INTRODUCTION

Neonatal gastric perforation (NGP) is a rare life-threatening condition that usually presents within the first week of life. It often occurs without any apparent precipitating event, after which patients deteriorate rapidly. Gastric perforations can also occur in the setting of necrotizing enterocolitis (NEC), distal obstruction, or secondary to trauma usually as the result of gastric tube insertion. Sleeve gastrectomy can be a possible therapeutic option for multiple neonatal gastric perforations.

KEYWORDS
multiple gastric perforations, neonate, preterm, sleeve gastrectomy

CASE REPORT

A 33-week preterm male of birth weight 2000g (Between 50th and 75th centile; Fenton preterm growth chart) was born by emergency lower segment cesarean section for ruptured ovarian cyst to a 27-year-old mother with APGAR scores of 4/10 and 8/10. He was admitted to the neonatal intensive care unit (NICU) shortly after birth due to poor respiratory efforts and managed for respiratory distress syndrome. Following this, he developed refractory septic shock on day two and was kept under mechanical ventilation and inotropes support for 6 days. On the sixth day of life, breastfeeding was started, but he developed progressive gastric distension, poor sucking, and lethargy making enteral feeding unfavorable. With suspicion of necrotizing enterocolitis, gastric decompression with a nasogastric tube (polyvinyl chloride 6 French) and intermittent...
suctioning were done along with continuous support of intravenous fluid and antibiotics. However, the condition of the baby was not improving, and he was referred to a tertiary center for further management on the fifteenth day of life.

At presentation, the baby was hemodynamically stable, however, was lethargic, in respiratory distress, with a nasogastric tube in situ, and had severe abdominal distention. An abdominal plain erect x-ray was done, which revealed pneumoperitoneum. (Figures 1 and 2) All of his blood investigations including an arterial blood gas analysis were normal except for raised leukocyte counts.

With suspicion of intestinal perforation secondary to necrotizing enterocolitis, an emergency exploratory laparotomy was performed. To our surprise, there were three punctate perforations (maximum size measuring 1×0.5 cm) along the greater curvature of the stomach at the distal end of the nasogastric tube. (Figure 3) Since there were multiple perforations with slough and a primary repair was unfavorable, thus a sleeve gastrectomy was performed which included surgical removal of part of the fundus and the body along the greater curvature with the resulting sleeve or tube-like structure. The stomach was then repaired in two layers; the inner layer through and through with vicryl 3–0 and the outer seromuscular layer with silk 3–0. (Figure 4) Distal small and large bowel were healthy and viable. In addition to the viable intestine, gestational age, weight, breastfeeding, and timing of perforation are against the diagnosis of necrotizing enterocolitis thus supporting gastric perforation.

The baby had an uneventful recovery after 4 days of admission to NICU (1 day in mechanical ventilation and inotropic support and 3 days in continuous positive airway pressure). On the fifth postoperative day, the baby started tolerating breastfeeding and started passing stool normally and was discharged on the seventh postoperative day. After 6 months of surgery, the patient is healthy, feeding well, gaining adequate weight, and has no complaints.

3 | DISCUSSION

Neonatal gastric perforation is a unique entity and is associated with a high mortality rate of 25%–100% with more predisposition in premature neonates.1,6,7 Preterm
and low birth weight neonates are at increased risk of ischemic episodes, such as hypotension and perinatal asphyxia, which may increase the risk of gastrointestinal ischemia, thereby resulting in higher morbidity and mortality of gastric perforation.8

Defects in the muscular layer of the gastric wall, especially among preterms, during ventilatory management for tracheo-esophageal fistula repair, hypoxic/ischemic necrosis and perforation, sepsis, duodenal/jejunal obstruction, use of the ibuprofen-paracetamol, necrotizing enterocolitis, excessive feeding are the reported causes of gastric perforation.7,9–14 In premature infants, owing to the fragility of the gastric wall, relatively minor traumatic events (insertion of nasogastric tube and/or gastric distension during bag-mask ventilation) may bring about a local gastric wall disruption and perforation.7 In the case of a punctate perforation, a traumatic factor should be considered, such as the use of gastric tubes.5 In our case, the baby was kept in mechanical ventilation along with nasogastric tube insertion for feeding, which might have led to the iatrogenic perforation on the background of the immature gut, owing to the prematurity of the child.

The clinical manifestation of neonatal gastric perforation includes abdominal distention, feeding intolerance, respiratory distress, poor activity, gastrointestinal bleeding, abdominal erythema, and hemodynamic changes such as shock.6 Respiratory distress and sudden abdominal distension have been reported as the predominant symptoms. In the study by Lin et al. including 15 patients with neonatal gastric perforations, massive pneumoperitoneum was a consistent radiographic finding, leading to a preoperative diagnosis of a perforated hollow viscus.2 In the study by Huang et al., which included 101 cases of surgically diagnosed neonatal gastric perforation, the most common perforation site was at the greater curvature in the cases with accurate recording of perforation sites, followed by the lesser curvature and the anterior wall of the stomach.9 As described, the presentation, radiological features, and the site of perforation were similar in our case too.

Once perforation is confirmed, immediate surgical laparotomy should be performed for early diagnosis of neonatal gastric perforation and advanced neonatal intensive care support can improve the prognosis.15 Gastrorrhaphy alone or combined with gastrostomy is the most common surgery done for NGP. Although spontaneous healing of gastric perforation has been observed in neonates after conservative management, urgent surgical repair of the perforation with debridement of the edges and primary closure of the perforation in two layers is the treatment of choice.16,17 Vigorous supportive measures, intravenous infusions, antibiotics, nasogastric suction, and vasoactive support are mandatory.18

Rarely, partial gastrectomy or subtotal gastrectomy is indicated.17,19 The major indication of sleeve gastrectomy is for bariatric interventions.20 However, sleeve gastrectomy has also been tried as a therapeutic option for multiple gastric perforations in neonates when there is adequate vasculature in the lesser curvature. Sleeve gastrectomy preserves the gastric chamber and maintains esophageal, gastric, and duodenal continuity compared with total gastrectomy, which has high morbidity and mortality.3 However, there is always a risk of intestinal obstruction owing to adhesions, stricture formation, internal hernia, delayed gastric emptying, and nutritional deficiencies.21

Preterm and LBW babies are at increased risk of mortality as compared to full-term neonates.6 In addition, studies have shown increased mortality with increasing size of perforation with perforation >1.5 cm being associated with poor outcomes.11,22 The baby in our case had 3 perforations, the largest being 1×0.5 cm, and had an excellent outcome after the procedure.

4 | CONCLUSION

Regardless of the cause, a timely diagnosis of gastric perforation must be made and surgical correction performed expeditiously to prevent significant morbidity and mortality. Although necrotizing enterocolitis is a common problem in premature infants, iatrogenic gastric perforation should be kept in mind while managing sick premature infants. Sleeve gastrectomy can be a feasible therapeutic option in multiple gastric perforations where primary closure is not possible.
AUTHOR CONTRIBUTIONS
Dinesh Koirala (DK) and Elisha Poddar (EP) involved in data collection and surgical therapy for the patient. EP, Suraj Shrestha (SS), Diphee Poudel (DP), Ritika Ranjan (RR), Niharika Pathak (NP), and Durand Singh Khadka (DSK) involved in writing—original draft preparation. Surendra Khanal (SK), Shailendra Pandey (SP), and Ramesh Khadayat (RK) involved in editing and writing. DK served as senior author and manuscript reviewer. All the authors read and approved the manuscript.

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DATA AVAILABILITY STATEMENT
All the necessary data and materials are within the manuscript.

CONSENT
Written informed consent was obtained from the patient's mother for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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