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Nasogastric Tube-Induced Gastric Perforation as a Rare Cause of Pneumoperitoneum in Premature Neonates: A Case Series Highlighting Individualized Approaches

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ABSTRACT

Nasogastric tube (NGT)-induced gastric perforation is an uncommon but serious complication in premature neonates, often presenting as pneumoperitoneum. This case series presents two preterm infants with similar initial presentations but contrasting management strategies and clinical outcomes. The first case involved a 30-week gestation neonate who developed abdominal distension while remaining hemodynamically stable. Radiography confirmed pneumoperitoneum, and conservative management was pursued with bedside glove drain insertion. The NGT was found to have perforated the greater curvature of the stomach in the X ray. After drainage, antibiotic therapy, and supportive care, the neonate recovered fully without requiring surgical intervention. The second case involved a 29-week neonate on presenting with progressive abdominal distension. Radiographic findings suggested pneumoperitoneum which persisted and progressed even after the bedside glove drain insertion, hence taken up for an emergency laparotomy, which revealed a full-thickness gastric perforation at the fundus caused by the NGT. Surgical repair was performed, and the patient recovered following antibiotic therapy and parenteral nutrition. These cases underscore the importance of individualized treatment strategies in NGT-related gastric perforation. Conservative management may be successful in stable neonates with limited contamination, while surgery remains necessary in cases with clinical deterioration or suspected sepsis. Early recognition, appropriate imaging, and careful NGT placement are essential for prevention and management. This series contributes to the limited literature guiding treatment in this rare neonatal emergency..

Keywords: Nasogastric tube, Gastric perforation, Premature neonate, Pneumoperitoneum, Neonatal surgery

1. INTRODUCTION

Nasogastric tube (NGT) insertion is a routine and essential practice in the management of neonates, especially in premature infants who require respiratory support, nutritional supplementation, or gastrointestinal decompression. Despite its widespread use and generally safe profile, NGT insertion carries risks of significant complications, including malposition, aspiration, and, rarely, gastrointestinal perforation. Among these, gastric perforation is a rare but life-threatening complication, particularly in preterm neonates, whose gastrointestinal tract is anatomically and physiologically more vulnerable to trauma and ischemia [1].

The incidence of neonatal gastric perforation (NGP) remains low but is associated with high mortality, especially when diagnosis or surgical intervention is delayed. The causes of NGP are often multifactorial and may include spontaneous perforation, ischemic injury, mechanical ventilation, vigorous resuscitation, and iatrogenic trauma from medical devices like NG tubes [2]. Premature neonates are at particular risk due to reduced gastric wall perfusion, immature muscular layers, and fragile mucosal integrity.

Iatrogenic gastric perforation, specifically caused by NG tubes, has been increasingly recognized as a distinct clinical entity. A retrospective review by Kamupira (2017) identified nine cases of gastric perforation attributed to NG tube insertion in neonates, all of whom presented with pneumoperitoneum and were initially suspected to have necrotizing enterocolitis (NEC). Interestingly, NEC was ruled out during laparotomy, confirming that the perforations were most likely due to direct mechanical injury from the NG tubes [1].

Pathophysiologically, NG tube-induced perforation may occur via several mechanisms. Traumatic perforation is typically associated with forceful or incorrect insertion, especially in very low birth weight (VLBW) infants. In these patients, the thin gastric wall may be unable to withstand even minor pressure or manipulation. Furthermore, repeated insertions or repositioning of the NG tube without adequate radiographic confirmation of placement can increase the risk of mucosal injury and eventual perforation [3].

Diagnosis is often made radiographically, with the presence of free air in the peritoneal cavity (pneumoperitoneum) being a hallmark sign. However, distinguishing NG tube-related perforation from other causes, such as NEC or spontaneous gastric perforation, can be clinically challenging. In a recent quality improvement study, Huang et al. (2025) emphasized the importance of radiographic verification of NG tube placement and staff education to reduce the incidence of complications. The study demonstrated a significant improvement in proper tube placement after implementing a protocol-driven intervention [4].

Management of gastric perforation depends on the severity of the presentation and the neonate's overall condition. Hemodynamically stable infants with localized perforations may be candidates for conservative management, including peritoneal drainage and supportive care. Conversely, exploratory laparotomy remains the gold standard in neonates with diffuse peritonitis, hemodynamic instability, or diagnostic uncertainty. A case series by Gasparella et al. (2011) reported that surgical repair was necessary in infants with full-thickness gastric perforation, with one case requiring splenectomy due to the extent of damage [5]. We report a series of 2 such cases which were managed by differential approaches.

2. CASE REPORTS

Case Report 1: Conservative Management with Glove Drain in a 30-Week Preterm Neonate

A preterm neonate, born at 30 weeks gestational age and admitted to the neonatal intensive care unit (NICU), was initially stabilized on continuous positive airway pressure (CPAP) for respiratory support. Enteral nutrition via nasogastric (NG) tube was initiated according to standard feeding protocols. Sudden onset abdominal distension and bilious gastric aspirates were observed on day 4 of life. Despite these symptoms, the infant remained hemodynamically stable, with a soft but distended abdomen and no clinical signs of sepsis or peritonitis.

An abdominal radiograph revealed free intraperitoneal air consistent with pneumoperitoneum and an acutely bent NGT going towards left hemidiaphragm. Given the stable condition and absence of generalized peritoneal irritation, the surgical team opted for bedside conservative management via glove drain insertion. Under sterile conditions, a small incision was made in the right lower quadrant, and a glove drain was placed for decompression. This revealed free air and a small amount of bilious fluid. The existing NGT was removed and a new NGT was inserted with proper measurement protocol with additional radiological guidance.

The neonate was kept nil per oral and commenced on broad-spectrum intravenous antibiotics. Clinical progress was closely monitored. Over the subsequent days, abdominal distension resolved, and serial imaging showed resolution of pneumoperitoneum. Enteral feeds were gradually reintroduced and well tolerated. The patient recovered fully without further surgical intervention. This case supports the efficacy of minimally invasive, conservative drainage techniques in selected stable neonates with isolated gastric perforation and limited peritoneal contamination.

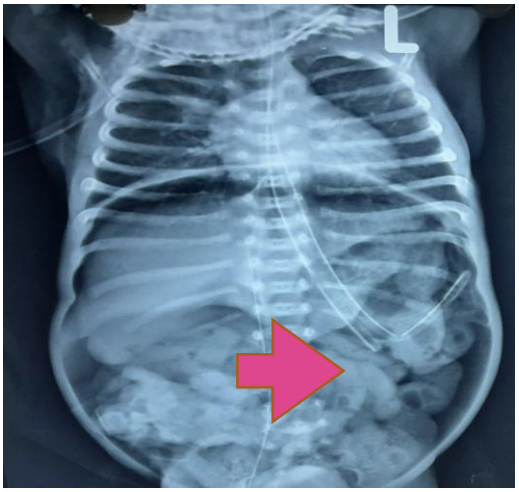

Fig 1- depicting Xray abdomen - showing air under diaphragm and NG tube kinking and tip seen towards the left hemidiaphragm, across the greater curvature of stomach

Fig 2- Showing transillumination test positive indicating pneumoperitoneum

Case Report 2: Surgical Repair via Laparotomy in a 29-Week Preterm Neonate

A neonate born at 29 weeks gestation was admitted to the NICU and managed with non-invasive ventilation (NIV). Due to clinical immaturity, the neonate was maintained nil per oral, with an NG tube in place for gastric decompression. Sudden abdominal distension was noted on day 6 of life, accompanied by bilious vomiting. Clinical examination revealed a tense, distended abdomen, though cardiovascular parameters remained marginally stable.

An urgent abdominal radiograph demonstrated significant pneumoperitoneum, for which a bedside glove drain was inserted which resulted in transient reduction of abdominal distension. There was progression of abdominal distension with persistent pneumoperitoneum in the follow up imaging after 12 hours, for which surgical team attempted dilatation of drain tract with another transient resolution only for 4 hours, followed by recurrent distension. In view of progressive abdominal signs and the possibility of high grade ongoing leak from gastrointestinal tract, we proceeded with emergency exploratory laparotomy. Intraoperatively, a full-thickness perforation was identified at the fundus of the stomach, caused by the tip of the NG tube. No additional pathology was observed in the rest of the gastrointestinal tract.

The perforation site was freshened, and the stomach was repaired in two layers using 5-0 polygalactin sutures. The peritoneal cavity was thoroughly irrigated and drained. Postoperatively, the neonate was managed with total parenteral nutrition (TPN), intravenous antibiotics, and close monitoring. A gradual return to enteral feeding was achieved, and full recovery was documented. This case illustrates that in the presence of tense abdominal distension, suspected ongoing persistent contamination, or diagnostic uncertainty, formal laparotomy remains the definitive and appropriate intervention.

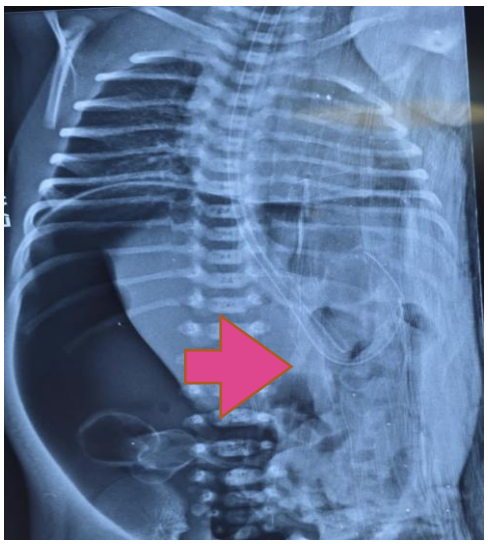

Fig 3- depicting massive pneumoperitoneum and arrow shows NG tube kinking and tip seen near fundus of stomach

3. DISCUSSION

Nasogastric tube (NGT)-related gastric perforation is an uncommon but life-threatening complication in premature neonates. The cases presented herein demonstrate two contrasting clinical trajectories—one managed conservatively and the other surgically—each with favorable outcomes. These cases contribute to the growing body of evidence that individualized management strategies based on hemodynamic status, clinical signs, and radiographic findings are critical in optimizing outcomes in this vulnerable population.

The etiology of gastric perforation in neonates remains multifactorial, with prematurity, low birth weight, and iatrogenic injury from feeding or decompression tubes being among the most commonly implicated risk factors. In both presented cases, the neonates were born preterm (30 and 29 weeks gestation, respectively), and gastric perforation was attributed to mechanical trauma from the NGT. The fragility of the neonatal gastric wall, particularly in premature infants, predisposes this population to such iatrogenic injuries, especially in the presence of respiratory support or manipulation of gastric tubes [6].

Case 1 demonstrates the successful use of conservative management with glove drain insertion in a hemodynamically stable neonate presenting with pneumoperitoneum secondary to NGT-induced gastric perforation. Conservative treatment in such cases, particularly when there is localized contamination and no signs of peritonitis, has been previously described. Elsayed (2023) reported a similar case of iatrogenic esophageal perforation in a preterm neonate managed non-operatively with favorable outcomes [7]. Similarly, Yong et al. (2016) described three cases of esophageal perforation due to NGT placement in extremely low birth weight infants, all of whom were treated conservatively with broad-spectrum antibiotics and parenteral nutrition, avoiding surgical intervention [8].

The rationale for conservative management rests on clinical stability, absence of widespread peritoneal signs, and radiological evidence suggesting a contained perforation. In the present case, peritoneal decompression with a glove drain effectively relieved intraperitoneal pressure, while supportive care facilitated mucosal healing. This approach minimizes surgical risks, particularly in neonates with limited physiological reserve.

Conversely, Case 2 necessitated surgical intervention due to progressive abdominal signs and clinical concern for possible necrotizing enterocolitis (NEC) or ischemic bowel. Exploratory laparotomy revealed a full-thickness perforation at the fundus of the stomach caused by the NGT. While NEC was excluded intraoperatively, the severity of presentation and persistence of pneumoperitoneum justified the surgical approach. This case reflects the well-established role of laparotomy in neonates exhibiting signs of clinical deterioration, uncertain diagnosis, or significant contamination.

Similar surgical cases have been documented in the literature. Kamupira (2017) reported nine neonates who underwent laparotomy for gastric perforations suspected to be secondary to NGT insertion. All presented with acute abdominal distension and radiologic evidence of pneumoperitoneum; NEC was ruled out intraoperatively, and NGT-related trauma was deemed the most likely cause [1]. Similarly, Vacaru et al. (2023) detailed a case of recurrent gastric perforation in a preterm infant, managed through serial laparotomies due to repeated dehiscence of the primary repair site, reinforcing the challenges of surgical management in extremely premature neonates [9].

The literature further underscores the importance of radiographic confirmation of tube placement to prevent such injuries. Tarnowska et al. (2004) emphasized that displacement of the nasogastric tube, even in the absence of overt symptoms, should raise suspicion for gastrointestinal tract injury [3]. Preventive strategies are critical in mitigating the risk of this potentially fatal complication. The use of softer, silicone-based feeding tubes, strict adherence to insertion protocols, and routine radiographic confirmation of NG tube placement have all been shown to reduce the likelihood of gastric or esophageal injury [5]. Additionally, the angle and depth of NG tube insertion, as discussed by Diez et al. (2023), may serve as a predictive measure for early detection of malposition and potential perforation [10].

These cases illustrate that while surgical repair remains the gold standard in unstable neonates or when peritoneal contamination is significant, conservative management can be a viable alternative in select patients. Ultimately, early recognition, judicious use of imaging, and individualized treatment strategies based on clinical parameters are paramount.

4. CONCLUSION

Nasogastric tube-induced gastric perforation, though rare, poses a significant risk in premature neonates due to their fragile gastrointestinal anatomy. The contrasting outcomes in the two presented cases highlight the need for individualized management based on clinical stability, radiologic findings, and the extent of peritoneal contamination. Conservative management with bedside drainage can be effective in stable infants with localized perforation, while surgical intervention remains crucial for those with signs of systemic compromise or diagnostic uncertainty. Early recognition through imaging, and prompt multidisciplinary decision-making are essential to improving outcomes. Prevention of such a scenario by strict attention to NGT placement protocols, especially in VLBW newborns and newborns on CPAP/NIV whose gastric wall is already prone for barotrauma or mechanical trauma due to thinning. These cases reinforce the importance of clinical vigilance and tailored intervention strategies in managing neonatal gastric perforation effectively.

REFERENCES

[1] Kamupira S. Upper gastrointestinal perforation from nasogastric tubes in neonates. Arch Dis Child. 2017;102:A193.

[2] Abdulsalam M, Osuoji R, Ajai O. Neonatal gastric perforation: a report of 3 cases and literature review. J Neonatal Surg. 2016;8:19–24.

[3] Tarnowska A, Potocka K, Marciński A, Zieliński T, Kornacka M. Latrogenic complications due to the nasogastric and rectal cannula in neonates. Med Sci Monit. 2004;10 Suppl 3:46–50.

[4] Huang W, Ou C, He F, Hu G, Gao C, Yu X, et al. Improving the proper placement of gastric tube in the neonatal intensive care unit: A quality improvement project in China. Nurs Crit Care. 2025;30(2):e13277.

[5] Gasparella M, Schiavon G, Bordignon L, Buffo M, Benetton C, Zanatta C, et al. Iatrogenic traumas by nasogastric tube in very premature infants: our cases and literature review. Pediatr Med Chir. 2011;33(2):85–8.

[6] Abdullahi LB, Mohammad AM, Anyanwu LJC, Farinyaro AU. Two cases of neonatal gastric perforation. J Neonat Surg. 2015;4:34.

[7] Elsayed MG. Iatrogenic Esophageal Perforation in Preterm Neonate Managed Conservatively. Acad J Pediatr Neonatol. 2023;12:555911.

[8] Yong SB, Ma JS, Chen FS, Chung M, Yang KD. Nasogastric Tube Placement and Esophageal Perforation in Extremely Low Birth Weight Infants. Pediatr Neonatol. 2016;57(5):427–30.

[9] Vacaru A, Sharafeddin F, Maidan A, Moores D, Raymond SL, Mladenov GD, et al. Neonatal gastric perforation: Case report. J Pediatr Surg Case Rep. 2023;102675.

[10] Diez S, Bartos H, Siemes A, Gerleve H, Schock A, Besendörfer M, et al. The subdiaphragmatic angle of the gastric tube in neonates – a potential predictor for perforations? Klin Padiatr. 2023. doi:10.1055/a-2187-5404.