiology of this disease are, (1) congenital defects in the gastric musculature [7, 13] (2) high gastric acidity in the early newborn period associated with a primary vascular insult,[10, 20] and (3) trauma, either direct (intubulation) or indirect (delivery). In individual instances some of the above factors have a causal relationship in the production of perforation. In most, however, the etiology of the disease remains unknown.

TABLE 6

Birth Weight	Number of Cases	Survival
3 to 4 lbs.	2	1
4 to 5 lbs.	3	3
5 to 6 lbs.	5	0
6 to 7 lbs.	0	0
7 to 8 lbs.	3	2
Total	13	6

Other observers feel that perforation is related to neonatal asphyxia and shock. Evidence to support this concept includes the occurrence of multiple areas of perforation or areas of ulceration elsewhere in the gastro-intestinal tract and the presence of other clinical signs and lesions associated with neonatal asphyxia.[4]

An additional point that may indicate a common pathogenesis is the incidence of positive blood cultures in three patients.

TABLE 7. *Site of Perforation*

Anterior wall	4
Posterior wall	2
Near greater curvature	4
Near lesser curvature	4
Prepyloric	2
Near cardia	4

It can be postulated that septic embolization of the gastric wall might produce local vascular insult sufficient to allow highly acid gastric juice of the newborn to perforate through all layers.

Review of the site of perforation provided no clue to the etiology of the disease. All areas of the stomach were involved with almost equal frequency (Table 7). The posterior gastric wall, as most investigators have shown, is least often involved.

Summary

Case records of 13 newborn babies operated upon for spontaneous rupture of the stomach have been reviewed. Emphasis has been directed toward the consistent clinical picture noted preoperatively which, if interpreted correctly, should lead to earlier diagnosis. It is evident that survival is related directly to the promptness with which surgical correction of the defect is accomplished.

Many factors have been postulated to explain the pathogenesis of this disease, and all of these occur in individual cases. An additional point has been made that septic emboli to the gastric wall may be an etiologic factor in some spontaneous perforations.

Bibliography

1. Arnold, Gayle G.: Perforation of the Stomach in the Neonatal Period. J. Pediatrics, **46**:276, 1955.
2. Beattie, J. W. and K. E. Bohan: Perforation of Gastric Ulcer in Premature Newborn with Operation and Survival. Am. Surg., **18**:1146, 1952.
3. Braunstein, H.: Congenital Defect of the Gastric Musculature with Spontaneous Perforation. J. Pediatrics, **44**:55, 1954.
4. Burnstein, Jay, M.D., Pathologist, Children's Hospital of Michigan: Personal communication.
5. Fomon, S., G. Lowe and H. DeLeeuw: Idiopathic Rupture of the Stomach in Newborn Infant. Am. J. Dis. Child., **88**:234, 1954.
6. Green, Wallace W. and Don F. Gose: Perforation of the Stomach in the Newborn; Report

of Two Cases with Necropsy Findings. Am. J. Dis. Child., **85**:47, 1953.

7. Herbert, Peter A.: Congenital Defect in the Musculature of the Stomach with Rupture in a Newborn Infant. Arch. Pathology, **36**: 91, 1943.
8. Johnson, C. M.: Spontaneous Rupture of the Stomach in the Newborn. Boletin de la association Medica Nacional de la Republica de Panama, **14**:145, 1951.
9. Kiesewetter, William B.: Spontaneous Rupture of the Stomach in the Newborn. J. Dis. Child., **91**:162, 1956.
10. Kellogg, Hoston G., Sol. M. Abelson and Forest A. Cornwell: (Survival) Perforation of the Stomach. J. Pediatrics, **39**:357, 1951.
11. Lee, W. E. and J. R. Wells: Perforation in Utero of a Gastric Ulcer. Am. Surg., **78**:36, 1923.
12. Leger, J. L., P. M. Ricard, C. Lenord and J. Piette: Union Med. Canada, **79**:1277, 1950.
13. MacGillivray, P. C., A. M. Stewart and MacFarlande: Rupture of the Stomach in the Newborn Due to Congenital Defects in the Gastric Musculature. Arch. Dis. Child., **31**: 56, February 1956.
14. Mann, Lawrence S., Irwin A. Kallen, August Tomask, Friedman: Rupture of the Stomach in the Newborn Infant with Survival. Surg., **37**: June, 1955.
15. Moore, Marcus: Spontaneous Rupture of the Stomach in Infants. U. S. Armed Forces Medical Journal, **8**: February 1957.
16. Musser, Harvey H.: The Etiology of Rupture of the Stomach in the Newborn. Ohio State Medical Journal, **52**:838, 1956.
17. Northway, R. O., R. H. DeLano and A. M. Clayton: Perforation of the Stomach in the Newborn Infant. Surg., **35**: June, 1954.
18. Pendergrass, E. P. and R. E. Booth: Report of a Case of Ruptured Stomach in an Infant Three Days Old. American Journal. Roent. and Rad. Therapy, **56**:590, 1946.
19. Ross, Maurice, P. S. Hill, Jr. and C. M. Haas: Neonatal Rupture of the Stomach. J.A.M.A., **146**:1313, 1951. Second Survival.
20. Soto Pradera, Emilio, Juan Silverio Latour, Jose R. Montaloo and Tralerio Tuste: Rupture of Hollow Viscera in the Newborn. Revista Cubana de Pediatria, **29**:15, 1957.
21. Tudor, R. B.: Peptic Ulcer in Infancy and Childhood. Minn. Med., **33**:57, 1950.
22. Vargus, Lester L., Sheldon M. Levin and Thomas V. Santulli: Rupture of the Stomach in the Newborn Infant. Surg., Gynec. & Obst., **101**:417, 1955.
23. Whittico, James M.: Perforation of Duodenal Ulcer and Rupture of Stomach; Report of Two Cases in Newborn Infants with Survival Following Closure. Case I o.k. Arch. Surg., **73**:179, 1956.
24. Wright, L. and B. Scott: Perforated Gastric Ulcer in a Newborn Infant. J. Pediatrics, **37**: 905, 1950.