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ORIGINAL ARTICLE

Two Types of Gastric Volvulus In Children: Case Reports And Review of The Literature

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Abstract

Gastric volvulus (GV) is a rare pathology in children, and therefore such clinical cases cause certain difficulties not only in diagnosis, but also in treatment. However, this problem is a clinical reality in pediatric surgery and seems to be underdiagnosed because of its rareness. These patients are threatened by the development of irreversible ischemic disorders in the affected organs (not only stomach), with a high degree of probability, they may need to perform an organ-removal operation at late admission. This article presents two clinical observations of pediatric gastric volvulus of various types, with different etiopathogenesis.

Keywords: Gastric volvulus, Gastropexy, Wandering spleen, Splenopexy

Introduction

Gastric volvulus is a rare disease, characterized by abnormal laxity or absence of the supporting ligaments - gastrophrenic, gastrosplenic (usually persist), gastrocolic, gastrohepatic (lesser omentum) - leading to twisting of all or part of the stomach that may obstruct the gastric cavity [3]. This condition usually requires urgent surgical intervention and conservative methods (as positioning etc) only postpone the definitive surgery.

More often pediatric GV is diagnosed in early childhood. Alexandre Darani et all [1] described 21 children whose age ranged from 0.2 months to 4.3 years. Godshall D, et all [7] reported that 20% of all GV in pediatric cases were represented by neonates.

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Most often in the literature, there is a description of two types of gastric volvulus - organoaxial and mesenteroaxial [1-14]. Less

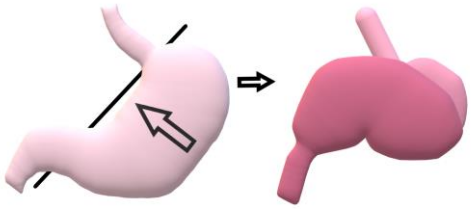

Figure 1: Organoaxial volvulus

common are references to the combined type [8, 15, 17]. Certain clinical signs distinguishing one type of volvulus from another have not been found in the literature.

Organoaxial volvulus (Fig.1) - inversion of the stomach along the longitudinal axis, connecting the cardia of the stomach and the pylorus. The antrum turns anteriorly upwards, and the fundus of the stomach descends backward. The greater curvature of the stomach rises to the anterior abdominal wall above the lesser curvature of the stomach, which descends posteriorly. Predisposing factors are the absence or loss of one or a few

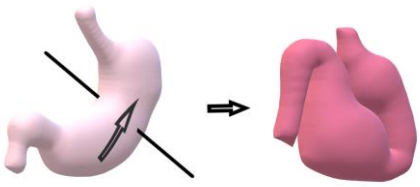

Figure 2: Mesenteroaxial volvulus

suspending ligaments – in children with congenital diaphragmatic hernia [11], trauma [10], etc.

The mesenteroaxial volvulus (Fig.2) of the stomach is a condition when the stomach is wrapped around its transverse axis. The antral section shifts to the cardiac. It is usually secondary to wandering spleen or congenital gastrocolic band anomaly [2], which could be after colectomy [9]. The frequency of vascular compromise in this type is low due to the rare incidence of complete (more than 360^0) rotation [12].

According to some authors [4, 8], mesenteroaxial GV is more common than organoaxial volvulus in the pediatric population (59% of GV), though others reported the prevalence of organoaxial in all children who were admitted with gastric volvulus [1].

Some patients have GV to a different extent which can manifest as chronic or subacute with incomplete or recurrent complete torsion of a stomach [1]. In an extremely torsed position, irrelevant to a type of gastric volvulus, blood circulation of the stomach is compromised, that in turn leads to ischemia and possible perforation of the gastric wall. The other adjacent organs are also compressed and their blood supply is restricted, which, in turn, may result in hemorrhage, pancreatic necrosis, and omental or splenic avulsion [11].

The clinical presentation of GV in children is not specific. Manifesting symptoms usually include acute abdominal pain, intractable vomiting, episodes of acute apnea associated with pallor, cyanosis, and hypotonia [1]. In several articles [1,5,6] the triad of Moritz Borchardt is reported as a classic which includes severe sudden epigastric pain, intractable retching without vomiting, and inability to pass a nasogastric tube. However, it is not always complete in pediatric patients [1].

Definitive treatment of acute gastric volvulus is only surgical. In some cases of chronic or incomplete GV it could be resolved spontaneously or with medical management (nasogastric tube decompression) [11,16].

However, acute forms and most of recurrent GV are indications for surgical intervention. The surgical procedure for organoaxial volvulus is derotation of the stomach (detorsion) and one of gastropexy (or all together as a triple) - esophagocardiopexy, phrenofundopexy or anterior gastropexy [1]. In certain circumstances gastrostomy could be considered as a fixating procedure [11]. More and more authors indicate the laparoscopic gastropexy as a good option [1, 3, 12, 13]. For mesenteroaxial volvulus, which caused by anatomic anomalies of the adjacent organs as wandering spleen or congenital diaphragmatic hernia, predisposing factor should be eliminated primary [2, 3, 17].

Case Report of Mesenteroaxial Volvulus

A 3-year-old girl was admitted with complaints, according to her mother, of the child's anxiety and intractable non-bloody vomiting. On palpation of the abdomen, in the right hypochondrium, the edge of the mobile abdominal mass was determined, the umbilical region was tender and achy, and no abdominal distension or rigidity was found. Plain radiography of the abdominal organs revealed a high intestinal obstruction with deformity of the stomach.

The nasogastric tube did not find any obstacles (the Borchardt triad was not complete in this case). During the esophagogastroscopy, the endoscope freely passed into the fundus of the stomach, where there was a large amount of mucus and fluid; it was not possible to pass the instrument into the body of the stomach due to compression from the outside. No signs of esophagitis were found. The ultrasound investigation discovered wandering spleen, no signs of free liquid inside the abdominal cavity (Fig.3). Taking into account the data of clinical and instrumental examination, indications for diagnostic laparoscopy were formulated, during which it was found that the spleen was located in the right hypochondriac region, immediately below the right lobe of the liver. The spleen was bluish in color, enlarged in size. With further exploration, most of the intestinal loops were located in the left half of the abdominal cavity. The ileocecal angle was located in the left hypochondrium, behind it the entire left subdiaphragmatic space was occupied by the small intestine. The stomach was found folded around its transverse axis, with the bluish ischemic distal half. The left dome of the diaphragm is thinned, prolapsing into the chest. After gastric detorsion and relocation of the spleen, meticulous exploration of organs was made. No signs of ischemic perforation or gastric wall thinning were found. There were no signs of circulatory disorders of the spleen. After laparoscopic detorsion of the spleen, it was noted that the latter has hypermobility in the abdominal cavity.

To fix the spleen and prevent the recurrence of gastric and splenic torsion, the peritoneum was cut longitudinally along the

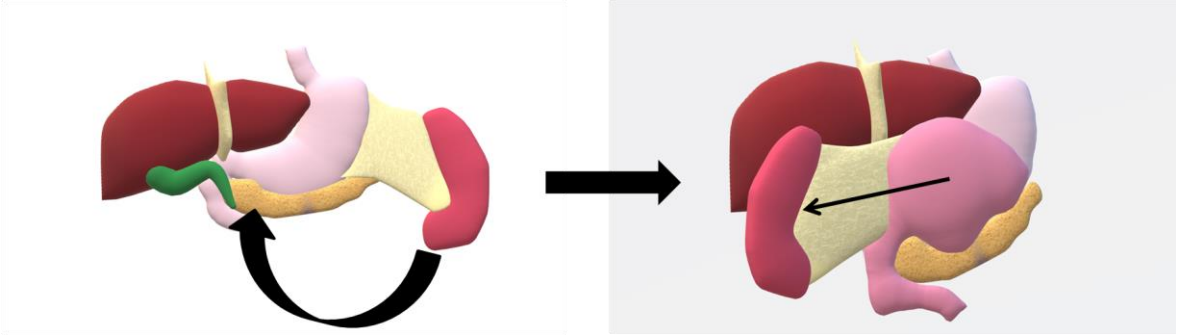

Figure 3: Mechanism of the gastric volvulus with wandering spleen

left lateral canal - an incision of about 8 cm, sheets of peritoneum were mobilized (Fig.4). The spleen is placed in the pocket created in the retroperitoneal space. The peritoneum was sutured with interrupted extracorporeal sutures Prolene 4-0 over the spleen.

There were no hemodynamic disorders of the spleen finally. On control examination, after a decrease of the pneumoperitoneum, it was proved, that the pathological mobility of the spleen was eliminated. No gastropexy was performed.

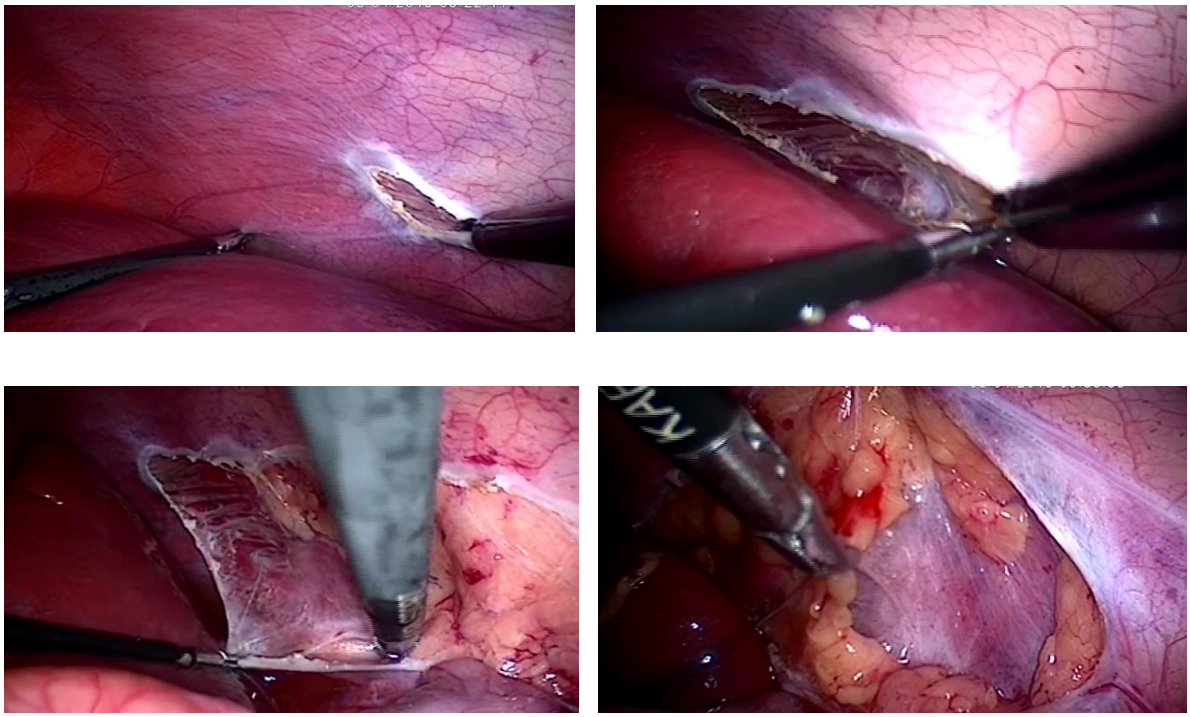

Figure 4: Creation of the retroperitoneal pocket for spleen

In the upper part of the subdiaphragmatic space, spleen was additionally fixed by plication of the diaphragm and parietal peritoneum with the creation of a barrier at the level of the upper pole of the spleen (Fig.5, 6).

Post-surgical diagnosis: Gastric volvulus due to wandering spleen. Eventration of the left diaphragm. Bowel malrotation.

In the postoperative period, ultrasound control of the abdominal organs was performed

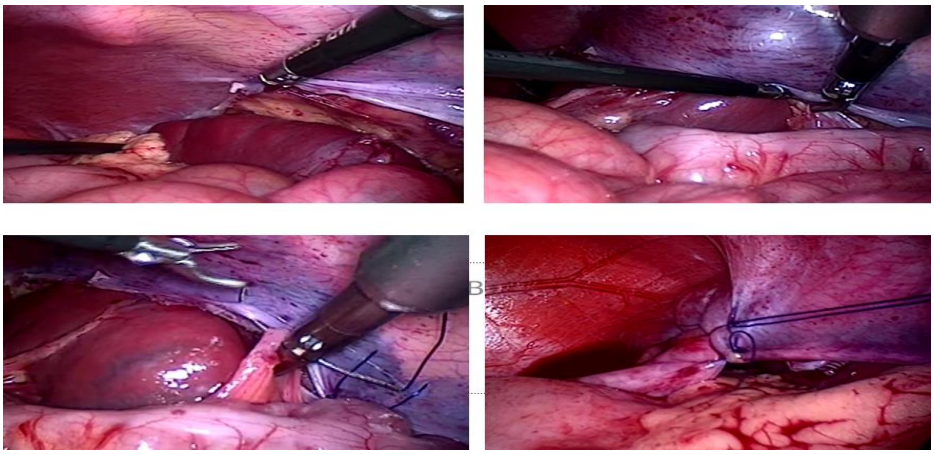

Figure 5: Placing the spleen into the retroperitoneal pocket. Suturing

and the spleen in the usual place, with dimensions of 86.7 * 33.3 mm. Duplex scanning of the splenic vessels showed the splenic vein with normal hemodynamic parameters (blood flow rate up to 28 cm/s), and a diameter of 3.5 mm at the level of the gate.

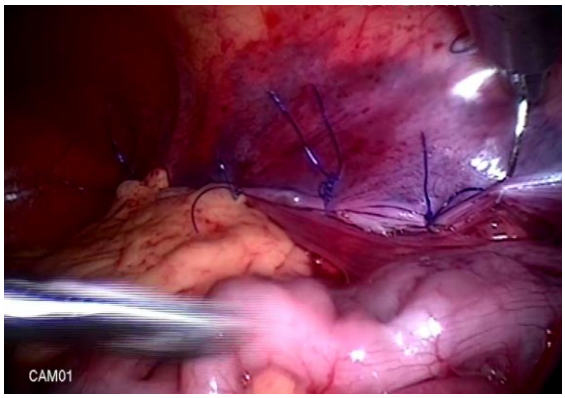

Figure 6: Final stage of splenopexy

The splenic artery was patent. Dopplerography revealed no disturbances in arterial and venous hemodynamics of the stomach. In the postoperative period, a course of antibacterial prophylaxis and symptomatic treatment were carried out. She was discharged home after 7 days without ongoing drug therapy.

Case Report of Organoaxial Volvulus

An 18-month-old boy presented with severe malnutrition with 6.5 kgs at presentation though his birth weight was 3 kgs.

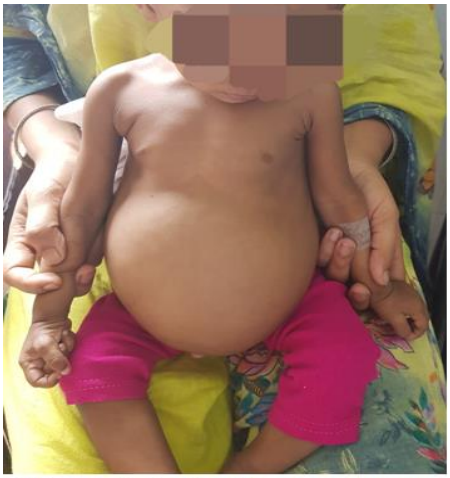

Figure 7: Patient's appearance at admission

He had very insignificant vomiting since birth though, which could give any clue, and the boy was otherwise playful and not irritable at all. He was exclusively breastfed for the first six months and weaning was similar to any other locally raised child of that age. Bowel habit was as usual for this age group. There was no urinary complaint either. On examination, the abdomen was significantly distended but there was no organomegaly or ascites to explain the distension (Fig.7).

Ultrasonography was inconclusive, hematologically the boy had 6.5gm/dl hemoglobin with hematocrit 25 and serum albumin was low. An upper GI contrast was advised which revealed features suggestive of organoaxial GV (Fig. 8).

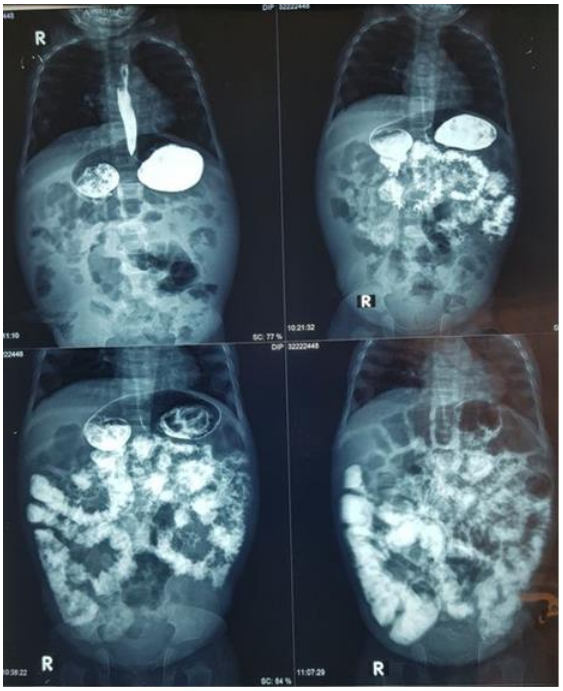

Figure 8: Upper GI contrast study results

Surgical correction was planned using an open laparotomy. There was organoaxial GV and the stomach was significantly dilated (Fig. 9). There was edematous small bowel with chyle exuding through the walls of the entire small bowel and the mesentery root was narrow causing a lymphatic obstruction (Fig.10), as it was supposed. There was the

enlargement of lymph nodes in the mesentery again due to outflow obstruction as the reason. No intraluminal obstruction, however, was detected and the liver was healthy-looking. The mesentery root was widened, the lymph node was taken for histopathology, and no tubercles were seen on the intestinal wall though. Gastropexy was performed. Postoperatively the boy had an uneventful recovery. He was advised to be fed coconut and its oil as a source of Medium Chain Fatty acid for easy absorption of dietary lipid and multivitamins along with daily exposure to sunlight. Histopathology revealed no pathology. At follow up after three months boy was gaining weight and was thriving well.

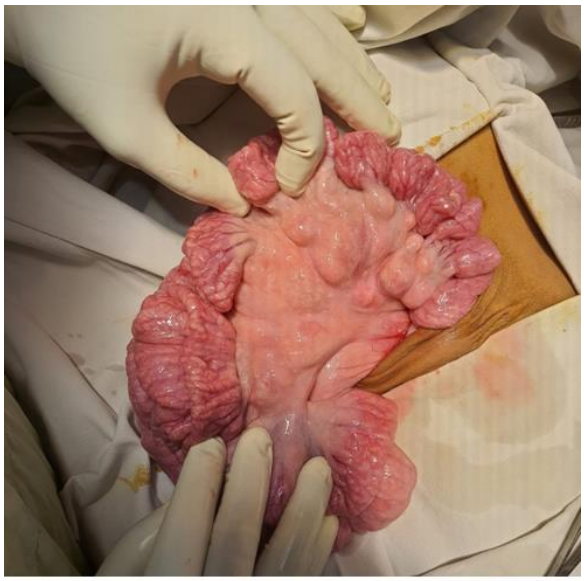

Figure 10: Signs of lymphatic obstruction

Discussion

The rare occurrence of GV in pediatric patients may mislead professionals who have never seen this entity. Early diagnosis and alertness in relation to this pathological condition will help to avoid complications. Whereas the diagnosis of GV in children is difficult but feasible, postoperative follow up measures are not defined and depends on many factors such as type of GV, type of performed surgical procedure and age of a patient [1, 14].

The modern meta-analysis [14] of 125 pediatric cases of pediatric GV revealed that esophageal stenosis is the most common pathology in postoperative period. Considering that, the necessity of fundoplication seems to be rational. However, terms and type of this procedure in group of patients with GV are undefined. Should it be simultaneous procedure or it requires specific indications? The retrospective study of 21 cases by Alexandre Daraniet all [1] demonstrated only 3 patients out of 21 who required fundoplication in postop period due to esophagitis. Therefore the majority of authors do not consider a fundoplication as initial mandatory procedure [1,16, 17]. Patients with the secondary GV are more likely to have normal esophagogastric motility [17].

Another unsolved question is a type of antireflux procedure in these patients. Some surgeons [1] performed an anterior gastropexy with reinforcement of the esophagogastric angle and in the other cases, an associated antireflux fundoplication was also met - Toupet [1] and Nissen [16, 17] methods for persistent gastroesophageal reflux disease.

Recurrence of GV, according to a metaanalysis [14], is a rare long-term complication and was met only in 1 patient out of 125.

In pediatric cohort of patients, congenital diaphragmatic hernia is considered as the most commonly associated pathology [16, 17], which is itself rare, therefore GV is not widespread. Wandering spleen is another rare condition characterized by excessive splenic mobility and displacement of stomach [4, 5], however, such association of gastric volvulus and wandering spleen is also quite rare [3].

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Data analysis and interpretation: **SAK, RMA, VGM, TKS**
Collection and/or assembly of data: **TKS, SAK, IVG, VGM**
Writing the article: **SAK, RMA**
Critical revision of the article: **IVG, MA**
Final approval of the article: **MA, SAK**

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References

1. Alexandre Darani, Mario Mendoza-Sagaon, Olivier Reinberg**.** Gastric volvulus in children**.** Journal of Pediatric Surgery, Volume 40, Issue 5, P855-858, MAY 01, 2005. DOI:https://doi.org/10.1016/j.jpedsurg. 2005.01.057
2. Soyer T, Ozgün-Arli A, Oztürk H, Kaya IS. Acute gastric volvulus due to congenital bands in a newborn case. Turk J Pediatr. 2008 May-Jun;50(3):296-8. PMID: 18773680
3. Omata J, Utsunomiya K, Kajiwara Y, et al. Acute gastric volvulus associated with wandering spleen in an adult treated laparoscopically after endoscopic reduction: a case report. Surg Case Rep. 2016;2(1):47. doi:10.1186/s40792-016-0175-0
4. Callahan MJ, Taylor GA. CT of the pediatric esophagus. AJR Am J Roentgenol. 2003;181 (5): 1391-6. AJR Am J Roentgenol
5. Johnson JA, Thompson AR. Gastric Volvulus and the Upside-down Stomach. J Miss State Med Assoc. 1994;35(1):1–4.
6. Cardile, Anthony P, and David S Heppner. "Gastric volvulus, Borchardt's Triad, and Endoscopy: A Rare Twist." Hawaii medical journal vol. 70,4 (2011): 80-2.
7. Godshall D, Mossallam U, Rosenbaum R. Gastric volvulus: case report and review of the literature. J Emerg Med. 1999 Sep–Oct;17(5):837–840.
8. Miller DL, Pasquale MD, Seneca RP. Gastric volvulus in the pediatric population. Arch Surg 1991;126:1146-9.
9. Rausch, V. H.; Henes, F. O. Akuter mesenterioaxialer Magenvolvulus nach Kolektomie als seltene Ursache eines akuten Abdomens beim Erwachsenen. RöFo 2015; 187(09): 812 – 814, DOI: 10.1055/s-0034-1399320
10. Alslev, J. Durch ein Trauma entstandener totaler Magenvolvulus. RöFo 1953; 79(09): 402 – 403, DOI: 10.1055/s-0029-1232240
11. Yana Cavanagh , Neal Carlin , Ruhin Yuridullah, Sohail Shaikh; Case Report Acute Gastric Volvulus Causing Splenic Avulsion and Hemoperitoneum; Hindawi Case Reports in Gastrointestinal Medicine; Volume 2018, Article ID 2961063, 5 pages; https://doi.org/10.1155/2018/2961063
12. C. M.Peterson, J.S.Anderson, A.K. Hara, J. W. Carenza, and C. O. Menias, "Volvulus of the gastrointestinal tract: Appearances at multimodality imaging," RadioGraphics,v o l .2 9 ,n o .5 ,p p . 1281–1293, 2009.
13. J Torres Bermúdez, S del Valle Ruiz, J Lopez Espejo, G Sánchez de la Villa; Laparoscopic Tanner's gastropexy for acute gastric volvulus. Epublication WebSurg.com, May 2010;10(05). RL: http://websurg.com/doi/vd01en2975
14. da Costa KM, Saxena AK. Management and outcomes of gastric volvulus in children: a systematic review. World J Pediatr. 2019 Jun;15(3):226-234. doi: 10.1007/s12519-019-00244-4. Epub 2019 Mar 21. PMID: 30900131.
15. Porcaro F., Mattioli G., Romano C. Pediatric Gastric Volvulus: Diagnostic and Clinical Approach; Case Rep Gastroenterol 2013;7:63-68; https://doi.org/10.1159/000348758
16. Al-Salem AH: Acute and chronic gastric volvulus in infants and children: who should be treated surgically? Pediatr Surg Int 2007;23:1095-1099.
17. Hung W.Y., ChinT.W., HsuY.J., Fu Y.W., Acute gastric volvulus inchildren: A systematic review. Formosos J Surg 2019;52;161-8.