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A case report: Gastroesophageal intussusception with megaesophagus in a Chihuahua puppy

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Abstract: A 1-month-old male Chihuahua presented with a 3-day history of milk regurgitation and lethargy. The owner reported accidentally stepping on the puppy's abdomen prior to presentation. Radiography and computed tomography (CT scan) revealed gastroesophageal intussusception. Surgical intervention, including caudal sternotomy and gastropexy and placing esophagostomy tube, was performed. The postoperative period was complicated by regurgitation, megaesophagus, and pancreatitis. Fluoroscopy confirmed esophageal dysmotility. Sildenafil was added to the treatment plan, resulting in clinical improvement. At 2 years of age, the patient had no clinical signs and maintained a normal quality of life. Early diagnosis, timely surgery, and long-term management were key to the successful outcome.

Keyword: Gastroesophageal intussusception, Puppy, Megaesophagus

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Summary

A 1-month-old Chihuahua puppy weighing 1.1 kg, was presented to Kasetsart University Veterinary Teaching Hospital (KUVTH) with a 3-day history of milk regurgitation and a history of abdominal trauma at 14 days of age. CT scan imaging revealed gastroesophageal intussusception. Emergency surgery was performed, which included caudal sternotomy, gastropexy, chest drain placement, and esophagostomy tube insertion.

Postoperatively, the patient required admission to the Intensive Care Unit (ICU). The patient experienced vomiting and persistent regurgitation. Complications included megaesophagus and pancreatitis. Neostigmine (0.04 mg/kg, SC, q12hr) was administered, but it did not improve clinical signs. Regurgitation persisted after each feeding. Fluoroscopy confirmed esophageal hypomotility and caudal megaesophagus, Sildenafil was initiated at 1 mg/kg, orally twice a day, which improved esophageal motility. By 27 days post operation, oral feeding had resumed with reduced regurgitation. Three weeks after post-ICU discharge, the patient had gained weight and no longer required the feeding tube. At 2 years of age, dog remained clinically normal with no regurgitation.

Background

Gastroesophageal intussusception (GEI) is a rare condition in small animals, characterized by the invagination of the stomach into the

esophagus. It may be associated with underlying esophageal abnormalities such as megaesophagus or esophageal dysmotility, which can facilitate the migration of the stomach into the esophagus. In some cases, the exact cause remains unknown. Common clinical signs include regurgitation, dyspnea, abdominal pain, and hematemesis. GEI typically occurs in young animals.

In this case, a 1-month-old male Chihuahua, was referred to KUVTH for evaluation of recurrent regurgitation and a recent history of trauma. Physical examination revealed weakness, dehydration, and poor body condition. Regurgitation observed hospitalization prompted further diagnostic imaging. Computed tomography confirmed the presence of gastroesophageal intussusception, providing essential information for surgical planning and subsequent postoperative management. The objective of this case report is to describe the diagnosis, postoperative management, complications, and surgical outcomes in a Chihuahua puppy with gastroesophageal intussusception.

Investigations and diagnosis

Based on clinical signs, thoracic radiography was recommended as the initial diagnostic tool, the radiographic findings revealed marked esophageal dilatation with increased intraluminal opacity. Additionally, the gastric silhouette was indistinct, raising concern for possible gastric displacement. Subsequently,

abdominal ultrasonography was performed to further evaluate visceral organ positioning. However, the stomach could not be visualized within the abdominal cavity, and the duodenum appeared to be displaced into the thoracic cavity, via the hiatus. Therefore, the hiatal hernia with gastroduodenal intussusception was

strongly suspected, and a CT scan was recommended to confirm the diagnosis.

The CT scan definitively demonstrated displacement of the stomach into the caudal esophageal part, thereby confirming the gastroesophageal intussusception.



Figure 1 Computed tomographic (CT) reconstruction of the thoracic and upper abdominal cavity. The image demonstrates circumferential invagination of the gastric wall (target-like appearance) into the caudal thoracic esophagus, consistent with intussusception. The stomach, including part of the gastric fundus and body, is displaced cranially into the esophageal lumen, causing marked esophageal dilatation.

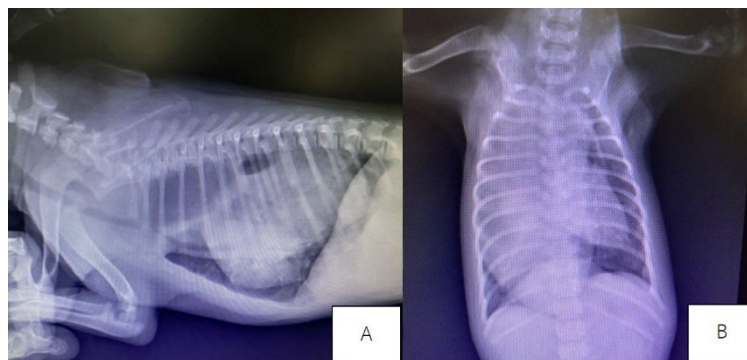


Figure 2 Thoracic radiographs of ventrodorsal (B) and lateral (A) views showing (A) Right lateral view showing a soft-tissue opaque mass occupying the caudal thoracic cavity, resulting in dorsal displacement of the trachea and caudal lung compression. The cardiac silhouette is indistinct, and a gas-fluid interface is observed within the mass-like structure, consistent with invaginated stomach content within the esophagus. (B) Ventrodorsal view revealing a rounded, soft-tissue opaque structure in the mid-to-caudal thorax, slightly

deviated to the left of midline. The diaphragm appears intact, but the gastric gas shadow is absent in the abdominal cavity.

On initial day, the complete blood count and serum biochemistry were within normal reference ranges.

Table 1 Complete blood count and serum biochemistry

Parameter	Result	Reference range*
Hematocrit	38.20	35.00–57.00 %
White blood cell	11.47	5.00–14.10x 10 ³ /uL
Platelets	464.00	211.00– 621.00 x 10 ³ /uL
Plasma protein	6.00	6.00–8.00 g/dL
BUN	15.00	8.00–28.00 mg%
Creatinine	0.55	0.50–1.70 mg%
Albumin	3.00	2.30–3.10 g/dL

* Reference ranges used at the Laboratory of Veterinary Diagnostic Unit, Faculty of Veterinary Medicine, Kasetsart University, Thailand

The differential leukocyte count was within normal proportions; however, band neutrophils were observed on the peripheral blood smear, which may suggest an early inflammatory or infectious process.

taking, physical examination, both basic and advanced imaging techniques were essential for accurate diagnosis, appropriate therapeutic planning, and prognosis evaluation.

Treatment, outcome, and follow-up

Differential diagnosis

The major differential diagnosis included hiatal hernia, esophageal foreign body, esophageal diverticulum and diaphragmatic hernia, all of which can present with overlapping clinical signs such as regurgitation, dyspnea, and esophageal dilation. Therefore, thorough history-

The referring veterinarian stabilized the patient with oxygen therapy and transferred the case for emergency surgery. After preoperative stabilization, the puppy underwent a caudal sternotomy and gastropexy, followed by placement of a chest drain and an esophagostomy feeding tube.

On the first postoperative day, the puppy vomited once. At the owner's request, the patient was transferred to a private clinic for continued care, where daily regurgitation was observed. On postoperative day 7, the puppy returned to KUVTH for follow-up, and the chest drain was removed. The puppy's condition deteriorated, and it was admitted to the ICU. The ICU care plan included pain control (morphine 0.1 mg/kg, SC, q8hr), infection control (amoxicillin-clavulanic acid 20 mg/kg, IV, q8hr), antiemetics (ondansetron 0.3 mg/kg, IV, q12hr), gastrointestinal protectants (omeprazole 0.7 mg/kg, IV, q24hr; sucralfate 250 g/dog, PO, BID), and supportive medications. Postoperative nutritional support was initiated using a recovery diet formula (Royal Canin Recovery®), administered via an esophagostomy tube. During the initial phase, the feeding volume was calculated to provide approximately one-quarter of the patient's estimated daily energy requirement (1/4 RER), divided into six small meals per day to minimize gastric distention and reduce the risk of regurgitation. Over several days, the feeding volume was gradually increased to one-half of the total energy requirement (2/4 RER), while monitoring of feeding tolerance and regurgitation frequency.

Once the patient was stable and demonstrated improved gastrointestinal motility, the feeding amount was progressively adjusted to meet 100% of the resting energy requirement (1 RER) appropriate for a growing puppy. This stepwise nutritional approach ensured adequate caloric intake while minimizing postoperative complications associated with esophageal dysfunction. Despite elevating the patient for 15 minutes after feeding, daily regurgitation persisted. On postoperative day 11, radiographs revealed a complication megaesophagus. Neostigmine (0.04 mg/kg, SC, q12hr) was administered, but regurgitation persisted. V-check cPL (Bionote) testing confirmed concurrent pancreatitis.

Fluoroscopy was performed and showed lack of esophageal motility with caudal megaesophagus. Sildenafil was added to the treatment regimen (1 mg/kg, PO, BID), resulting in reduced regurgitation. By postoperative day 27, oral feeding trials began. The puppy was kept upright for 15 minutes after feeding and showed regurgitation only once daily. On postoperative day 32, the patient was discharged from the ICU and transferred to a private clinic at the owner's request. The esophagostomy tube remained in place at the time of discharge.

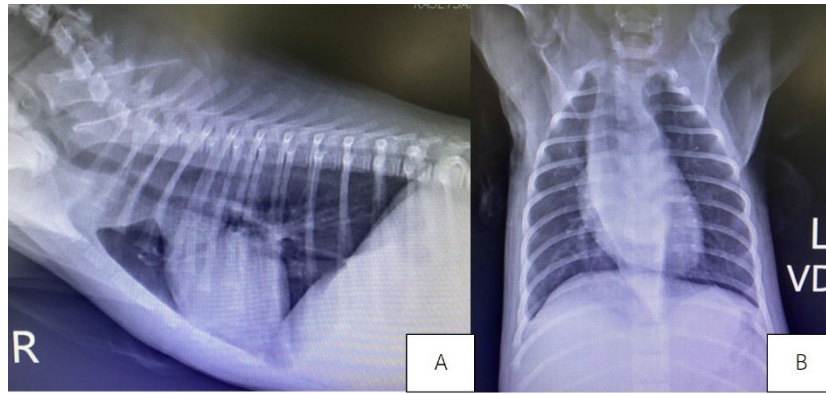


Figure 3 Follow up Thoracic radiographs of ventrodorsal (B) and lateral (A) views showing (A) Right lateral view demonstrating resolution of the previously observed soft-tissue mass within the caudal thoracic cavity. The esophagus shows marked reduction in luminal diameter compared with preoperative images, and normal gastric gas shadow is now visualized within the abdominal cavity, indicating successful repositioning of the stomach. (B) Ventrodorsal view showing normal cardiac silhouette and lung field re-expansion. The esophagus shows dilated.

Three weeks after ICU discharge, the puppy returned for follow-up. It was able to eat orally, had gained weight, and continued to receive sildenafil therapy. The esophagostomy tube was successfully removed. Following tube removal, the puppy continued sildenafil therapy, exhibited no further regurgitation, and gained weight. The patient is currently 2 years old with no signs of regurgitation and enjoys a normal quality of life.

Discussion and learning points

Gastroesophageal intussusception (GEI) is rare but potentially life-threatening condition in puppies. This condition is most often seen in young male dogs and may be over-represented in German Shepherds (Janet *et al.*, 2020; Rohwedder *et al.*, 2021). Prompt diagnosis and

aggressive treatment are crucial for a successful outcome (Janet *et al.*, 2020; Tayler *et al.*, 2021). The case of a 1-month-old Chihuahua illustrates the complexity of diagnosing and managing GEI, especially in neonates with concurrent post-surgical complications.

The etiology of GEI remains unclear in many cases, but several factors may contribute to its pathogenesis, including: an increase in abdominal pressure from vomiting or trauma; abnormalities in esophageal motility; esophageal enlargement; and lower esophageal sphincter failure (Shibly *et al.*, 2014; Jenet *et al.*, 2020). In this patient, the history of abdominal trauma at 14 days might have caused sudden increase in abdominal pressure leading to the displacement of the stomach through esophageal hiatus into thoracic cavity. However, preexisting lower esophageal sphincter abnormalities or motility issues could also

be a predisposing factor for intussusception in this dog. Clinical signs such as regurgitation, vomiting, and lethargy are non-specific but should raise suspicion for GEI in young dogs, particularly when persistent despite supportive care (Shibly *et al.*, 2014).

Advanced imaging, including a CT scan, was essential for diagnosis and surgical planning. Immediate surgical intervention, involving caudal sternotomy, gastropexy, chest drain placement, and esophagostomy tube placement, was required to correct the anatomical displacement and support recovery (Hoe *et al.*, 2022).

In this case, gastropexy was chosen as the primary surgical technique in this case following the successful reduction of the gastroesophageal intussusception. The rationale for this approach was to achieve definitive fixation of the stomach to the abdominal wall, thereby preventing recurrent displacement of the gastric cardia into the esophagus. Unlike procedures such as esophagopexy or phrenoplasty, gastropexy directly addresses the mechanical instability of the stomach a major contributing factor to GEI recurrence without substantially prolonging surgical time or increasing the risk of esophageal trauma, particularly in critical or juvenile patients. Several studies have reported favorable outcomes with gastropexy alone, underscoring its role as a cornerstone in the surgical management of GEI in dogs (Hoe *et al.*, 2022; Shibly *et al.*, 2014; Lockwood *et al.*, 2010). In the present case, the absence of significant hiatal laxity or

diaphragmatic abnormalities supported the use of gastropexy alone as the most appropriate and minimally invasive method of stabilization.

Persistent esophageal dilation and continuing regurgitation post-operation was commonly reported (Shibly *et al.*, 2014; Jenet *et al.*, 2020; Rohwedder *et al.*, 2021). After surgical correction, this patient developed complications including persistent regurgitation, and pancreatitis. Postoperative pancreatitis may develop as a complication following surgical correction of gastroesophageal intussusception (GEI) through several possible mechanisms. The displacement and subsequent reduction of the stomach can transiently compromise pancreatic blood flow, leading to ischemia and subsequent reperfusion injury once normal circulation is restored. In addition, intraoperative manipulation of the stomach and duodenum may cause mechanical irritation or traction on the pancreatic tissue, further predisposing it to inflammation. Perioperative factors such as anesthesia-related hypotension, hypoperfusion, and inadequate fluid therapy may exacerbate pancreatic injury, while certain drugs, including propofol and opioids, have also been associated with postoperative pancreatic inflammation. In this patient, the pancreatitis was likely multifactorial, emphasizing the importance of minimizing surgical manipulation, maintaining hemodynamic stability, and performing close postoperative monitoring to detect pancreatic complications at an early stage. (Hoe *et al.*, 2022; Shibly *et al.*, 2014; Mansfield, 2012).

Megaesophagus was confirmed via fluoroscopy, which revealed impaired esophageal motility and dilation. Medical management involving prokinetic agents such as neostigmine was initially unsuccessful; however, the addition of sildenafil (Sidegra®) significantly improved esophageal function and reduced episodes of regurgitation (Yi Ju *et al.*, 2020; Ryo *et al.*, 2021). Sildenafil has been shown to decrease lower esophageal sphincter tone in both humans and cats. This drug has also previously reported as successful in reducing clinical signs in cases of congenital megaesophagus (Quintavalla *et al.*, 2017).

In this case, neostigmine was selected to transiently enhance esophageal motility by inhibiting acetylcholinesterase, thereby increasing acetylcholine availability at the neuromuscular junction. This pharmacologic mechanism facilitates the contraction of the striated muscle of the canine esophagus, which is often compromised in patients with megaesophagus. The rapid onset and the short duration of action of neostigmine make it suitable for short-term evaluation of esophageal contractility during postoperative recovery. However, bethanechol, a direct muscarinic agonist, remains the standard pharmacologic option for stimulating smooth muscle activity in the gastrointestinal and urinary tracts, including cases of idiopathic megaesophagus, as it exerts minimal nicotinic effects. While both agents act on cholinergic pathways, the safety profile of bethanechol is generally considered more

favorable for long-term management, as neostigmine may induce more pronounced systemic cholinergic effects, including bradycardia, hypersalivation, and muscle fasciculations. In this patient, neostigmine was used primarily as a short-term adjunct during the recovery phase to evaluate potential improvement in esophageal motility rather than as a chronic therapeutic agent. Further studies comparing the efficacy and safety of cholinergic agents in canine megaesophagus are warranted to establish evidence-based recommendations for their clinical use. (Nakagawa *et al.*, 2019; Galluzzi *et al.*, 2025;)

The prolonged postoperative care and nutritional support via a feeding tube, together with consistent monitoring and medication adjustments, were essential to the patient's long-term recovery. This case emphasizes the importance of individualized care, interdisciplinary collaboration, and sustained follow-up in managing complex esophageal conditions in puppies (Ryo *et al.*, 2021).

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