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Case Report

Gastric Duplication Managed with Mucosectomy and Gastric Repair: A Rare Case Report

Duplikasi Lambung Yang Dikelola dengan Mukosektomi dan Perbaikan Lambung: Laporan Kasus Yang Langka

Filza RA Aslam[1]*, Ibrahim Ismar[2], Tubagus OR Wahid[2], Andrea Valentino[3], Salamullah Salamullah[4], Viona Sabrina[5]
[1]Surgical Resident of Medical Faculty, Arifin Achmad General Hospital, Faculty of Medicine, Riau University
[2]Pediatric Surgeon, Surgery Department, Arifin Achmad General Hospital, Faculty of Medicine, Riau University
[3]Neurosurgery Surgeon, Surgery Department, Arifin Achmad General Hospital, Faculty of Medicine, Riau University
[4]Oncology Surgeon, Surgery Department, Arifin Achmad General Hospital, Faculty of Medicine, Riau University
[5]Medical Student of Medical Faculty, Arifin Achmad General Hospital, Faculty of Medicine, Riau University
Jl. Diponegoro 1, Pekanbaru, Riau 28156, Indonesia
**Correspondence author*
Email: filzarifqi@gmail.com

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Abstract

This case report aims to present the clinical presentation, diagnostic workup, surgical management, and outcome of a rare case of gastric duplication in an infant. Gastrointestinal duplication (GD) is a rare congenital anomaly accounting for 4–8% of all duplication cases, predominantly occurring in children. An 8-month-old female presented with a progressively enlarging abdominal mass, vomiting, and distension. Initial ultrasound months earlier showed a mass near the umbilicus, but the family pursued alternative treatments. Examination revealed a well-defined, rubbery cystic mass (8 × 5 cm). Sonography showed a septated cystic lesion, and a barium study demonstrated a filling defect. The patient underwent exploratory surgery with mucosectomy and gastric repair. Postoperatively, she received intravenous fluids, antibiotics, analgesics, and proton pump inhibitors. Despite transient vomiting and distension, by day seven, she gained weight and was discharged. Histopathology confirmed a benign gastric duplication cyst. At 11-day follow-up, she was thriving and feeding well. This case underscores the importance of early diagnosis and surgical intervention in GD to prevent complications and highlights favorable outcomes with timely management.

Keywords*:gastric duplications; gastrointestinal tract duplications; mucosectomy; pediatric surgery; congenital anomaly*

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Abstrak

Tujuan laporan kasus ini adalah untuk menyajikan gambaran klinis, penegakan diagnosis, penatalaksanaan bedah, serta luaran dari kasus langka duplikasi lambung pada seorang bayi. Duplikasi gastrointestinal (GD) merupakan kelainan kongenital yang jarang terjadi, mencakup sekitar 4–8% dari seluruh kasus duplikasi, dan sebagian besar ditemukan pada anak-anak. Seorang bayi perempuan berusia 8 bulan datang dengan keluhan massa perut yang semakin membesar, muntah, dan distensi. Pemeriksaan ultrasonografi beberapa bulan sebelumnya menunjukkan adanya massa di dekat umbilikus, namun keluarga memilih menjalani pengobatan alternatif. Pemeriksaan fisik menemukan massa kistik berbatas tegas dengan konsistensi kenyal berukuran 8 × 5 cm. Sonografi menunjukkan lesi kistik bersepta, dan pemeriksaan barium memperlihatkan adanya cacat pengisian. Pasien kemudian menjalani operasi eksplorasi dengan tindakan mukosektomi dan perbaikan lambung. Pascaoperasi, pasien mendapatkan cairan intravena, antibiotik, analgesik, serta inhibitor pompa proton. Meskipun sempat mengalami muntah dan distensi sementara, pada hari ketujuh berat badannya meningkat sehingga diperbolehkan pulang. Pemeriksaan histopatologi memastikan diagnosis kista duplikasi lambung jinak. Pada kontrol hari ke-11, pasien tampak sehat, menyusu dengan baik, dan mengalami peningkatan berat badan. Kasus ini menegaskan pentingnya diagnosis dini dan intervensi bedah pada GD untuk mencegah komplikasi, serta menunjukkan luaran yang baik bila ditangani tepat waktu.

Kata kunci: duplikasi lambung; duplikasi saluran pencernaan; mukostektomi; bedah anak; anomali kongenital

Introduction

Gastrointestinal tract duplications are rare congenital anomalies characterized by a spherical structure, presenting as a mucosal-covered muscle layer.[1] They can develop anywhere throughout the gastrointestinal tract, commonly occurring in the ileum (35%). Gastric duplications (GD) are particularly uncommon, comprising only 2–9% of all gastrointestinal duplications.[2] They are most frequently located along the greater curvature of the stomach. With an incidence rate of 17 cases per million people[3], GD cysts are seldom diagnosed in the adult population and happen more commonly in young children, who may present with symptoms of abdominal pain, gastric outlet obstruction, or a palpable abdominal mass.[4]

Several theories have been proposed to explain the pathogenesis of gastric duplication cysts (GDC), such as bowel recanalization defects, persistence of embryonic diverticula, intrauterine strokes, incomplete twinning events, and defects in notochord formation.[5,6] Given the rarity of these lesions, each reported case contributes valuable insight into their clinical presentation and management. To the author's knowledge, although GD cases are rare, most reports in the literature describe surgical resection of the duplicated gastric tissue as the definitive treatment. This recommendation stands even for asymptomatic or incidentally discovered lesions.

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The rationale is twofold. First, it eliminates the risk of developing future complications such as obstruction, bleeding, or perforation. Second, and more critically, it addresses the small but significant risk of malignant transformation within the cyst.[7]

However, the mandate for complete resection presumes that the duplication is anatomically distinct and can be safely excised without harming to adjacent organs. The literature is less clear on the optimal management strategy when a duplication cyst is densely and inseparably fused to a vital structure. This presents a formidable surgical dilemma: does the surgeon risk a potentially devastating iatrogenic injury to resect the benign cyst, or is there a safer, organ-preserving alternative? The novelty of this report does not lie merely in the documentation of a rare disease, but in its detailed account of a successful pancreas-sparing mucosectomy for a cyst congenitally fused to the pancreas—a clinical scenario that forces a departure from the standard of care.[8] Therefore, this report aims to detail the clinical features, diagnostic evaluation, surgical approach, and postoperative outcome of a rare case of gastric duplication cyst firmly adherent to the pancreas, managed successfully with mucosectomy.

Case

We reported a case of an 8-month-old female baby named R.G from Bandar Sari Village, Siak Kecil Sub-district - Bengkalis, Riau, who was admitted to the Arifin Achmad Regional Public Hospital (RSUD AA) with a chief complaint of vomiting that had been present for the past four months, occurring after the consumption of formula milk. When the symptoms first appeared, the patient was brought to Siak Regional Public Hospital, where an abdominal ultrasound revealed a mass approximately the size of a marble located in the upper left abdomen near the umbilicus. However, instead of pursuing further medical treatment, the family opted for traditional alternative therapy. The mass subsequently enlarged to approximately the size of a chicken egg, and the vomiting persisted. The patient was then brought back to Siak Regional Public Hospital and referred to RSUD AA for advanced treatment. Additional complaints included recurrent episodes of fever, but there were no issues related to the digestive, urinary, or respiratory systems beyond what was already described. There was no prior history of similar complaints. The patient also had no history of allergies, asthma, or other congenital anomalies. Likewise, there was no family history of similar conditions or congenital disorders. The patient's mother was 32 years old at the time of pregnancy, which was monitored through three antenatal care visits.

The patient was delivered vaginally at 35 weeks' gestation, with a birth weight of 2000 grams. On abdominal examination, the abdomen was distended, with signs of a darm-contur, bulging in the left upper quadrant abdominal region, increased bowel sounds, palpable mass on

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the epigastric and umbilical regions without any muscular defense, and tympanic percussion on all abdominal areas. Further palpation of the bulging area in the left upper quadrant revealed a fixed, cystic, rubbery mass measuring approximately 8 x 5 cm. A blood workup performed on November 4th, 2022, revealed the following results: hemoglobin 8.7 g/dL, leukocytes 13.95 × 10^3/µL, platelets 615 × 10^3/µL, hematocrit 28.2%, prothrombin time (PT) 12.6 seconds, activated partial thromboplastin time (APTT) 25.0 seconds, and albumin 4.1 g/dL. On November 5th, 2022, additional blood chemistry tests showed: C-reactive protein (CRP) 11.3 mg/L, albumin 3.6 g/dL, AST 81 U/L, ALT 37 U/L, random blood glucose 75 mg/dL, urea 24.0 mg/dL, creatinine 0.33 mg/dL, sodium 138 mEq/L, potassium 5.4 mEq/L, and chloride 111 mEq/L.

Ultrasonography (Figure 1) demonstrated a large, predominantly anechoic cystic lesion with thin internal septations adjacent to the stomach. The cyst wall appeared slightly layered, suggestive of a gut signature typically seen in enteric duplication cysts, thereby helping to differentiate it from other intra-abdominal cystic masses. To further evaluate these findings and better delineate the anatomical relationships, a fluoroscopic barium study was subsequently performed to assess for possible communication with the gastrointestinal tract and to support the working diagnosis.

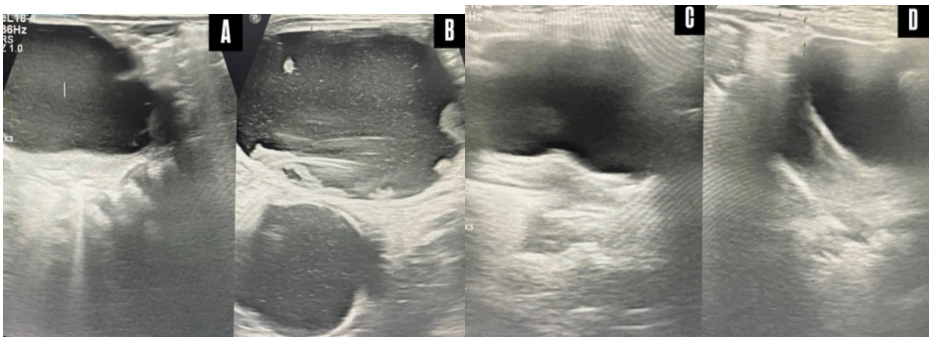

Figure 1 Abdominal ultrasound results on November 25th, 2022
(A, B) Transverse section shows a large, thin-walled, anechoic cystic structure with little internal echogenicity, adjacent to the bowel; **(C, D)** Longitudinal section shows the extent of the cyst relative to the surrounding structures, supporting the suspicion of a duplication cyst.

The fluoroscopic (Figure 2) series demonstrated progressive filling of the true stomach and duplicated gastric segment with barium contrast, without evidence of obstruction or narrowing in the distal gastrointestinal tract. The images showed a large extrinsic impression along the greater curvature caused by the adjacent non-communicating cystic mass. These sequential radiographs confirmed both the anatomical origin of the lesion arising from the gastric wall and its functional impact, producing significant mechanical compression on the gastric lumen, thereby explaining the patient's symptoms of intermittent gastric outlet obstruction.

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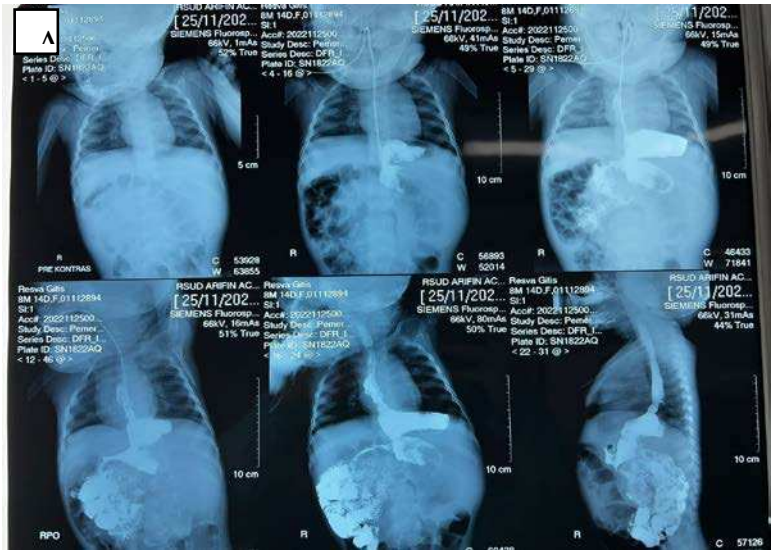

Figure 2 Serial fluoroscopic images obtained on November 25th, 2022, demonstrating contrast progression within the stomach and duplicated segment
(A) Immediate (0 min) post-contrast administration; **(B)** 5 minutes; **(C)** 10 minutes; **(D)** 15 minutes; **(E)** 20 minutes; **(F)** 30 minutes. These images illustrate delayed contrast transit, consistent with partial obstruction due to the duplication cyst.

In preparation for surgery, comprehensive preoperative stabilization was first performed. This phase encompassed critical resuscitative measures for an 8-month-old infant who was severely undernourished and exhibited signs of chronic illness. These measures included intravenous fluid rehydration to correct volume depletion from prolonged vomiting, packed red blood cell transfusion to manage anemia (Hb 8.7 g/dL) likely resulting from inadequate nutrition and chronic inflammation, and prophylactic antibiotics (Ceftriaxone) to reduce the risk of infection in this vulnerable patient.

An exploratory laparotomy with mucosectomy and gastric repair was performed on December 5th, 2022 (Figure 3). Under general anesthesia and appropriate aseptic precautions, a transverse abdominal incision was made, revealing a distended abdomen. Exploration identified two interconnected and distended gastric structures. A small incision on one of these released approximately 150 cc of clear gastric fluid, confirming the mass effect of a non-communicating cyst. Further dissection revealed that the duplication cyst was densely adherent and inseparable from the body and tail of the pancreas, representing a congenital fusion likely sharing a common seromuscular layer.

Given the pancreas's fragile, enzyme-rich nature and the high risk of complications such as pancreatic fistula, pseudocyst formation, pancreatitis, or severe hemorrhage, the surgical team prudently abandoned the standard plan for complete resection. Instead, they performed a meticulous mucosectomy—removing the entire mucosal lining of the cyst—thereby eliminating its secretory potential and oncologic risk while preserving the shared muscular wall to protect the

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pancreas. The gastric walls were then repaired to restore anatomical integrity. Hemostasis was secured, the operative field was irrigated, and the abdomen was closed in layers, successfully completing a procedure that elegantly balanced disease eradication with the preservation of critical surrounding structures.

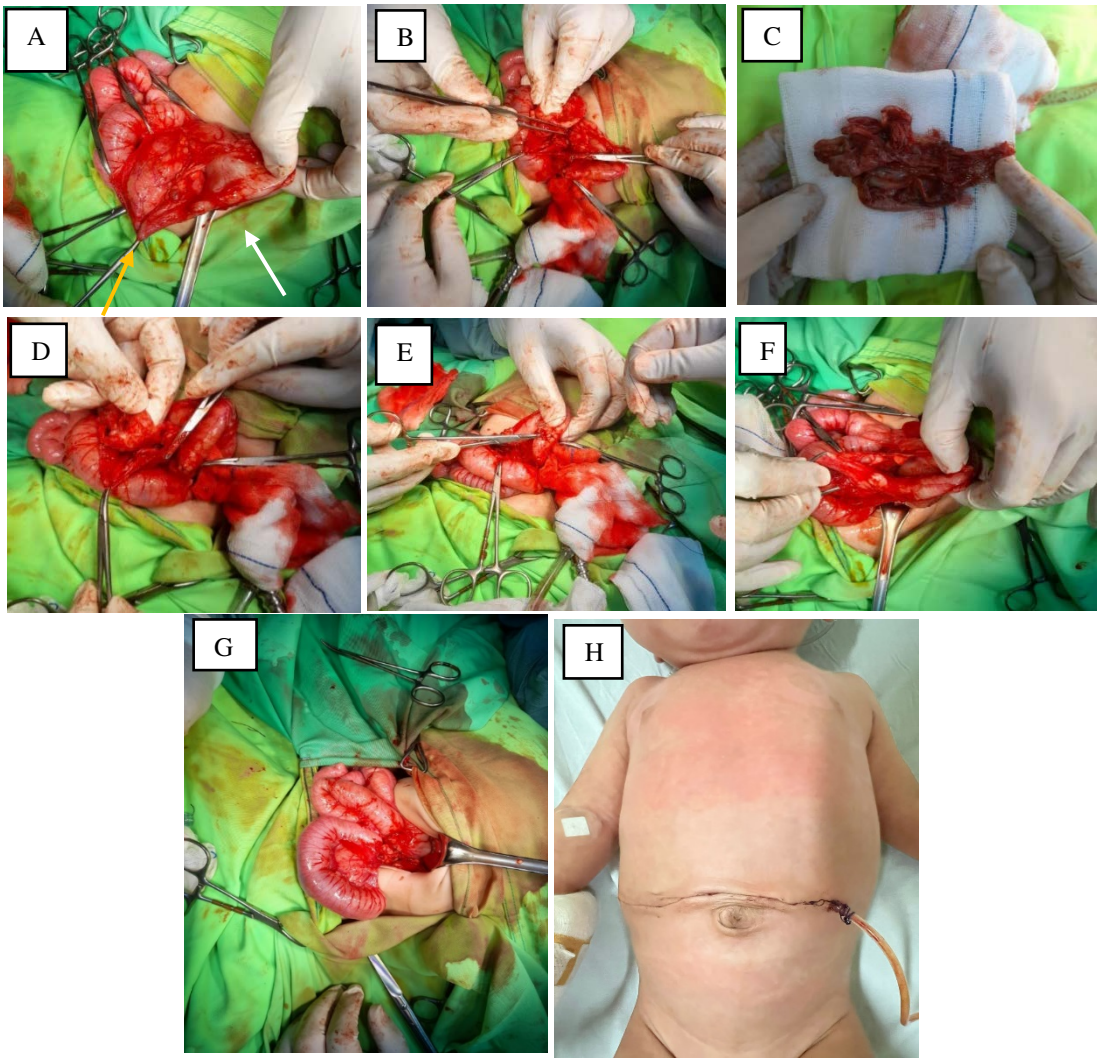

Figure 3 Surgical Procedure

(A) Identification of the gastric duplication during exploratory laparotomy, revealing two distinct gastric structures: the true stomach (indicated by the yellow arrow) and the duplicated gastric segment (indicated by the white arrow); **(B)** Mucosectomy initiated by excising the inner mucosal lining of the duplicated segment while preserving the seromuscular wall; **(C)** Excised mucosal layer of the duplicated stomach displayed on gauze; **(D)** Ongoing mucosectomy showing careful dissection near the gastric wall; **(E)** Gastric wall repaired in layers using absorbable sutures to ensure watertight closure; **(F)** Intraoperative finding showing the body and tail of the pancreas densely adherent to the posterior gastric wall; **(G)** Final intraoperative appearance of the stomach post-mucosectomy and reconstruction; **(H)** Immediate postoperative condition showing a midline incision, surgical drain in place, and a nasogastric tube (NGT) inserted primarily for gastric decompression to reduce intragastric pressure and protect the suture line, with cautious oral feeding initiated only after bowel function resumed.

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The surgical intervention, performed on December 5th, 2022, was a critical turning point in the management of this case. Initially planned as a complete resection of the gastric duplication—following standard guidelines to prevent complications and eliminate the risk of malignant transformation—the procedure was significantly modified due to intraoperative findings. Upon exploration, the duplicated segment was found to be inseparably fused with the body and tail of the pancreas. Attempting resection in this context posed a high risk of pancreatic injury, which could lead to severe complications such as pancreatic fistula, pseudocyst formation, hemorrhage, or acute pancreatitis. Recognizing these risks, the surgical team opted for mucosectomy, excising only the mucosal lining of the duplication while preserving the shared seromuscular layer and the adjacent pancreas. The gastric wall was then reconstructed in layers, and a nasogastric tube was placed for decompression to minimize tension at the repair site. The patient was kept nothing per oral (NPO) postoperatively and supported with intravenous dextrose-containing fluids, specifically D5 ½ NS at a maintenance rate of 430 mL per day, to ensure adequate hydration and caloric support during the period of restricted enteral intake. This case highlights the importance of surgical flexibility and clinical judgment in the face of intraoperative anatomical challenges.

On the second postoperative day, the patient continued to experience episodes of vomiting, though notably without fever, and was still able to pass stool, despite clinical signs of malnutrition. Vital signs were stable, with the patient alert, blood pressure at 102/66 mmHg, heart rate 124 beats per minute, respiratory rate 33 breaths per minute, temperature 36.7°C, oxygen saturation 100%, and body weight recorded at 4.3 kg. Abdominal examination revealed preserved bowel contour with a palpable bulge in the upper left quadrant, without distension or rigidity (darm steifung), increased bowel sounds, no muscular guarding on palpation, and tympanic percussion throughout the abdomen. The management plan at this stage included IV fluids (Ringer's Lactate 430 cc/24 hours), intravenous Ceftriaxone 200 mg once daily, Paracetamol 70 mg three times daily, Omeprazole 5 mg twice daily, and a loading dose of Metronidazole 60 mg.

A nasogastric tube (NGT) remained in place primarily for gastric decompression, addressing a transient postoperative ileus—a common, expected temporary impairment of bowel motility following major abdominal surgery. This is typically due to extensive intraoperative handling of the intestines, the effects of anesthesia, and the inflammatory response inherent to surgical trauma. The NGT served to evacuate gastric secretions and swallowed air, preventing distension, reducing nausea, and allowing the bowel to rest, while intravenous fluids ensured adequate hydration and electrolyte balance during this period of limited enteral intake. Although

breastfeeding was cautiously continued in parallel, it is important to note that the NGT was not used for feeding at this stage. Instead, careful oral intake was introduced as bowel function gradually returned, evidenced by subsequent passage of flatus and resolution of vomiting on the third postoperative day. This approach exemplifies standard conservative management, recognizing the ileus as a self-limiting phase in postoperative recovery rather than a complication, and supporting the patient until normal gastrointestinal motility was restored.

On the third postoperative day, the patient demonstrated significant clinical improvement. She exhibited no further episodes of vomiting or fever, was able to pass flatus—a key sign of restored bowel motility—and maintained adequate urine output, although she had yet to defecate. Vital signs remained stable, with a blood pressure of 102/66 mmHg, pulse rate of 119 beats per minute, respiratory rate of 30 breaths per minute, temperature of 36.7°C, oxygen saturation of 100%, and a body weight of 4.3 kg. Abdominal examination revealed the presence of "darm contour without distension," indicating visible intestinal peristaltic movements beneath the abdominal wall without accompanying abnormal swelling or tension. This finding suggested that bowel peristalsis was active and that there was no evidence of obstructive distension or paralytic ileus. Additional physical findings included normal bowel sounds, absence of muscular guarding upon palpation, tympanic percussion throughout the abdomen, and a surgical wound that was dry and without signs of leakage.

The management plan at this stage comprised maintaining the abdominal drainage, administering breast milk feeds at 30 cc every three hours, and continuing intravenous fluid therapy with Ringer's Lactate at 430 cc per 24 hours. Pharmacologic support included Ceftriaxone 200 mg once daily IV, Paracetamol 70 mg three times daily IV, Omeprazole 5 mg twice daily, and a loading dose of Metronidazole 60 mg. These collective observations and interventions underscored a favorable postoperative course, supporting the gradual reintroduction of enteral nutrition while ensuring adequate antimicrobial coverage and symptom control.

On the seventh postoperative day, the patient exhibited no complaints of vomiting or fever, was able to pass flatus, and continued breastfeeding without difficulty. On clinical examination, the patient was alert, with stable vital signs: blood pressure 102/66 mmHg, pulse rate 128 beats per minute, respiratory rate 30 breaths per minute, temperature 36.2°C, oxygen saturation 100%, and body weight 4.3 kg. Abdominal examination revealed no distension or rigidity, the surgical wound was dry and intact without signs of leakage, bowel sounds were normal, there was no muscular guarding on palpation, and percussion remained tympanic across all abdominal quadrants. Based on these reassuring findings, the treatment plan included continuing breastfeeding or breast milk substitutes, maintenance intravenous fluids (Ringer's

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Lactate 430 cc per 24 hours), along with Ceftriaxone 200 mg once daily IV, Paracetamol 70 mg three times daily IV, Omeprazole 5 mg twice daily, and a loading dose of Metronidazole 60 mg. Given her stable condition and satisfactory clinical recovery, the patient was subsequently discharged.

Histopathological analysis of the excised mass confirmed it to be a benign lesion of the stomach. At follow-up on the eleventh postoperative day, the patient presented with no complaints. Physical examination was unremarkable, and it was noted that she was exclusively breastfeeding with an increased body weight of 4.6 kg, reflecting a favorable postoperative course.

Discussion

The term "dietary tract duplication" was first used by WE Ladd in 1934.[9] Duplication cysts of the digestive tract are rare embryologic abnormalities that may occur anywhere along the gastrointestinal tract. The ileum was the most frequently affected, whereas gastric duplication cyst is highly uncommon, with an incidence of 4–8% among all dietary duplication cysts. Most gastric duplication cysts occur in the greater curvature of the stomach.[10]

There are 2 types of gastrointestinal duplication according to communication with the alimentary tract. The non-communicating type counts for about 80% of duplication cysts, while the communicating type is usually tubular.[10] The tube type is interlinked with the stomach, whereas the majority of cyst-type cases happen at the greater curvature of the stomach. Given that the cyst-type of gastric duplication is not connected with the stomach, it is not simply diagnosed by gastrointestinal angiography and gastroscopy.[3] The etiology of GDs is not well defined, but many theories have been proposed, including McLetchie's theory, Bremer's theory, split notochord, partial twinning theory, and intrauterine trauma.[1,11-13]

In our case, the patient was an 8-month-old female baby, consistent with literature stating that gastric duplication is known to be more predominant in females[14], the ratio is up to (8:1) [9], with the majority of cases being diagnosed in the pediatric population within the first 3 months of life and rarely after 12 years of age.[4] However, the etiology of this prevalence is uncertain to this day.

The clinical manifestations of gastric duplication are usually broad, such as nausea and vomiting, abdominal pain, palpable abdominal mass, weight loss[15], bloody stools[3], and bigger lesions can result in major mucosal swelling, causing more severe mucosal bleeding[16], but the lack of specific clinical symptoms, imaging, and laboratory results make the diagnosis even more challenging.[17,18] Mostly, patients with gastric duplication presented with all of the above

symptoms occur before 2 years of age, while some cases were found in adulthood.[6,16,19] In this case, the patient's main complaint was vomiting that persisted for 4 months, alongside palpable mass that was getting larger from time to time, consistent with GDs clinical manifestations. GDs are often related to other malformations, such as vertebral deformity and ectopic pancreas [14], however, in this study such comorbidities were not seen.

The diagnostic tests of GDs include radiography, ultrasound, computerized tomography (CT), and magnetic resonance imaging.[1] Prenatal detection of abdominal masses, particularly on the left upper abdomen region using ultrasound can be used as an initial screening for GDs.[18] Usually, clinical diagnosis depends on imaging examinations. On ultrasound examination, a GD is mostly revealed as a thick-walled cystic mass with a clear border. The internal hyperechoic layer and external hypoechoic layer (double wall sign) are typical ultrasonic features.[20] Fluoroscopy using barium study could show a filling defect due to compression from the mass.[21] Pathological examination is the definitive diagnosis of gastric duplication cysts.[1,9] The diagnosis of gastrointestinal duplications should include the following criteria: (1) these duplications are spherical structures located in any part of the gastrointestinal tract; (2) their inner surface is lined by typical gastrointestinal mucosa; (3) at least one coat of smooth muscle with muscularis propria surrounds the duplication cysts.[22]

The recommended treatment for gastric duplication is total resection once the disease is confirmed [1] due to the risk of severe complications such as malignancy.[7] Gastric duplications without symptoms are also considered to be removed to avoid malignant conversion.[22] If the cyst ruptures during surgery, it may lead to peritoneal metastasis and adenocarcinoma. Consequently, gastric duplication cysts should be resected completely even though their symptoms are similar to those of benign cysts.[22] Surgical resection can be performed by open and laparoscopic techniques.[1] Laparoscopic cyst removal is suitable for a simple cyst without severe inflammatory adhesion. However, laparoscopy-assisted resection by removing it through the navel is suitable for cysts with severe inflammatory adhesion.[3]

In this case, the gastric duplication was attached to the pancreas, leading to the decision to conduct a mucosectomy similar to the case reported by Liu, *et al*, in which the stomach was attached to the splenic hilum.[14] Afterward, the inter-gastric connection was severed, followed by gastric repair. Although the majority of GDs are benign, considering that GD may be related to serious complications such as obstruction, bleeding, perforation, and even malignant transformation, it is wiser to remove it completely.[23-25] Malignant transformations such as adenocarcinoma, neuroendocrine carcinoma, mixed adenocarcinoma with squamous carcinoma,

leiomyoma, and gastrointestinal stromal tumor have been reported in gastric duplication but seem to be uncommon.[1,10]

Conclusion

Gastric duplication is a rare congenital anomaly that is often difficult to diagnose due to its nonspecific clinical presentation and complex anatomical location. Definitive diagnosis typically requires surgical exploration combined with histopathological confirmation. In this case, where the duplication cyst was inseparably fused with the pancreas, a pancreas-sparing mucosectomy was performed to remove the pathological mucosal lining while preserving healthy pancreatic tissue. This tailored approach minimized morbidity and maintained organ function, leading to rapid recovery and improved nutritional status. This case highlights that radical resection is not always necessary; organ-preserving solutions such as mucosectomy offer safe and effective alternatives when vital structures are involved. Detailed reporting of such individualized techniques is essential, providing valuable references for managing similar anomalies and supporting future advancements in diagnostic precision and standardized, safer surgical strategies.

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