



## Gastric dilatation and volvulus (bloat)- A case report and mini-review of literature

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### ABSTRACT

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*Gastric dilatation and volvulus (GDV) is a progressing bloat condition in dogs characterized as dilatation followed by rotation of stomach. A seven year old 18 kg black colour female non-descriptive dog presented, with history of difficulty in respiration within half an hour after feeding of curd meals. With the history and general clinical examination the case tentatively diagnosed as gastric dilatation. After unsuccessful advancement of oro-gastric tube, needle gastric paracentesis was performed on left side of the abdomen caudal to the last rib for decompression. Mid-ventral celiotomy and gastrotomy were performed after stabilization of heart rate and respiratory rate. After evacuating the whitish frothy content from the stomach, derotation and incisional gastropexy was performed. On 14<sup>th</sup> postoperative day telecommunication confirmed the milk based meal induced GDV canine patient recovered uneventfully. Electrocardiogram monitoring done for first 24 hours period and ventricular arrhythmia was managed by using lidocaine (loading@2mg/ kg bw followed by 25mcg/ kg/min for 30 min). It is concluded that on 14<sup>th</sup> postoperative day telecommunication confirmed the milk based meal induced GDV canine patient recovered uneventfully.*

### Introduction

Gastric dilatation and volvulus (GDV) is a progressing bloat condition in dogs characterized as dilatation followed by rotation of stomach. There are multiple factors predisposed and exact cause clearly not understood (Goshall *et al.*, 1999; Maki *et al.*, 2017). This is a life threatening syndrome commonly affecting deep and narrow chested breed of dogs (Grauer *et al.*, 1978; Raul *et al.*, 2018; Da Silva *et al.*, 2012). In comparison of human literature, rotation of stomach less than or more than 180 degree often referred as gastric torsion or volvulus, respectively. But in veterinary literature torsion and volvulus are used synonymously. This syndrome displays high fatality rate by the causing hypovolemia, cardiac

disturbances, gastric necrosis, splenic hemorrhage, reperfusion injury and bacterial translocation (Broome and Walsh, 2003; Paravicini *et al.*, 2020). Surgical intervention is a choice of therapy in these cases with stabilization. In this case report we are addressing a successful management of gastric dilation and volvulus affected dog and short review.

### Case History, Presentation and Diagnosis

A seven year old 18 kg black color female non-descriptive dog presented on January 1 2018 to Teaching Veterinary Clinical Complex & Referral Veterinary Polyclinic, with history of difficulty in respiration within half an hour after feeding of curd meals. The ailments described by the owner are

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progressive engorgement of abdomen, respiratory distress and frothiness on mouth. General clinical examination revealed sudden bloat with progressively diminishing patient condition. The patient was presented with symptoms like aerophagia, siallorhea, dyspnea, tachycardia (innumerable via auscultation), and weak femoral pulse, prolonged capillary refill time (CRT), pale and dry mucous membranes and asynchrony of heart rate and pulse rate. With the history and general clinical examination the case tentatively diagnosed as gastric dilatation. The weak pulse and easy palpation of spleen preclude for GDV.

### Medical Therapy

Immediately we administered aggressive fluid therapy (90 ml per kg body weight) on both the cephalic vein. After Unsuccessful advancement of oro-gastric tube made us to perform needle gastric paracentesis on left side of the abdomen caudal to the last rib for decompression. Surgical intervention was considered after stabilization of heart rate and respiratory rate.

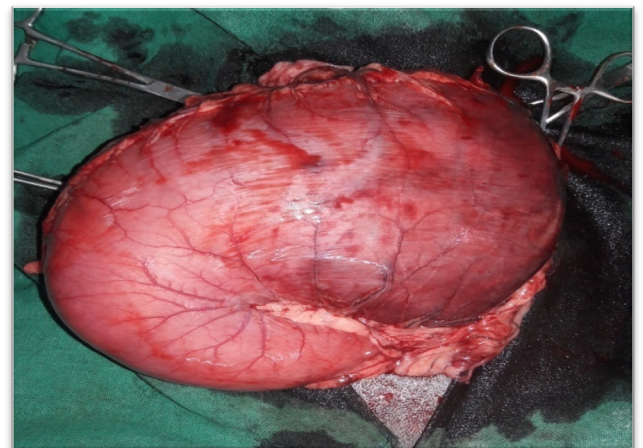
### Surgical treatment

The dog was premedicated with atropine sulphate @ 0.04mg/kg, midazolam@0.1m/kg and Butorphanol @ 0.2mg/kg body weight. The animal was restrained on dorsal recumbency and mid ventral celiotomy site (from xiphoid to brim of pelvis) prepared aseptically and pre-oxygenated. Anesthesia was induced with propofol@4mg per kg "till effect" and maintained with isoflurane. Vital parameters were monitored till recovery of patient. Real-time ECG showed occasional ventricular premature complex.

Mid-ventral celiotomy skin incision was performed from xiphoid to pubis. On subsequent dissection of linea alba a layer mesentery covered distended stomach was found (Figure 1). This confirms the gastric torsion. Because in normal anatomical stomach mesentery won't wrap around the stomach and in mid-ventral celiotomy also we can't find mesentery covered over stomach. Pulling aside of mesentery showed small pin point congestion over the stomach and displaced spleen. Gastrotomy was performed on near greater curvature where fewer blood vessels noticed. About 3.5 liter foamy sour odorous gastric contents were evacuated (Figure 2). Warm water lavage and suction was done 2 times till clear warm water sucked out by medical suction device. Gastric mucosa was assessed grossly to rule out necrosis. We have noticed small area of discoloration and gross necrotic changes in and out

of the stomach. Gastrotomy incision was closed in two layers Connell pattern reinforced with Lembert pattern using polyglactin-910. Before derotation, to combat reperfusion injury a single dose dexamethasone @ 0.5 mg per kg body weight was administered.

Derotation was done as follows: pylorus hooked by right index finger with compression of fundus of stomach, then the stomach reverted to normal anatomic location. Spleen follows stomach rotation. Unwrapped mesentery of stomach and normal anatomic location of spleen and pylorus ensures complete derotation. Splenic examination revealed mild red infarct on the surface. The discussion with owner about splenectomy was unsuccessful, so procedure was not performed. Incisional gastropexy was performed on right abdominal wall using 2-0 polyglactin 910 sutures. Mid-ventral celiotomy incision was closed in three layer patterns as follows: linea alba with interrupted suture pattern, subcutaneous tissues closed with simple continuous suture pattern and skin was closed with cross mattress pattern using polyamide suture.



**Figure 1.** Dilated and rotated stomach was observed immediately after entering into abdominal cavity.



**Figure 2.** White foamy sour odorous gastric contents were evacuated from dilated stomach.

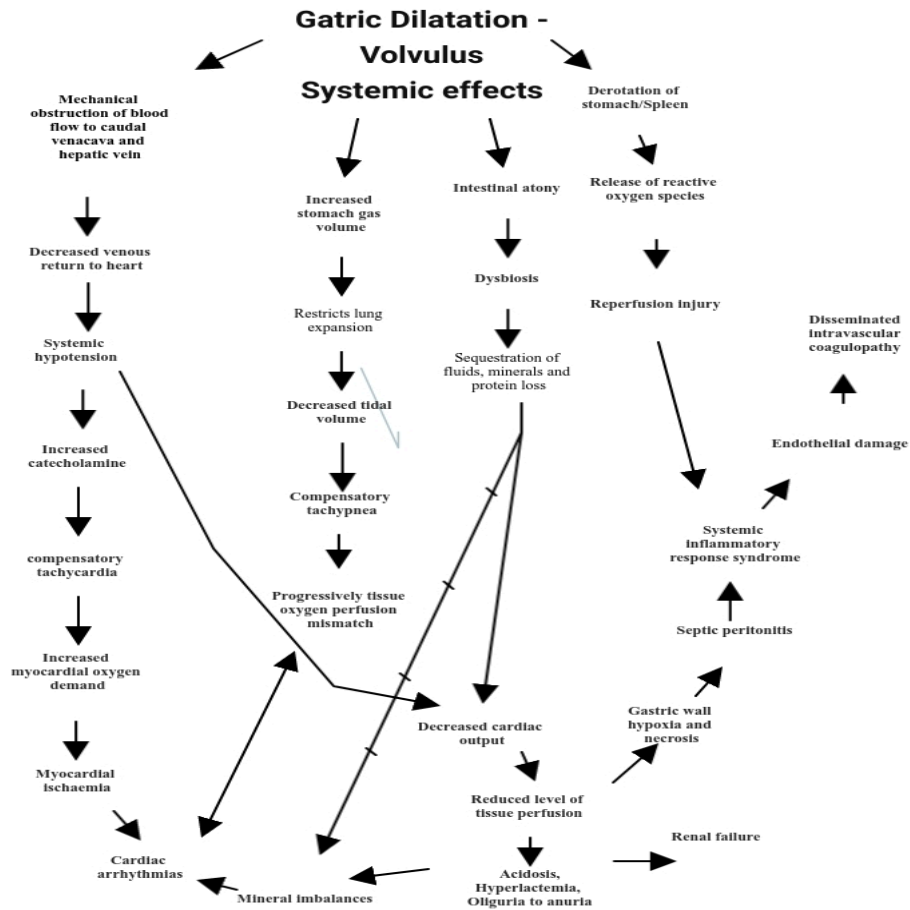


Figure 3. Pathophysiological events during gastric dilatation with volvulus (Systemic effects).

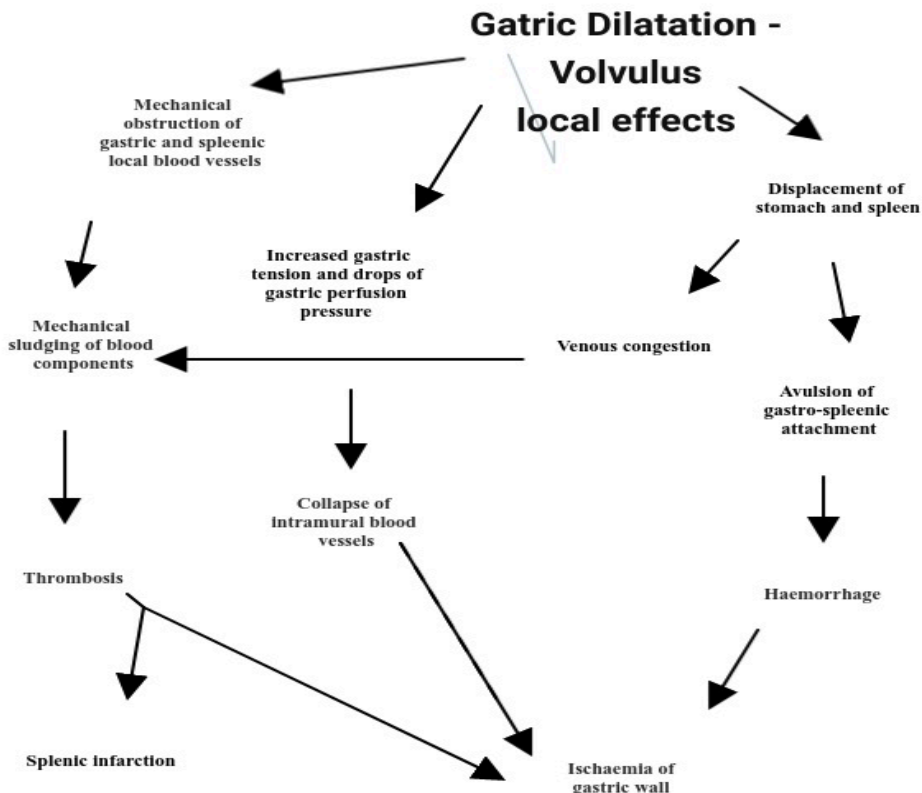


Figure 4. Pathophysiological events during gastric dilatation with volvulus (Local effects).

## Postoperative care

The suture line was protected by abdominal bandage. Nothing per os followed for 24 hours. Electrocardiogram monitoring was done for first 24 hours period and ventricular arrhythmia at 14<sup>th</sup> hour of postoperative period was managed using lidocaine (loading@2mg/kg body weight followed by 25mcg/kg/min for 30 minutes). Slow intravenous potassium given along with fluid therapy for first two postoperative days. The animal was discharged on second post operative day as per owner wish. Postoperative antibiotic (Ceftriaxone@20mg/kg), analgesic (Butorphanol@0.2mg/kg) and fluid therapy (Ringers lactate) was advised for 7 days.

## Discussion

Gastric dilatation and volvulus is a critical emergency case. The critical events progress from stomach rotation and eventually cause mortality. There are many predisposing factors well documented but exact cause is unknown for GDV. Breed, age, body size and conformation, gastric and pyloric variations in location and activity are intrinsic risk factors for GDV. Breeds with less thoracic width and high thoracic height are most susceptible. Pure large breeds like Great Dane, Saint Bernard, and German shepherd are most susceptible. A recent poster report documented that feeding from height, presence of gut sounds and history of previous abdominal surgery are influencing factors in the development of GDV in grey hounds (Dolbear and Dunning, 2019). Neutered female animals have high incidence of GDV (Pipan *et al.*, 2012). High incidence of GDV is reported in old aged patients. Feeding program, animal temperament and environmental factors are extrinsic risk factors responsible for GDV (Glickman *et al.*, 1994; Glickman *et al.*, 1997). Interestingly we observed that the day of case presentation was humid (Humidity: 79-100%) with high barometric (maximum 1022 mbar) pressure than rest of the week days (timeanddate.com, 2018). The onset of clinical signs displayed often after a large meal with or without extreme activities. Restlessness, gastric distension, lethargy and collapse are the common signs of GDV affected dogs. Clinically tachycardia, tachypnea, pale mucus membrane and gastric tympany associated with cardiac compromise are noticeable derangements of GDV patients (Pipan *et al.*, 2012). A retrospective study on 736 canine GDV patients found higher survival rate during early admission time and surgical correction within 3 hours of admission by specialist

surgeons (Song *et al.*, 2020). The pathophysiology of GDV causes multi-organ dysfunction. Though pathological events occur parallel, for the understanding purpose it has been divided into local and systemic effects (Tivers and Brockman, 2009a), which are depicted in figure 3 and 4. Acidosis, hyperlactemia, prolonged capillary refilling time, decreased cardiac output, increased levels of cardiac troponin I and T along with gastric distension associated clinical signs evidences in GDV affected dogs.

Acute nature of devastating condition needs immediate diagnosis and stabilization of patient. The stabilization procedure includes restoration of circulation, decompression of the stomach and maintaining almost normal vital parameters to proceed for surgical correction of GDV. Shock fluid therapy using crystalloids, colloids or hypertonic saline commonly followed, it's advised to have blood products because large volume resuscitation may drops the PCV. In addition empirical shock therapy @ 90 per ml kg no longer recommended due to fluid overload. Hence titration of fluid therapy according to patients is mandatory. Decompression can be carried out in many ways like orogastric, percutaneous or laparoscopy assisted. But failure of orogastric method of gastric decompression does not preclude GDV confirmation. Moreover needle or percutaneous gastric decompression assists passing of orogastric tube into stomach and further useful for luke warm gastric lavage. Eventually in stabilization part use emergency drugs to maintain stable vital parameters considered. Radiography is not necessary to diagnose gastric dilatation but is an invaluable aid in diagnosing volvulus (Hathcock, 1984; Brockman, 2008). It is a necessary tool to differentiate between gastric dilatation (GD) and gastric dilatation and volvulus (GDV). In radiographic view double bubble/compartmentalization/popeye arm sign, displaced spleen and pylorus are characteristic for GDV and just single distended structure of stomach gastric dilatation (Paravicini *et al.*, 2020). Right lateral view of abdomen is better choice for GDV patients with prior stabilization and decompression. In surgical intervention, anesthesia should be appropriate and do not compromises the cardio-respiratory functions. Though minimal anaesthetic protocols, selection based on deranged physiology of GDV affected patients would be fruitful. Use of nitrous oxide and arrhythmogenic agents prohibited in these patients. Surgical procedure comprises of gastric derotation and gastropexy and rarely



gastrotomy performed prior to gastropexy to remove gas and contents of stomach. Midventral incision has supremacy than paracostal or flank incision due to wide exploration of abdominal organ and easy manipulative maneuver for derotation of stomach. Mid body incision at 1 to 2 cm dorsal or ventral to the greater curvature of the stomach is a site of choice for gastro-centesis or temporary gastrotomy in GDV affected patients, because mid body is an uncommon site of gastric necrosis (Fox-Alvarez et al., 2019). Gastric derotation often assumed as problematic for both experienced and novice surgeons due to dysbiosis and ischaemic reperfusion injury. Nonetheless many antioxidants are in use, nothing has given fruitful results. Derotation maneuver usually performed after administration of antioxidants.

The derotation maneuvers includes emptiness of stomach, identification of pylorus and grasping on right hand, supine compression of stomach by left hand, bring back the pylorus from left side to right hand side of the animal by gentle traction (Tivers and Brockman, 2009b). Assessment of gastric wall, spleen and other abdominal structures is necessary to improve survivability. Stomach viability usually assessed by color, wall thickness and presence of pulse in the local vessels of stomach. Bleeding from seromuscular incision would be indication of viable stomach wall. Any color change, reduced thickness and reduced blood supply in Doppler warrants partial gastrectomy. Spleen usually follows paths of stomach and hence rotation of stomach may lead spleen torsion. Once ensured spleen torsion complete splenectomy done prior to correction of splenic torsion to avoid entry of toxins into systemic circulation. While spleen inspection any wide area of infarction and palpable thrombi are suggestive for partial or complete splenectomy. Making permanent adhesion between pyloric antrum and right abdominal wall is preventive as well as reoccurrence abolishing surgical procedure in GDV higher risk and affected patients. Rate of reoccurrence is as high as 80% in cases where gastropexy was not performed. Several gastropexy techniques are reported in literature. Among that balloon gastropexy and circumcostal gastropexy seems to be weakest and strongest gastropexy technique, respectively (Monnet et al., 2003). In present case report incisional gastropexy was done due to its simplicity and reliability to form permanent adhesion. Postoperatively antibiotic, analgesic and antioxidant along with cardio-respiratory monitoring would improve outcome. ECG monitoring is a mainstay

monitoring of GDV patients due to cardiac arrhythmias which mostly from ventricular origin (Homer, 2020). Treatment strategy for arrhythmias, lidocaine@ 2mg per kg IV followed by 25-50 microgram per kg per minute or procainamide@2mg per kg per minute if needed 25-50 microgram per kg per minute in refractory lidocaine cases is advised rather prophylaxis. Moreover, lidocaine prevents ischemic reperfusion injury (Bruchim and Kelmer, 2014). These agents are pro-arrhythmic hence use with caution when required (Buber et al., 2007 missing in list of ref). Diet formulation should be carried for individual patient based on either gastrectomy or splenectomy or any additional surgical intervention done.

Expected postoperative complications like hypotension, hypoperfusion, cardiac arrhythmias, peritonitis, ileus, systemic inflammatory response syndrome and disseminated intravascular coagulation (DIC) should be addressed promptly by fluid therapy; oxygen therapy or blood products; antiarrhythmics; prokinetics; antibiotics administration and peritoneal lavage are advisable (Bruchim and Kelmer, 2014). Systemic inflammatory response syndrome and DIC noticed patients has poor prognosis. A goal directed therapies would be beneficial in such multiorgan dysfunction syndrome (McGowan and Silverstein, 2015). Close monitoring in early postoperative period about 3 to 4 days may be recommended to address complications from severely affected highrisk patients. GDV can happen in unusual patients without proper substantial evidences on time, but back tracking and notifying to veterinarian and owners will improve understanding and to form therapeutic and preventive measures. In this report, we found case presented on the high humid weather day after feeding of normal meal and managed successfully. Nonetheless full proof of metrological change increased risk of GDV on dogs, this has to be considered further for prospective controlled investigation on dogs.

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