Management of canine gastric dilatation and volvulus

Gastric dilatation and volvulus (GDV) is a syndrome of gaseous gastric distension (dilation) and rotation around the long axis of the stomach (volvulus). It is a frequently diagnosed condition in dogs that results in haemodynamic disturbances, and ultimately shock and death, if correct management is not delivered promptly.

**Key words:** change to gastric dilation and volvulus, surgical management of GDV

**Aetiology**

The exact cause of gastric dilatation and volvulus and whether the dilatation or the volvulus is the primary event has not been determined. It is widely postulated that the volvulus occurs secondary to gastric dilatation and this theory is supported by the prevention of recurrence following gastropexy (Glickman 1998). Risk factors identified for gastric dilatation and volvulus include purebred large and giant breed dogs, large thoracic depth : width ratio, increasing age, poor body condition, having a first degree relative with GDV, gastric ligament laxity, feeding a large meal once daily, aerophagia, small food particle size, anxiety or exercise immediately after feeding and the presence of a gastric foreign body (Hall et al 1995, Glickman et al 2000, de Battisti et al 2012). There is mixed evidence regarding the risk of gastric dilatation and volvulus following splenectomy. A recent study with large case numbers concluded that the odds of gastric dilatation and volvulus in dogs with a history of previous splenectomy was approximately 5 times that of dogs without a history of splenectomy (Sartor et al 2013). It is worth noting that reports are often contradictory with regard to postulated risk factors and a specific combination of factors may be required in order for gastric dilatation and volvulus to occur.

Breeds identified to be at increased risk of gastric dilatation and volvulus include Great Danes, German Shepherd Dogs, Irish Setters, Weimaraners and Standard Poodles (Brockman et al 1995, Ward et al 2003).

**Pathophysiology**

Typically volvulus is the result of pyloric migration ventrally, from the right side of the abdominal cavity to the left, and then cranially resulting in stretching of the hepatoduodenal ligament and folding of the stomach with subsequent obstruction to eructation and pyloric outflow. Gastric rotation of 180 to 270 degrees is seen most commonly however 360 degree rotation can occur.

The ensuing progressive gastric distension results in increased intra-abdominal pressure with subsequent restrictions to both venous flow and diaphragmatic excursion. Compression of the caudal vena cava results in reduced venous return, reduced cardiac output and systemic hypotension. Respiratory compromise is the result of reduced excursion of the diaphragm and subsequent alveolar hypoventilation, hypoxaemia, hypercapnia and respiratory acidosis.

Reduced coronary perfusion results in myocardial ischaemia and potentiates cardiac arrhythmias; the most commonly encountered being sinus tachycardia, ventricular premature contractions, idioventricular rhythms and ventricular tachycardia.

The increase in intragastric pressure secondary to progressive gastric dilatation and volvulus compresses the thin walled capillaries within the gastric wall. This, in combination with the potential for avulsion of the short gastric arteries from the greater curvature of the stomach at the time of volvulus, may result in ischaemia of the gastric wall and subsequent gastric necrosis if perfusion is sufficiently disrupted. In severe cases, full thickness necrosis and gastric perforation result. Bacterial translocation can occur across a compromised gastric wall and may result in endotoxaemia without the presence of gastric perforation.

During volvulus, the spleen moves with the greater curvature of the stomach due to the attachment via the gastroplenic ligament. Subsequent thrombus formation within or avulsion of the splenic vasculature may lead to splenic necrosis.
In summary, reduced venous return, respiratory dysfunction and cardiac arrhythmias will have a cumulative and negative impact on perfusion of and oxygen delivery to the tissues, ultimately resulting in irreversible shock and death if appropriate treatment is not administered in a timely manner.

**Clinical Findings**

Clinical history, signalment and physical examination findings are often highly suggestive of gastric dilatation and volvulus. A large-breed, deep chested dog presenting with abdominal distension, non-productive retching or vomiting and hypersalivation is a typical presentation (Figure 1). Smaller breeds can be affected however. Clinical examination findings are dependant on the degree of cardiovascular compromise and shock at the time of presentation. It is important to recognize that shock is a continuum with a transition of clinical signs as the disease state progresses. Hypovolemic shock results in tachycardia, peripheral vasoconstriction and a sluggish capillary refill time (> 2 seconds). Maldistributive shock, seen if the systemic inflammatory response syndrome (SIRS) or sepsis develop, is associated with massive systemic vasodilation causing hyperemic mucous membranes and a rapid capillary refill time (< 1 second). As both forms of shock may occur concurrently with gastric dilatation and volvulus it is not possible to list the specific clinical signs that a dog with a certain degree of shock will present with. However as decomposition occurs progressive hypothermia, hypotension and decreased mentation will be apparent.

Gastric dilatation and volvulus typically presents as an acute event although a form of chronic, recurrent gastric dilatation with incomplete volvulus has been described (Paris et al 2011). This syndrome should be considered a differential diagnosis for dogs presenting with chronic weight loss and gastrointestinal signs. A combination of abdominal radiography, abdominal ultrasound and upper gastrointestinal endoscopy are used to make this diagnosis. Endoscopic findings include difficulty passing through the cardiac sphincter, abnormal position of the normal gastric landmarks and dynamic changes in the position of these landmarks during the procedure (Paris et al 2011). The potential for development of life-threatening, complete gastric volvulus means that prophylactic intervention in the form of gastropexy is indicated when this diagnosis is made.

**Diagnosis**

A presumptive diagnosis can often be made based on the signalment of the patient and presenting clinical signs. It is critical that the patient is stabilised appropriately prior to performing diagnostic imaging. Delays in providing intravenous fluid resuscitation and performing gastric decompression will significantly affect the prognosis. A right lateral abdominal radiograph is used to definitively diagnose gastric dilatation and volvulus and differentiate this from simple dilatation (Figure 2a and 2b). Dorsal pyloric displacement and gas entrapment within the pylorus and body of the stomach separated by a soft tissue band results in the classic “inverted C”.

![Figure 1: Typical presentation of a dog with gastric dilatation and volvulus. Note the abdominal distension, apparent respiratory compromise and hypersalivation. Two peripheral intravenous catheters have been placed in the cephalic veins for administration of intravenous fluid therapy and an ECG has been attached prior to gastric decompression being performed. (Image courtesy of Shaileen Jasani)](image1)

![Figure 2a: Right lateral abdominal radiograph demonstrating gastric dilatation and volvulus. Dorsal pyloric displacement and gas entrapment within the pylorus and body of the stomach separated by a soft tissue band results in the classic “inverted C”](image2a)

![Figure 2b: Right lateral abdominal radiograph demonstrating gastric dilatation without volvulus. The characteristic compartmentalization and soft tissue band seen with gastric dilatation and volvulus are absent in cases of pure gastric dilatation](image2b)

Note the spherical soft tissue opacity present ventrally and just caudal to the ribs. The pylorus is dependent and hence fluid filled when the dog is positioned in right lateral recumbency, creating this opacity which is not present on a left lateral abdominal radiograph.

![Figure 3: Right lateral abdominal radiograph demonstrating gastric dilatation and volvulus with pneumoperitoneum secondary to gastric perforation. The crus of the diaphragm and stomach wall are both highlighted due to the presence of air within the lung cranially and the peritoneal cavity caudally. Note the loss of serosal detail in the cranial abdomen consistent with free fluid within the abdomen](image3)