THE NEWFOUNDLAND CLUB

BLOAT

GASTRIC DILATATION-VOLVULUS EXPLAINED

WHAT DO THE FOLLOWING TERMS HAVE IN COMMON?

BLOAT
DISTENSION
GASTRIC TYMPANI
GASTRIC DILATATION / VOLVULUS
GDV
GASTRIC VOLVULUS
DILATATION VOLVULUS
GASTRIC TORSION
GASTRIC DILATATION

They are all terms used to describe a part, or the entire syndrome, of GASTRIC DILATATION-VOLVULUS (GDV).

WHAT IS GDV?

Gastric Dilatation-Volvulus is a condition, usually found in large dogs, where the stomach fills with gas and fluid and twists on itself. Untreated dogs usually die very quickly.

WHICH DOGS GET GDV?

1. Dogs and bitches are affected equally, although bitches may be at increased risk after whelping and during lactation.

2. Older dogs are more at risk than younger ones, although GDV has been seen in puppies.

   (In a recent study in the USA[1] of all breeds, the relative risk of developing GDV was found to be lowest in dogs under 2, but rose rapidly over the age of 4. 78.8% of dogs in the study were at least 4 years old when they developed GDV.)

3. Large, deep-chested breeds of dog are most at risk, but it is not unknown in Daschunds and Cocker Spaniels.

   (A recent study[2] found that pure-bred dogs had a 2.5 times higher risk of developing GDV than mongrels of similar size - no explanation was suggested!)

4. Studies in several breeds[3] have identified a predisposition to GDV in certain bloodlines.

   (The ratio of chest depth to width may be significant. A US study into a family of Red Setters[4] supports the theory that dogs with a greater chest depth/width ratio are at higher risk of developing GDV than dogs of the same breed with smaller chest depth/width ratios.)

5. Although a relatively uncommon condition, the overall incidence of GDV seems to be increasing, even when the increasing popularity of certain breeds has been taken into account.

(In another US study[5] : 0.06% of admissions to a group of veterinary hospitals in 1975 had GDV but by 1995 this figure had risen to 0.31%, an increase of over 500% . The authors put the increase down to an unknown 'environmental' cause.)

6. Certain breeds[3] seem to have breed-specific predisposing factors; e.g. Boxers have a Pyloric Sphincter malfunction; Setters have an exaggerated habit of air-swallowing (**Aerophagia**).

WHAT HAPPENS AND WHY DO DOGS DIE IF THEY GET GDV?

1. The syndrome begins with an abnormal build up of gas in the stomach. Gastric juices are produced and build up. The normal mechanisms for stomach emptying fail and the stomach begins to dilate.

2. In health, the stomach is relatively free to move, but is fixed in position where the oesophagus enters. Once it has started to dilate, the stomach begins to rotate around this fixed point . The rotation may be to the right (270^{o}) or left (90^{o}).

   Other names given to a rotation or twisting of an organ are: TORSION or VOLVULUS.

3. When the stomach twists, the inlet from the oesophagus and the outlet into the small intestine (pylorus) are blocked so food or gas cannot escape. Any food present will continue to be digested and may ferment, adding digestive juices and gas to the original contents and increasing the dilatation of the stomach.

4. As a result of the stomach dilating and twisting on itself, part of the blood supply to the stomach is cut off, leading to damage to the tissues of the stomach, especially the lining. If the interruption to the blood supply is prolonged, a portion of the stomach lining and wall may die and the stomach may rupture. Rupture of the stomach will release food, gas, digestive juices and bacteria into the abdomen causing Peritonitis.

   Reduced blood flow to a tissue is called ISCHAEMIA.
   Death of tissue due to reduced blood flow is called ISCHAEMIC NECROSIS.
   An area of tissue that has undergone ischaemic necrosis is sometimes described as INFARCTED.
   Once tissue has died, it will begin to decay and this is called GANGRENE.

5. The Portal Vein, which carries large amounts of blood from the intestines to the liver, and the (caudal) Vena Cava which carries all the blood returning to the heart from the rear part of the body lie very close to the stomach. These veins become twisted and compressed, trapping a large amount of blood and preventing its return to the heart. Back pressure of the trapped blood in the tissues can lead to damage there.

6. The blood vessels to and from the **Spleen** run behind the stomach and may be compressed or even twisted as a result of the stomach twisting. This traps blood within the spleen, causing it to become engorged. This may lead to damage or even

death of the tissues of the spleen; in extreme cases the spleen may rupture. Trapping of blood within the spleen further reduces the amount of blood returning to the heart.

7. As increasing amounts of blood become trapped in the rear part of the body, the amount of blood returning to the heart and available to transport oxygen and other nutrients around the body is reduced. This is called **Hypovolaemia**.
The body can compensate for hypovolaemia by increasing the heart rate, constricting blood vessels and reducing the blood supply to non-critical areas.

   If the hypovolaemia persists and worsens, the compensatory mechanisms will not be able to cope and the blood flow to vital organs (heart, brain, kidney, liver, lungs) will drop below a critical level. This is **Hypovolaemic Shock**, and is rapidly fatal if not treated.

8. Lack of oxygen to the pancreas, **Pancreatic Hypoxia**, causes the release of a chemical called Myocardial Depressant Factor. This reduces the pumping efficiency of the heart, and so works against some of the compensatory mechanisms for hypovolaemia.

9. Tissues that are damaged, either as a result of back pressure or as a result of ischaemia, release toxic substances known as **Tissue Toxins**.

   The intestines contain millions of bacteria, some of which produce dangerous chemicals known as *Bacterial Toxins*. Normally, bacteria are confined to the intestine and cause no problems. Once the lining of the intestine becomes damaged, bacteria and their toxins can escape into the circulation.

   Both of these types of toxins can initiate a sequence of chemically controlled events which cause shock (and work in opposition to the compensatory mechanisms described above). This is **Toxic Shock** and is rapidly fatal if not treated.

10. Prolonged shock, of whatever type, will eventually lead to death as the supply of oxygen and nutrients to vital organs reaches a critical level and they cease to function. There is a 'point of no return' after which organ and tissue damage become so extensive, no recovery is possible.

WHAT CAUSES GDV?

The key events seem to be accumulation of gas and 'failure of the normal mechanisms of stomach emptying'. Swallowed air is normally 'burped' back up or passes harmlessly on through the intestine. In GDV this does not seem to be the case but the reason is not understood. It is probably due to the interaction of several factors.
Several possible contributory causes have been suggested in the past, the following information reflects current thinking and research:-

- No particular food has been found to increase the risk of GDV.
  It has been suggested that some Soya-based and dry cereal based food may ferment, but this should not be a problem in normal dogs.

- There is no difference in the rate the stomach empties after a meal of canned, meat

based food; dry cereal based food or dry cereal based food mixed with water.
Recent studies suggest that Gastrin, a hormone which influences the contraction of muscles in the stomach wall (**Gastric Motility**), does not play a significant part in the development of GDV.
Delayed emptying of the stomach is not now thought to be an important cause of GDV.

- GDV may be more likely in dogs which eat very rapidly.

- Dogs which swallow large amounts of air while eating or drinking are more at risk of developing GDV.

- 'Windy' dogs ('gassing guts') are especially susceptible to GDV.

- GDV may be more likely in dogs who drink large amounts of water after a meal of dry food.

- The ligaments which hold the stomach in place are fairly weak and may become stretched if large volumes of food and/or fluid are eaten regularly. If this happens, the stomach may become more mobile and more likely to twist . In susceptible dogs, this may increase the risk of GDV.

- GDV can occur after eating only a small amount of food e.g. a titbit, opportunistic snatching of food from another dog, following kitchen
accidents etc. GDV has also been seen in hospitalised dogs that have fasted for over 24 hours.

- Dogs that eat rotting meat may be at risk of GDV, as it may contain gas and toxin producing bacteria.

- Strenuous exercise shortly before or after feeding increases the risk of GDV. However, gentle walking is thought to be safe as it stimulates normal gastrointestinal activity.

- Dogs that jump around in excitement when anticipating food are at increased risk of GDV.

- Stress is increasingly thought to be a significant contributing factor for the development of GDV.

- What constitutes a stressful situation varies from dog to dog, but the following are possibilities :

  Moving house, illness, death (human or fellow dog), long car journeys, dog shows, boarding kennels, visits to the vet, thunderstorms, fireworks, holidays, a new dog, dogs in proximity to bitches in season etc.

- The incidence of GDV increases in hot weather, possibly due to thirsty dogs drinking large amounts or water.

- The role of the musculature of the stomach in GDV and factors affecting its motility are currently being studied.

- Part of the nerve supply to the stomach is carried in a major nerve called the Vagus nerve. If this nerve supply is damaged, gastric motility may be reduced thus predisposing to GDV.

- There may be a familial tendency for weak gastric ligaments.

- There is no hard evidence that heredity plays an important role beyond that described as a familial tendency.

- Conformation is being studied to determine the relevance of chest width/depth ratio.

WHAT ARE THE SYMPTOMS AND SIGNS OF GDV?

Early recognition of symptoms is a major factor in successful treatment of GDV.

Not every dog will exhibit all of these symptoms and signs.

In particular, abdominal swelling is <u>not</u> always obvious.

A dog may pass from early GDV to the terminal stages in as little as six hours or less.

GDV is divided into three phases :-

PHASE I

The stomach is dilating, but may not have twisted yet.

The earliest signs are anxiety and restlessness - the dog may be unable to settle, changing position from standing to lying to sitting and back without relaxing; pacing; stretching; looking at the abdomen; salivating; whining.

The dog may attempt to vomit every 10 to 20 minutes, but brings nothing up. Conversely he may vomit up white, frothy saliva resembling whisked egg white, undigested or partially digested food is rarely seen.

If the dog eats or drinks anything, it will be vomited back covered in white froth.

There may be abdominal fullness and the back may be arched.

PHASE II

The stomach has now twisted and 'shock' will start to develop

The dog is now very restless; whining; panting; salivating copiously.

He may stand with front legs apart, head down.
He is now trying to vomit every 2 to 3 minutes.

The abdomen is enlarged and tight and sounds hollow when tapped

The gums are dark red.

The heart rate is raised to 80 - 100 beats per minute.
(Normal is 60 - 75 beats per minute).

The temperature may be raised, sometrimes as high as104^{o}F (??^{o}C).
(Normal is ??^{o}F or ??^{o}C).

PHASE III

'Shock' is well developed and death is imminent.

The gums are white or blue.

Breathing is shallow.

The dog is either unable to stand or stands shakily, with the legs spread.

The abdomen is very enlarged.

The heart rate is over 100 beats per minute and the pulse is very weak.

The temperature drops to 98^{o}C.

WHAT DOES THE TREATMENT INVOLVE?

Treatment for GDV involves :-

1. DECOMPRESSION OF THE STOMACH.

   Careful release of the pressure in the stomach may prevent volvulus in a dog presenting with dilatation alone.
   If volvulus has already occurred, decompression will restore the circulation, reduce shock and improve the blood supply to the stomach wall.
   The vet will attempt to release the accumulated gas by passing a tube into the stomach. This is usually done with the dog in the sitting position, preferably without sedation. Following decompression, the stomach is usually washed out. If it is not possible to pass a tube, the gas may be released by passing a large bore needle through the abdominal wall and into the dilated stomach. A further attempt to pass a stomach tube should then be made.

2. PREVENTION / ALLEVIATION OF SHOCK AND STABILISATION OF THE CIRCULATION.

   This should be carried out as early as possible and should not be delayed if decompression proves difficult .
   It is important that shock is treated before surgery is begun, as administering an

anaesthetic to a shocked animal is extremely dangerous.
The treatment of shock involves administration of:-

- intravenous fluids via a drip, to increase the blood volume and correct any abnormalities in blood chemistry,
- antibiotics to combat infection
- corticosteroids to combat the effects of shock.
- oxygen to increase the oxygen level in the blood and hence the tissues.
- drugs to improve the efficiency of the heart and stabilise the pulse.

3. SURGERY.

This is required to :-

- Reposition the stomach. Once the stomach is untwisted, a tube is passed and the stomach is gently washed out. Opening the stomach to remove the contents is usually avoided because of the risk of abdominal contamination.
- Assess damage to the spleen and remove it if necessary.
- Remove any dead tissue in the wall of the stomach.
- Suture the stomach to the abdominal wall to help prevent further episodes of volvulus.

4. POSTOPERATIVE CARE

Although surgery will remove the fundamental cause of shock, the body will suffer from its after-effects for several days and so care of the dog over this time is very important.

- The heart rate and efficiency of the heart should be monitored for 48 hours after surgery.
- Antibiotics may be prescribed, especially if part of the stomach wall was badly damaged (necrotic).
- The temperature should be monitored as a guide to the possible development of infection.
- The intestine will 'shut down' for a variable period and so fluid will need to be given intravenously.
- Once the intestine starts to function again, usually after 24 - 48 hours, small amounts of fluid can be given by mouth.
- If the dog regurgitates this fluid, the vet will stop giving it and try again a few hours later.
- The amount of fluid given can be gradually increased until the drip is no longer required.
- If fluid and gas accumulate in the stomach, the vet may need to decompress it again using a stomach tube.
- Occasionally it may be necessary to give a drug to stimulate the stomach to empty.
- Once fluids are accepted without problem, a liquid diet can be introduced.
- Normal diet should be re-introduced gradually, but given as frequent, small meals.
- Careful nursing in a quiet place, heated to a comfortable temperature for the dog is extremely important. A toilet area must be provided close to the dog's bed, indoors if necessary.

WHAT SHOULD I DO IF MY DOG DEVELOPS GDV?

GDV is always fatal unless recognised quickly and treated, without delay, by a vet who is familiar with the condition.

You can take steps to increase your dog's chance of recovering from GDV before he even gets it.

- ► Ensure your vet offers **24 hour emergency cover**, and that you can reach the surgery within a **maximum of 20 minutes**.

- ► **Discuss GDV** with your vet and remind him that **Newfoundlands are susceptible**. Get him to show you how to measure your dog's pulse and check for early signs of shock.

- ► Find out if your vet would be happy for you to administer a dose of antacid to your dog if he develops Phase I GDV.

- ► Get to know your dog and **be alert** to any changes in behaviour that may indicate early GDV.

- ► Follow the list of preventative measures below.

GDV should always be treated as a veterinary emergency in which **every second counts** - gastric dilatation, even in the absence of volvulus, is a life threatening condition.

If GDV strikes, the life of your dog will depend on your ability to recognise the symptoms very quickly, so study them carefully and keep the quick reference guide in the centre pages somewhere prominent for easy reference.

*If your dog starts to show symptoms and signs of **PHASE I GDV***

- ► Call your vet, explain what you suspect and why.

- ► Administer antacid but only if your vet has previously indicated approval and doing so will not cause any delay in getting to the surgery.

- ► **Take the dog to the vet without delay.**

*If your dog shows symptoms and signs of **PHASE II GDV***

- ► Get someone to call your vet on your behalf and explain that you are en route with a GDV emergency.

- ► **Take the dog to the vet without delay**.

If your dog shows symptoms and signs of ***PHASE III GDV***

- ► Get someone to call your vet on your behalf and explain that you are en route with a GDV emergency.

- ► **Take the dog to the vet without delay**.

- ► Sadly, in the most severe cases, it may be too late to save his life, but the vet will be able to alleviate further suffering.

HOW WILL THE VET DIAGNOSE GDV?

Your vet will rely on :-
- Your description of what has happened so far - the history.
- The appearance of the dog - distressed with a distended abdomen.
- Signs of shock - rapid, weak pulse.

He may perform an X-ray to confirm the diagnosis, but only if it will not delay treatment unduly.

WHAT ARE THE CHANCES OF MY DOG RECOVERING FROM GDV?

Full-blown GDV is always fatal unless treated, but some dogs may dilate without going on to develop volvulus, and recover without treatment.
Estimates vary, but between 15% and 68% of dogs that develop GDV will die even with treatment.

Older dogs that develop GDV are more likely to die from it than younger ones.

Dogs that are severely shocked, who have undergone some necrosis of the stomach wall or who require removal of the spleen are all more likely to die.

WILL MY DOG GET GDV AGAIN?

Recurrence is common, especially in older dogs, and further attacks may occur quite soon after the initial episode.
If the stomach is sutured to the abdominal wall to prevent it twisting in future (**Gastropexy**), the likelihood of recurrence is greatly reduced. Dogs that do dilate after gastropexy are much less likely to undergo volvulus. (This has been shown in at least three
Dogs that dilate, then recover without undergoing volvulus are very likely to have full-blown GDV at some point.

WHAT IS BEING DONE TO IMPROVE UNDERSTANDING OF GDV?

Research into GDV is being carried out in many places. Among others, at Purdue University in the USA, the 'Canine Gastric Dilatation-Volvulus Research Program' looks into many aspects of GDV and produces a regular newsletter detailing their progress.

HOW CAN I REDUCE THE CHANCE OF MY DOG GETTING GDV OR DYING FROM IT?

1. Feed your dog good quality food.

2. Do not feed ONE large meal. Divide the day's ration into two or even three meals and space them well apart. If possible, ensure someone keeps an eye on the dog for at least one hour after a meal.

3. If you feed a dry food, soak it well beforehand.

4. If your dog gulps food or eats very quickly, try the following methods of slowing them down :
    a. Place several large smooth pebbles (too big to be swallowed) on top of the food in the bowl. The dog will have to push them aside before each mouthful.
    b. Divide the food between the holes of a muffin tin.
    c. Put a pool of yoghurt under the food. Yoghurt fans push the food aside to get at it, taking in small amounts of food along the way.
    d. Feed by hand.

5. If there is a 'competition' element in the speed two or more dogs eat, try feeding them separately or in separate rooms.

6. Do not allow your dog to drink large quantities at one time, especially after a meal.

7. Avoid vigorous exercise for one hour before and two hours after a meal.

8. Avoid feeding before or during stressful or exciting situations. If appropriate, wait for at least an hour after the stress or excitement has ceased before feeding.

9. If you change your dog's food, introduce the new one gradually over a 3 to 5 day period.

10. Teach your dog a command to stop him gobbling up any food you may accidentally drop on the floor.

11. Avoid leaving your dog for long periods without checking on him.

12. If your dog sleeps in an area remote from you, get a baby monitor and position it so you can hear if he becomes distressed during the night.

13. Study the symptoms of GDV, especially the early ones and be alert for any changes in your dog's behaviour.

14. Establish a good relationship with your vet and discuss GDV with him. Show him this booklet and point out the references at the end.

REFERENCES :

1. L. T. Glickman *et al.*: *J. Am. Vet. Med Assoc*. 204(9):1465-1471, 1994.

2. Article : GDV Research Project. Norbern News. Dec 1997.

3. Article : Canine Bloat. Newsletter of the Scottish Bernese Mountain Dog Club. Dec. 1997.

4. R. H. Schiable *et al.*: *J. Am. Animal Hosp. Assoc*. 33; 379-383, 1997.

5. Bloat Notes. News from the Canine Gastric Dilatation-Volvulus Research Program. Purdue University. (This is available on the internet, linked to : http://www.vet.purdue.edu/depts/vad/cae)

6. A. V. Eggertsdottr *et al.:Acta Vet. Scand*. 37(4); 415-426, 1996.

7. A. Meyer-Lindenberg et al.: J. Am. Vet. Med Assoc. 203(9): 1303-1307, 1993.

ACKNOWLEDGEMENTS :

The information in this booklet has been gleaned from the following articles:

Bloat Notes. News from the Canine Gastric Dilatation-Volvulus Research Program. Purdue University.

Article : GDV Research Project. Robert Duquette. Norbern News. Dec 1997.

Article : Gastric Bloat by John M. Williams, MA, VetMb, CertVR, FRCVS. Norbern News. Dec 1997.

Article : Canine Bloat by Joy Sinclair. Newsletter of the Scottish Bernese Mountain Dog Club. Dec. 1997.

Gastric Torsion by Helen Hein, PhD, BVMS, MRCVS, 1986. Published by :

Elaine Mountford, October 1998.