

## Gastric Dilatation and Volvulus Syndrome in Dog

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### Abstract

Gastric dilatation and volvulus syndrome (GDV) in dogs is an abnormal accumulation of gastric gas (dilatation), which may be complicated by rotation of the stomach (volvulus) about its mesenteric axis. A number of factors, both environmental and host have been implicated in GDV. This syndrome has a variety of effects on the cardiovascular, respiratory, gastrointestinal, metabolic, haemolympathic-immune, renal and central nervous systems. Clinical signs include distended, painful, tympanic abdomen, retching, unproductive vomiting, hypersalivation, respiratory distress accompanied by varying degrees of shock. Treatment of GDV includes medical and fluid therapy at shock dosages to initially stabilize the patient followed by gastric decompression. Surgical procedure comprises of gastric derotation followed by partial gastrectomy or splenectomy depending upon gastric or splenic viability and lastly, permanent right sided gastropexy. Post surgical considerations include frequent small meals instead of one large meal, avoiding vigorous activity immediately after meals and not allowing animal to gorge on water after meals or activities.

**Keywords** : Gastric Dilatation, dogs, Volvulus.

### Introduction

Gastric dilatation and volvulus is an abnormal accumulation of gastric gas (dilatation), which may be complicated by rotation of the stomach (volvulus) about its mesenteric axis. A series of per-acute pathophysiological changes occur that are responsible for the high mortality rate associated with this condition (Williams, 1991). Acute gastric dilatation and gastric dilatation with volvulus are differentiated from food engorgement (food bloat) which is characterised by a known or presumed consumption of food resulting in an overdistended, food filled stomach in a normal position. Chronic gastric volvulus is a subcategory of gastric dilatation with volvulus. Signs are subtle and varied; diagnosis may not be made until a routine diagnostic evaluation is carried out for intermittent bouts of weight loss, borborygmus, flatulence, eructation or vomiting and the volvulus happens to be present during that evaluation (Frendin et al., 1988).

Acute gastric dilatation and gastric dilatation with volvulus have been recognised to affect the dog population for many decades, yet pathogenesis remains unclear. Which condition develops first, dilatation or volvulus, has been debated extensively, consensus suggests that dilatation precedes volvulus (Betts et al., 1974). The decision for care is based on the

factors unique to these cases. Treatment may range from conservative to aggressive on the basis of these details.

### Risk Factors

A number of factors, both environmental and host have been implicated in gastric dilatation and volvulus. These include breed, age, sex, chest confirmation, diet, stress and exercise patterns (Glickman et al. 2000). In summary these multiple studies suggest the following:

1. Large and giant breeds viz. Great Dane, German Shephard, Standard Poodle, Weimeraner, Saint Bernard, Gordon / Irish Setter, Large Mixed Breed, Smaller Breeds: Bassett Hound, Dachsund
2. Dogs with close relative who've had GDV
3. Large thoracic depth to width ratio
4. Underweight for breed
5. Increasing age
6. Previous splenomegaly or splenectomy
7. Aerophagia/gulping food
8. Eating from a raised bowl
9. Stress
10. Feeding once a day and small food particle size (<30mm diameter) (Williams et al., 1999).

### Patho-Physiology

Gaseous/fluid distension of the stomach alters the normal position of the pylorus and lower esophageal sphincter, limiting eructation and abroad elimination of entrapped materials. Distension and displacement of the stomach have a variety of effects on the cardiovascular, respiratory, gastrointestinal, metabolic, haemo-lymphatic, immune, renal and central nervous system.

#### A. Direct cardiovascular effect :

A rapidly distending stomach and increased general intra-abdominal pressure results in compression of intra-abdominal veins, caudal venacava, portal vein and splanchnic vasculature. (Wingfield et al.,1975). This venous occlusion causes both a forward reduction in vascular volume and a backward increase in venous pressure leading to poor venous return and splanchnic pooling with resulting reduction in cardiac output and systemic blood pressure.

#### B. Direct Respiratory effects:

As the stomach distends, it pushes cranially on the diaphragm preventing normal excursions; tidal volume is reduced in compensation, respiratory rate and efforts are increased. Ultimately, these compensatory efforts cease to meet demands for oxygenation and carbon dioxide elimination; pCO<sub>2</sub> rises first (stimulating more effort) and pO<sub>2</sub> falls when the respiratory system has exceeded its abilities. The elevated pCO<sub>2</sub> creates a respiratory acidosis.

#### C. Direct Gastrointestinal effects:

Increased intraluminal gastric pressure reduces the myoelectrical activity of the stomach. (Hall et al.,1993) further exacerbating the accumulation of gas and fluid and preventing normal recovery. Gastric necrosis due to torsion, occlusion and avulsion of short gastric arteries supplying the greater curvature and fundus of the stomach. Splenic infarcts and necrosis seen due to compromise of the splenic vasculature during volvulus.

#### D. Metabolic effects:

Acid-base and potassium abnormalities, glucose abnormalities, reperfusion injuries, disseminated intravascular coagulopathy, endotoxemia, renal effects have been seen.

### Diagnosis

Signalment : Acute gastric dilation or gastric dilatation with volvulus is usually diagnosed by signalment, history and physical findings.

Presumptive diagnosis is based on:

1. Clinical findings
2. Radiography

**Clinical Signs:** Pacing, restlessness, salivation, panting, ineffective vomiting attempts, increased

restlessness, gums are pale or cyanotic, dog appears "shaky" when standing, or cannot stand, abdomen very large, tachycardia (+100 bpm), weak pulse.

### Radiography

Abdominal radiography is not performed until after medical stabilization. The right lateral position is most revealing (Hathcock, 1984). Gastric dilation (with or without volvulus) is confirmed if a gas distended gastric shadow is present with various degrees of gas filled small or large intestine. Volvulus is suspected if a tissue density separates the gas filled gastric shadow into two chambers or the pylorus is dorsocranial to the fundus in the right lateral view.

### Gastric Decompression

1. Orogastric intubation - "Stomach Tube"
2. Needle trocarization

**Orogastric intubation:** A lubricated stomach tube is passed to the stomach to relieve gastric compression. Be sure to advance the tube carefully at the gastroesophageal junction. If resistance is found, rotate tube and then advance. Passage of the stomach tube into stomach lumen does not mean that there is no gastric rotation.

**Needle Trocarization :** An 18 gauge needle is used to puncture the distended stomach. The stomach wall is against the body wall so other viscera is displaced, hence low risk of injury to other tissues.

### Treatment of Shock

Fluid	Type	Rate
Crystalloids	Lactated Ringer's solution	Initially 0ml/kg/hr. monitor response and reduce as needed.
Colloids	Haemaccel (3.5% polygeline)	20ml/kg q24h
Combinations	7% saline with colloid	5ml/kg over 15 min
Blood substitute	Haemoglobin glutamer 200 (oxyglobin, biopure)	10ml/kg/hr Total dose should not exceed 30ml/kg

### Anaesthesia

- Neuroleptoanalgesics or narcotics preferred for induction.
- Phenothiazine derivatives, alpha agonists contra indicated since they further lower BP in compromised patients. (Thurman et al., 1996).
- Maintained with gas anaesthetics viz. isoflurane or sevoflurane.
- Nitrous oxide is contraindicated as it causes further gastric distension.

### Surgical Anatomy and Rotation

1. Clockwise rotation of stomach is most common.
2. Most rotations are between 180 and 270 degrees.

3. Occasionally, counterclockwise rotation of 90 degrees is seen.
4. Stomach is rotated about the distal esophagus and tilted cranially.

#### Determination of Stomach Ability

After repositioning the stomach, gastric viability is assessed and devitalized areas are excised by partial gastrectomy. Fluorescein has been used to predict gastric wall necrosis but does not provide better predictability than visual and tactile means. (Wheatson et al., 1986).

Serosal Color - gray / green, thickness of stomach wall – thin, fragile and no vascular patency indicates devitalized tissue.

**Gastropexy:** The goal of gastropexy is to produce a permanent adhesion between the pyloric antrum and the right lateral body wall to prevent rotation of the stomach. Recurrence rates can be as high as 80% if gastropexy is not carried out. A number of gastropexy techniques have been identified these are:

**Beltloop Gastropexy:** This technique uses a flap of gastric wall passed through a tunnel in the right lateral abdominal wall to create a permanent gastropexy. Whitney et al., 1989 reported significant, short, fibrous adhesions between the pyloric antrum and the right body wall.

**Incisional Gastropexy:** This technique relies on the healing of the edges of a gastric seromuscular incision to the edges of a peritoneum-transverse the abdominal muscle incision for permanent gastropexy. The incisional gastropexy was evaluated clinically in 44 dogs during a period of 5 years by (MacCoy et al., 1982) with occasional surgical confirmation of adhesion and with no reported recurrence.

**Circumcostal Gastropexy:** This technique relies on the flaps of gastric seromuscular tissue brought through a tunnel, which here is created behind the last full rib. Experimental observations have confirmed the formation significant adhesions with this technique (Fox, 1985).

**Tube Gastropexy/ Gastrostomy:** Tube gastropexy has the advantage of being quick to perform and allowing gastric decompression post operatively. Though easy to place, increased morbidity and longer hospitalisation periods are associated with this technique. A subcutaneous tunnel is made by means of blunt dissection with long artery forceps, from a stab incision in the skin lateral to the laparotomy wound, and caudal to the last rib on the right. Foley's catheter is drawn into the abdominal cavity. It is introduced in the stomach (pyloric antrum) after pre placing a purse string suture.

**Laparoscopy Assisted Gastropexy:** The laparoscopic assisted gastropexy requires only a minimal surgical approach using two small openings

for entry of 5-10mm laparoscope and a laparoscopic babcock forcep. This incisional gastropexy is strong and is relatively quick and easy for a surgeon with entry level laparotomy skills. (Rawlings, 2001). The initial trocar canula is placed on the midline 2-3 cm caudal to the umbilicus and is used for the viewing telescope. The peritoneal cavity is distended with CO<sub>2</sub> and the cranial abdominal area is viewed with a 5-10mm laparoscope. A 10mm trocar canula is inserted and a laparoscopic babcock forcep is used to grasp the antrum of the stomach. An incision is made through the serosa and muscular layer of the antrum. A simple continuous pattern of 2-0, synthetic, monofilament, absorbable suture is placed to appose the seromuscular layer of the antrum to the transversus abdominis muscle. After viewing the gastropexy for position and orientation, the laparoscope's canula is removed and the incision is closed.

#### Prevention of Recurrence

Smaller meals to be fed more frequently to avoid excessive filling of stomach. Excessive exercise to be avoided especially after meals are fed to the animal. Consumption of large amount of water after exercise to be avoided to prevent distension.

#### Conclusion

Gastric dilatation and volvulus is an abnormal accumulation of gastric gas (dilatation), which may be complicated by rotation of the stomach (volvulus) about its mesenteric axis. It is a life threatening emergency and should be corrected within 4-6 hours of presentation. Common in dogs with a long and deep chest confirmation viz. Great Dane, German Shepherd, Irish Setter, Saint Bernard. This condition may be acute or chronic and has effects on the cardiovascular, respiratory, haemopoietic and renal system. Typical clinical signs include retching, unproductive vomiting, cranial abdominal distension, circulatory collapse and dyspnoea. Blood sampling, biochemical tests do not show pathognomonic results. Hence surgery need not be delayed results are obtained. Radiography can be used to differentiate between simple gastric obstruction and volvulus. Aggressive fluid therapy must be started to stabilize the patient. Surgical options include Tube, Incisional, Circumcostal and Belt Loop Gastropexy. Frequent smaller meals should be fed and minimum exercise allowed to prevent recurrence. Laparoscopic assisted gastropexy can also be considered as an emerging surgical option.

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