

ACUTE GASTRIC DILATATION DUE TO PYLORIC BAND, WITH ACUTE APPENDICITIS AND ILEOILEAL INTUSSUSCEPTION IN A 4-YEAR-OLD GIRL: CASE REPORT

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Abstract:

Acute gastric dilatation (AGD) is caused by mechanical and non-mechanical stomach processes. Acute appendicitis affects children and is treated with surgery. Intussusception is proximal bowel invagination against the distal bowel. Clinical findings of intussusception in the form of intermittent abdominal pain, a palpable mass in the abdomen, accompanied by wine-red stools. Due to significant morbidity and mortality, multiple-problem surgical emergencies require accurate diagnosis and treatment. A 4-year-old girl complained of a full stomach, abdominal discomfort, inability to flatus, vomiting, and fever, suggesting appendix perforation and widespread peritonitis. Radiographs show an intra-abdominal mass. Exploratory laparotomy surgery revealed gastric dilatation due to the pyloric band, acute appendicitis, ileoileal intussusception, grade 3 adhesions, and generalized peritonitis. Laparoscopic surgery revealed significant issues. The procedure was followed by partial gastrectomy, milking procedures, appendectomy, omentectomy and release of adhesions. Gastric histopathological examination showed the results of acute suppurative gastritis. Postoperatively the patient was hospitalized for nine days with improved condition. The complex pathogenesis is related to multiple cases in these patients. A continuous process is thought to occur between acute appendicitis and ER through the mechanism of intra-abdominal infection involving the omentum according to the anatomical location. Then hypertrophy of the lymphoid tissue of Peyer's plaque due to acute appendicitis is thought to contribute to intussusception. Clinical evaluation and appropriate management of surgical emergency cases with multiple problems are important to prevent further deterioration and complications.

Keywords: Acute Gastric Dilatation, Pyloric Band, Acute Appendicitis, Intussusception.

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INTRODUCTION

Acute gastric dilatation (AGD) is a rare condition that S.E Duplay first reported in 1833. Some literature discusses it, but there is no clear definition yet. AGD can be caused by mechanical and non-mechanical processes characterized by radiological findings of an enlarged stomach on plain abdominal radiographs or CT scans (Shaikh et al., 2021). The Gastric is a thick-walled organ with a rich vascular supply compared to other organs in the gastrointestinal tract. Disorders of

gastric vascularization in the emergency room can cause severe life-threatening complications such as ischemia, necrosis, perforation, emphysema, bleeding, electrolyte imbalance and shock (Shaikh et al., 2021).

Acute appendicitis is the most common surgical emergency in children, peaking in adolescence. The mortality rate is relatively high, especially in late diagnosed patients. Treatment delays can cause perforation, gangrene, periapendicular abscess mass, and peritonitis. Perforation in children occurs within 8-24 hours of initial presentation. The diagnosis of acute appendicitis is based on clinical examination, laboratory and radiological findings and a scoring system. It is often difficult to diagnose acute appendicitis in its early stages (Lee et al., 2013). There are several scoring systems for appendicitis, but each has its drawbacks. Such as in children, it can produce lower scores because it is uncooperative and less able to express their complaints. The scoring system cannot distinguish simple appendicitis from appendicitis with complications (Özsoy et al., 2017). The standard management of acute appendicitis is surgery, although many case reports suggest non-surgical therapy in uncomplicated cases (Rahardjo, 2022).

Intussusception is one of the most common causes of intestinal obstruction in infants and toddlers. The pathological abnormality is the invagination of the proximal intestine (intussusceptum) against the distal intestine (intussuscept). The highest incidence is in children aged 4 to 9 months with 90% idiopathic etiology and is more common in boys. Clinical findings of intussusception are intermittent abdominal pain accompanied by burgundy feces and a palpable mass in the abdomen. Intussusception can progress to ischemia, necrosis, and perforation within 8-12 hours if not treated immediately (Holcomb, 2019). We report a case of AGD due to pyloric band, accompanied by acute appendicitis, ileoileal intussusception, grade 3 adhesions and generalized peritonitis in a 4-year-old girl. Due to the high morbidity and mortality level, proper diagnosis and treatment are required.

Case. A 4-year-old girl was referred from a private hospital on March 7, 2022, with suspicion of generalized peritonitis due to a perforated appendix. Complaints of persistent flatulence for two days accompanied by pain and inability to flatus, fever, and non-bilious vomiting with every drink and eat. A history of 8 days prior to having a urinary tract infection was declared cured. There was no history of surgery or trauma to the abdomen.

The results of the general condition examination looked weak, and *compos mentis* consciousness, pulse 120 times/minute, respiration rate 20 times/minute, temperature 36.8o C, O2 saturation 98% of room air. Physical examination of the head, neck and thorax revealed no abnormalities. Physical examination of the abdomen revealed distension, weak bowel sounds, dullness to percussion, non-palpable intra-abdominal mass, and undulations. Figure 1 Rectal touch examination (RT) revealed smooth mucosa, strong anal sphincter tone, and rectal ampulla did not collapse; there was no mass or tenderness. After RT, no feces, blood, or mucus were found on the gloves. The patient had a urinary catheter, and a nasogastric tube (NG) decompressed with a yellowish discharge.



Figure 1. Preoperative patient clinical

Plain abdominal radiographs showed a superior intra-abdominal mass that shifted the bowel airflow to the inferior part (Figure. 2). Routine blood examination showed an increase in white blood cells $28.7 \times 10^9/L$, an increase in the percentage of granulocytes 77.9%, hemoglobin and platelets within normal limits. Electrolyte examination showed mild hyponatremia (131 mmol/L), potassium and chloride within normal limits. Blood glucose when within normal limits (112 mg/dL).



Figure 2. Plain abdominal radiographs

Patients were planned to be hospitalized with IVFD therapy KAEN 3B 16 TPM, Ceftriaxone 600 mg every 12 hours, Metronidazole 200 mg every 8 hours, Paracetamol 200 mg every 6 hours, and Omeprazole 20 mg every 12 hours. A few hours later, the patient complained of generalized abdominal pain. On abdominal examination, found tenderness throughout the abdominal area (muscular defans). The patient was planned for an exploratory laparotomy.



Source:

Figure 3. Gastric dilatation and partial gastrectomy

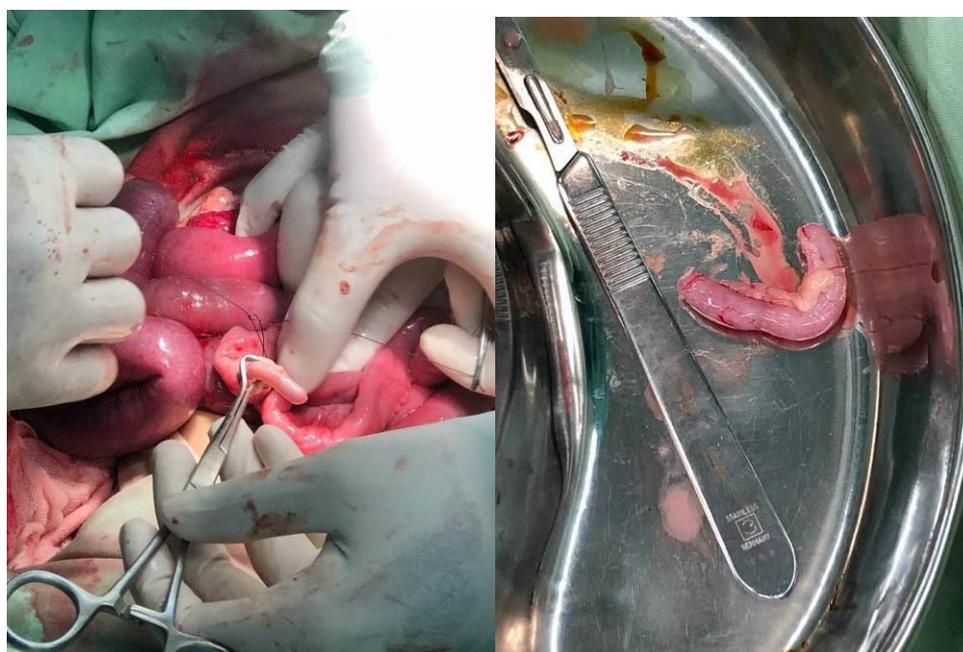


Figure 4. Retroperitoneal acute appendicitis

Operative findings revealed a pyloric band causing gastric dilatation to the suprasymphysis region (Figure. 3), appendicitis of the retroperitoneal appendix (Figure. 4), grade 3 adhesions, ileoileal intussusception, and generalized peritonitis. The action continued with the evacuation of gastric contents through the NGT, but it was ineffective. It was decided that a gastric incision (gastrostomy) for evacuation contained a lot of fluid mixed with food. The procedure was continued with partial gastrectomy, milking procedure, appendectomy, omentectomy, and release of adhesions. After the operation, the patient was fasted for 5-7 days and given fluids and total parenteral nutrition, antibiotics, and wound treatment. Drainage from the nasogastric tube obtained a greenish fluid, so gastric lavage was performed every 12 hours. During nine days of treatment, the patient's condition improved, and he could be discharged. The results of the

histopathological examination on March 14, 2022, showed gastric tissue that was predominantly necrotic with dense inflammation of acute inflammatory cells, the conclusion that the morphological picture was suitable for acute suppurative gastritis.

METHOD

The methods used to collect data in this case are interviews, observation and reviewing the patient's medical record. The first data obtained by in-depth interviews were asked to the patient's parents to get an idea of the patient's condition before and after the patient was in the hospital, the entire interview process was recorded by the author after obtaining the consent of the informant. The second data is obtained by direct observation when the patient is operated on and until the patient returns to the ward. The third data is obtained from the patient's medical record in which there is a patient report when first arrived at the emergency room, the operation report and the patient's medical resume report when in the room. These three data are very related to each other so that it helps the author in collecting data on the case report.

RESULTS AND DISCUSSION

Acute gastric dilatation is a rare phenomenon, and this condition can cause necrosis of gastric tissue with or without perforation. AGD can be caused by mechanical obstruction of the gastric tract as in postoperative strictures or adhesions, pyloric stenosis, volvulus, and superior mesenteric artery syndrome (Sakurai et al. 2020) Other authors also suspect this condition as a non-mechanical secondary functional impairment due to other diseases along the digestive tract such as pancreatitis, peptic ulcer, gallbladder disease, and appendicitis (Luncă et al., 2005). AGD has been reported in patients with coexisting conditions such as Prader-Willi syndrome and patients with cerebral palsy, but this condition is rarely seen in the healthy population (Etensel et al., 2005). Initial findings after a laparotomy incision showed gastric dilatation to the supra symphysis region with ischemic and necrotic tissue. Further evaluation revealed a pyloric band that entangles the stomach causing mechanical dilatation. Another finding was found in acute appendicitis, which was thought to play a role in forming the pyloric band.

The Gastric is an organ that is highly resistant to ischemia because of its rich blood supply and extensive intramural anastomoses. In cases of acute massive gastric dilatation, the intra-gastric pressure usually exceeds 30 mm Hg leading to a significant reduction in intramural blood flow, followed by necrosis and perforation. In most cases, necrosis of the greater curvature and gastric fundus requires immediate treatment (Luncă et al. 20085; Blat et al. 2017). Gastric dilatation in cases is quite massive, causing high intraluminal pressure, then suppressing vascularization, causing ischemia and necrosis of the fundus to the greater curvature.

Emesis is a typical symptom in 90% of cases. In some cases, with massive distention, the patient may complain of being unable to vomit. The complaint is caused by occlusion of the gastroesophageal junction by a distended fundus, which causes angulation of the esophagus against the right crux of the diaphragm resulting in a one-way valve (Luncă et al., 2005; Moslim et al., 2017) Generalized abdominal distension, abdominal pain, and signs of peritonitis in cases with perforation may be found. Pain can be felt lighter in intensity compared to the severity of abdominal distension (Luncă et al., 2005). Complaints in the case are flatulence (distention) that persisted for two days, accompanied by pain and unable to flatus, fever, and non-bilious vomiting every time he drank and ate. The severity of abdominal distention from clinical evaluation reflects the massive gastric dilatation. Cause intestinal passage disturbances are seen from the decrease in bowel sounds and the absence of defecation and flatus. Evaluation within a few hours of severe abdominal pain with muscular defans indicates peritonitis.

Abdominal radiographs examination can be done in 3 positions to assess the presence of free air and distended gastric (Jones et al., 2020). Plain abdominal radiographs may show air bubbles in the distended gastric that do not appear to cross the midline. If the obstruction is large, the small intestine may not be visualized. An ultrasound examination was performed to evaluate the dilated gastric. The body, antrum, and pylorus of the gastric can be visualized well in the right lateral decubitus position, with the right lobe of the liver as the acoustic window (Lamont et al., 2018). CT scan of the abdomen can be performed in stable patients, and this examination can clearly show gastric distension and the cause of distension. Radiological examination with contrast can be done using a water-soluble material because perforation is possible. Endoscopy is often required to exclude the presence of intra-luminal mechanical obstructions such as a tumor or peptic ulcer and can reveal the condition of the gastric mucosa (Luncă et al., 2005). The imaging examination performed in this case was only an abdominal photo due to the severity of the clinical condition that required immediate surgical management with indications that peritonitis had occurred. Abdominal radiographs showed a superior intra-abdominal mass which caused the distribution of intestinal air to be shifted to the inferior part.

The first treatment is to correct distension with a decompressed NGT, but a normal-sized NGT is often less efficient for decompression (Luncă et al., 2005). Installation of a large Faucher or Edlich tube can be performed under the supervision of an anesthesiologist in the operating room to obtain adequate gastric emptying. In addition, a decompression gastrostomy can be performed with fluid resuscitation and intravenous antibiotics (Moslim et al., 2017). The initial treatment, in this case, was the insertion of a decompressive NGT to reduce intra-abdominal pressure, followed by fluid administration, broad-spectrum antibiotics and a urinary catheter placement to monitor fluid balance.

Surgery can be performed if conservative therapy does not show improvement or if there are signs of gastric infarction (Mishima et al., 2012; Trindade et al., 2008). A further consideration is a management if there is gastric necrosis or perforation. The most commonly reported method is partial or total gastric resection, but depending on tissue viability gastrorrhaphy has also been reported to show improvement (Kim et al., 2011; Baldassarre et al., 2006). Surgical exploratory laparotomy was performed on indications of peritonitis, suspected to be caused by necrosis and perforation of hollow organs that caused intra-peritoneal inflammation. Evacuation of gastric contents in cases through NGT was ineffective due to massive dilatation, a gastric incision (gastrostomy) was performed for evacuation, and a lot of fluid mixed with food was found. It was decided for a partial gastrectomy to separate extensive ischemic and necrotic tissue. Histopathological examination of gastric tissue obtained morphological results suitable for acute suppurative gastritis.

The intra-operative evaluation found other findings in acute appendicitis with adhesions and ileoileal intussusception, which were suspected to be continuous. It contributed to gastric dilatation through the mechanism of intra-abdominal infection involving the omentum. Appendicitis is inflammation of the appendix caused by obstruction of the lumen of the appendix, with standard management through surgical appendectomy (Junga et al., 2018). The definition of the omentum is the fused fold of peritoneum, connecting the gastric and duodenum with other intra-abdominal organs. The greater omentum extends from, the greater curvature of the gastric and proximal duodenum, descending inferiorly through the transverse colon, jejunum, and ileum. The greater omentum is very mobile and moves with peristalsis of the intestine. In the process of intra-abdominal infection, the omentum also contributes, having the ability to isolate areas of the organ that are infected and necrotic. The greater omentum may attach to an inflamed organ, such as appendicitis. Tissue damage during the inflammatory process and peritoneal irritation alter the

homeostasis of fibrin deposition and lysis, as well as thrombin, which allows the omentum to adhere and separate infection from surrounding organs. The presence of adhesion is highly dependent on the balance of fibrin deposition and degradation (fibrinolysis) (Hu Q et al., 2020). Fibrinolysis and incomplete absorption of degradation products leave connective tissue scarring and adhesion formation (Herrick et al., 2021).

Adhesion of the omentum to the appendix, in this case, is thought to have contributed to the entrapment of the gastric pylorus through the formation of the pyloric band due to the anatomical positional relationship. A case study in children involving acute appendicitis, intestinal malrotation and total duodenal obstruction stated that fibrous adhesion at the duodenojejunal junction involving the omentum is one of the organs that play a role in the intra-abdominal inflammatory process. Although the mechanism is not described in detail in the report, variations in the location of the appendix may also be related. This condition is also associated with a mobile cecum so that the appendix can be in various locations. The position of the appendix is not fixed and varies from person to person, ranging from 1.7 to 2.5 cm below the terminal ileum. The most common location is dorsomedial to the fundus caecum or beside the ileal orifice in 2-3% of cases. The appendix is located retroperitoneally in 65% of cases and may descend into the iliac fossa in 31% of cases. The location of the appendix in the retroperitoneal space can be behind the terminal ileum, cecum, ascending colon, or liver (Bickell et al., 2006). Chan et al. (2003) reported a case of a male with perforated appendicitis with obstruction of the distal duodenum in the absence of nonrotation or malrotation of the bowel. Ueo et al. (1990) also reported a case of a male with duodenal obstruction and acute appendicitis with intestinal malrotation and fibrous adhesions due to an inflamed appendix in the duodenojejunal junction.

Another possibility is that the formation of the pyloric band, in this case, is thought to be due to a congenital abnormality. Anomalous congenital bands unrelated to a history of surgery, trauma, or peritonitis are a rare etiology of gastrointestinal obstruction in children, and their exact incidence is unknown (Etensel et al., 2005; Nourira et al., 2012). The etiology is uncertain, but it is not a secondary abnormality of embryological remains such as the omphalomesenteric duct or the vitelline vasa. The study by Akgur et al. showed that the most common location of the congenital band was between the ascending colon and the terminal ileum, as well as the ligament of Treitz and the terminal ileum (Erginel et al., 2016; Akgür et al., 1992). Obstruction can be caused by several mechanisms of bowel compression, partial volvulus, and entanglement of the bowel loop between the band and the mesentery. Maeda et al. reported a 17-year-old boy with a congenital band from the anti-mesenteric wall of the jejunum proximal to the ligament of Treitz.²⁷ Congenital bands do not originate from embryonic structures. Therefore their location can vary and co-occur at several locations (Sun et al., 2012; Kostic et al., 2013).

Intussusception is the invagination of the proximal intestine (intussusceptum) against the distal intestine (intussusciens). 90% of primary intussusception cases are idiopathic and no lead points are found, but hypertrophic Peyer's plaques can be found on the intestinal wall (Holcomb et al., 2019; Belongia et al., 2010). Secondary intussusception may have lesions identified as lead points (1.5-12%), the most common being Meckel's diverticulum, followed by polyps. There are several other lead points, such as appendicitis, hemangiomas, carcinoid tumors, foreign bodies, and lipomas (Holcomb et al., 2019). Intussusception and appendicitis are common, although rarely reported in the literature. The mechanism that precedes it is much debated, but it relates to the hypertrophy of Peyer's plaques. Infection in appendicitis initiates the enlargement of Peyer's plaque which is the basis for pathological abnormalities in intussusception.³¹ Intussusception in this case is thought to be related to the presence of acute appendicitis through the mechanism of Peyer's plaque lymphoid hypertrophy. Inflammation of the appendix, which is a lymphoid tissue,

also represents hypertrophy of other intra-abdominal lymphoid tissues, including Peyer's plaques, which play a role in the pathogenesis of intussusception. Min Kee reported the case of a 38-month-old boy with suspected acute appendicitis who underwent a CT scan showing an ileocolic intussusception with the appendix trapped in the intussusception. A histological examination of the appendix only showed an early inflammatory infiltrate. They concluded that patients with intussusception should be suspected of having an associated disease such as acute appendicitis (Howell et al., 2010)

Operative management is indicated for intussusception with partial response or failure of non-operative management (pneumatic and hydrostatic reduction), presence of lead points, signs of peritonitis, and radiological evidence of pneumoperitoneum. The laparoscopic approach is currently the first choice in some centers. However, it has contraindications, namely hemodynamic instability, peritonitis, pneumoperitoneum, and limited visualization in severe bowel distension. In the laparotomy procedure, the manual reduction is performed with milking procedures, namely movements such as milking to remove the invaginate. If manual reduction fails, an ischemic bowel is found, and there is a lead point, resection and anastomosis are required. If this is not possible, an ileostomy can be performed (Wang A et al., 2019). The treatment, in this case, was milking procedures to reduce the invaginate, and the procedure was followed by appendectomy, omentectomy, and release of adhesions.

CONCLUSIONS

AGD is a rare condition and can overlap with other diseases. Appropriate clinical evaluation in cases of multiple surgical emergencies is important, especially in cases with high morbidity and mortality rates. Simple investigations in plain abdominal radiographs can help direct the diagnosis. Installation of NGT decompression and administration of fluids can be done as initial management. If there are signs of peritonitis and increased intra-abdominal pressure, surgery should be carried out immediately to prevent further complications. The mechanism of adhesion of the omentum, major in appendicitis which continues to become fibrous adhesions, is thought to have involved entrapment of the pylorus through the formation of the pyloric band, causing AGD. Inflammation in appendicitis also causes hypertrophy of lymphoid tissue, especially in Peyer's plaque, which plays a role in intussusception in this case. Clinical evaluation and appropriate management in multiple surgical emergencies are important to prevent further deterioration and complications.

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