

MORTALITY OF PATIENTS PRESENTED FOR GASTRIC DILATION-VOLVULUS IN EMERGENCY PRACTICE IN THE UNITED KINGDOM

Ava M Firth, BS DVM MVS MANZCVS DACVECC
Vets Now, Dunfermline, Scotland, United Kingdom

INTRODUCTION

Though the last 25 years have seen great advances in veterinary emergency and critical care, gastric dilation-volvulus (GDV) syndrome continues to test the mettle of emergency clinicians around the world. Factors such as the presence of arrhythmias, increased lactate and presence of gastric necrosis all serve to increase the perioperative mortality of GDV and have been well-described. Various aspects of treatment have also been investigated, such as the methods of decompression, methods of gastropexy and the use of lidocaine in treatment of arrhythmias.

However, a meta-analysis of the literature reveals certain knowledge gaps regarding GDV. The gaps may be roughly divided into two categories: (1) those factors which are relevant to primary or emergency clinic practitioners, namely incidence of gastric dilation (GD) versus GDV, and mortality rates at each stage of treatment, and (2) those factors which are most relevant to the owner, namely recognition of clinical signs and breed predisposition.

GD vs GDV

It would be helpful for owners and emergency clinicians to know the likelihood of a gastric dilation (GD) compared to a GDV. Two studies have published information on the percentage of patients that had GD compared to those which had GDV. Brockman et al ¹reported a 23% (66/295) of GD vs GDV, while Zatloukal ² 2005 reported a 9.8% (17/173) incidence of GD vs GDV.

OVERALL MORTALITY

Most of the mortality rates published in the veterinary literature are based upon referral populations, which by definition are pre-screened. No information exists on what percentage of patients presenting with GD/GDV actually die or are euthanised at the time of initial consultation with their primary veterinary practitioner and before referral. This data gap is likely to skew the mortality data for all GD/GDV patients. The size of this gap would be helpful information that could give the veterinary profession and owners a more realistic view of the mortality associated with this condition.

Based on a meta-analysis of nine large case series dating back to 1980, the overall mortality rate for GDV varies from 10% to 33.3% (Table 1). Eight of these nine reports were based upon referral patient populations. Seven of these eight reports were in the USA, as well as one case series from Czech Republic and one case series from Israel. Only one of the referral-setting studies² reviewed reported any information regarding the euthanasia rate at time of presentation. Of the 156 patients presented for GDV in that study, 19 (12.1%) did not proceed with treatment (3 dead, 16 other co-morbidity) .

Table 1. Comparison of GD and GDV studies, sorted by initial year of study

Study	Case Years	n	GD/GDV	Setting	Country	% Mortality overall of GDV
Glickman ³ JAVMA 1994	1980-1989	1934	GDV only	12 university teaching hospitals	USA	33%
Brockman ¹ JAVMA 1995	1986-1992	295	66 GD/193 GDV, 36 unconfirmed GD	University teaching hospital	Pennsylvania, USA	15%
Brouman ⁴ JAVMA 1996	1988-1993	137	GDV only	Univ and private mixed	USA	18%

Glickman ⁵ JAVMA 1998	1991-	136	GDV only	27 uni and private clinics	USA	24.3%
Beck ⁶ JAVMA 2006	1992-2003	166	GDV only	University teaching hospital	Colorado, USA	16.2%
Zatloukal ² ActaVetBrno 2005	1997-2001	173	17 GD/ 156 GDV	University teaching hospital	Czech Republic	23.6%
Buber ⁷ JAVMA 2007	1997-2005	112	GDV only	University teaching hospital	Israel	26.8%
Mackenzie ⁸ JAAHA 2010	2000-2004	306	GDV only	Private referral hospital	Ohio, USA	10%
Green ⁹ JVECC 2011	2003-2007	84	GDV only	Private referral teaching hospital	Wisconsin, USA	12

REFERRAL V PRIMARY EMERGENCY CLINIC SETTING

The outcome of GD/V cases when managed in non-referral clinics has not previously been investigated. To the best of this author's knowledge, only one study⁵ has reported mortality rates for cases drawn from a network of emergency clinics and primary veterinary clinics. This study reported a 24.3 % mortality. It would be useful to investigate the risk factors, factors influencing outcome, and overall survival and prognosis for GD/V patients in a primary emergency clinic setting.

Factors specific to the primary emergency clinic that could negatively influence the outcomes of GDV include a lower level of staffing and lack of specialist qualifications in Emergency & Critical Care or Surgery. Generally, referral institutions have higher staffing levels in contrast to many emergency clinics (particularly in the UK) which often have only one vet and one nurse on duty after-hours. Another factor that could hypothetically influence the outcomes is the level of technical expertise at the veterinary clinic. In the UK particularly, emergency clinic veterinarians generally do not have specialist-level qualifications. On the other hand, factors that could favourably influence the outcomes in primary emergency clinics are a streamlined infrastructure and a focus on quick results. Also, emergency clinic staff may have experience with a relatively higher proportion of caseload that consists of immediate and life-threatening conditions, in comparison to a referral surgery caseload. It is also hypothetically possible that the travel time to a (local) emergency clinic is shorter than the travel time to a referral hospital, which would decrease the duration of clinical signs prior to treatment.

DURATION OF CLINICAL SIGNS

At least three studies have reported that the duration of clinical signs is significantly lower for survivors compared to non-survivors of GDV. Zatloukal² reported that duration of clinical signs was significantly lower for survivors compared to non-survivors (3.24 h +/- 3.1 h for survivors, vs 5.12 +/- 4.12 h for non-survivors, $P < 0.05$). Buber⁷ also showed that a duration of clinical signs ≥ 5 h was associated with a 46% mortality, compared to an 11.3% mortality for patients with clinical signs of less than 5 h duration. Beck et al ⁶ showed that dogs with clinical signs for more than 6 h prior to admission had significantly increased risks of arrhythmias and increased requirements for partial gastrectomy and splenectomy.

In the largest published study of 306 GDV patients,⁸ it was reported that the duration between clinical signs and admission and the duration between admission and surgery was found to have no statistical significance on the rates of survival in GDV. However, closer examination of their data shows the duration of clinical signs ranged from 2 to 12 h, with a median of 6 h. The time between admission and surgery ranged only from 15 to 300 minutes, with a median of 60 minutes. Both of these are in fact quite narrow ranges.

While surgical and medical expertise has undoubtedly improved, the factor that provides the most opportunity for improvement is duration of clinical signs (as noticed by the owner) to presentation. Logically, owner education provides the largest opportunity for improving the outcomes of GD/V patients.

Studies also show that the duration between presentation and surgery will affect rates of survival. The faster surgical correction is performed, the lower the mortality of the cases seen.^{5,8} Presence of some conflicting literature on this topic suggests that more investigation is required to confirm the relationship between time to surgery and survival. A likely source of error is the inconsistency in definitions of 'duration of clinical signs', 'arrival' and 'surgery start time'. It would also be useful to know if any decompression techniques had been employed, as a lack of decompression is likely to impact upon venous return, systemic perfusion and organ ischaemia. The true relationship between these factors could be used to give clinicians an idea of the critical periods of treatment. This knowledge could then be used to alter appropriate treatment.

BREEDS AFFECTED

Several studies have published data that suggests that large or giant breeds, particularly those with deep chested conformation are most frequently affected.^{1,3,10,11} Breeds such as the Great Dane, Weimaraner, Saint Bernard, Gordon Setter, Irish Setter, Rottweiler, and the Standard Poodle all feature heavily in published studies. In the UK, a large postal survey of purebred dog owners (15,881 dogs) identified bloodhound, Grand Bleu de Gascogne, German longhair pointer, Neapolitan mastiff, otterhound, Irish setter and Weimaraner to be at greatest risk of GDV morbidity and mortality.¹² No data on German shepherds was reported in this study.

However, German Shepherds were the most frequently affected in three of the major studies^{1,7,8} and the second most frequently affected in a fourth study⁹. This is likely a reflection of the prevalence of German shepherds in the population at large, but nevertheless presents a significant opportunity for owner education.

Recently, a retrospective study was performed to examine the characteristics and mortality outcomes of GD/V patients presenting to primary after-hours emergency clinics in the UK.¹³ Case records of 574 dogs were reviewed for information on breed, gender, length of clinical signs prior to admission, times of admission, diagnosis, surgery and discharge, details of surgery and survival.

Of the 574 cases seen, 357 (62%) had confirmed cases of GDV, 139 (24%) had GD and 77 (13.4%) were unconfirmed. Of the 497 dogs with confirmed GD or GDV, 4.4% (22/497) died and 26% (130/497) were euthanised at the time of admission. However, for those patients whose owners elected to proceed with treatment and surgery, the mortality rate to discharge was 17.9%.

The breeds with the highest number GD or GDV with were found to be (in descending order); German Shepherd Dog (102), Weimaraner (69), Great Dane (34), Crossbreeds (28), Boxer (27) and Labrador Retriever (26).

Using 77 cases of GDV in which there were very clear timestamps in the record, it was possible to construct Kaplan-Meier survival curves which showed that survival decreased to less than 50% if the duration of clinical signs was greater than 3.3 h.

REFERENCES

1. Brockman DJ, Washabau RJ, Drobatz KJ. Canine gastric dilatation/volvulus syndrome in a veterinary critical care unit: 295 cases (1986-1992). *J Am Vet Med Assoc* 1995;207:460-4.
2. Zatloukal J, Crha M, Lexmaulová L et al. Gastric Dilatation-Volvulus Syndrome: Outcome and Factors Associated with Perioperative Mortality. *Acta Vet Brno University of Veterinary and Pharmaceutical Sciences*, 2005;74:621-631.
3. Glickman L, Glickman N, Perez C et al. Analysis of risk factors for gastric dilatation and dilatation-volvulus in dogs. *J Am Vet Med Assoc* 1994;204:1465-1471.

4. Brouman JD, Schertel ER, Allen DA et al. Factors associated with perioperative mortality in dogs with surgically managed gastric dilatation-volvulus: 137 cases (1988-1993). *J Am Vet Med Assoc* 1996;208:1855–8.
5. Glickman LT, Lantz GC, Schellenberg DB et al. A Prospective Study of Survival and Recurrence Following the Acute Gastric Dilatation-Volvulus Syndrome in 136 Dogs. *J Am Anim Hosp Assoc* 1998;34:253–259.
6. Beck JJ, Staatz AJ, Pelsue DH et al. Risk factors associated with short-term outcome and development of perioperative complications in dogs undergoing surgery because of gastric dilatation-volvulus: 166 cases (1992-2003). *J Am Vet Med Assoc* 2006;229:1934–9.
7. Buber T, Saragusty J, Ranen E et al. Evaluation of lidocaine treatment and risk factors for death associated with gastric dilatation and volvulus in dogs: 112 cases (1997-2005). *J Am Vet Med Assoc* 2007;230:1334–1339.
8. Mackenzie G, Barnhart M, Kennedy S et al. A Retrospective Study of Factors Influencing Survival Following Surgery for Gastric Dilatation-Volvulus Syndrome in 306 Dogs. *J Am Anim Hosp Assoc* 2010;46:97–102.
9. Green TI, Tonozzi CC, Kirby R et al. Evaluation of initial plasma lactate values as a predictor of gastric necrosis and initial and subsequent plasma lactate values as a predictor of survival in dogs with gastric dilatation-volvulus: 84 dogs (2003-2007). *J Vet Emerg Crit Care* 2011;21:36–44.
10. Glickman LT, Glickman NW, Schellenberg DB et al. Incidence of and breed-related risk factors for gastric dilatation-volvulus in dogs. *J Am Vet Med Assoc* 2000;216:40–5.
11. Ward MP, Patronek GJ, Glickman LT. Benefits of prophylactic gastropexy for dogs at risk of gastric dilatation–volvulus. *Prev Vet Med* 2003;60:319–329.
12. Evans KM, Adams VJ. Mortality and morbidity due to gastric dilatation-volvulus syndrome in pedigree dogs in the UK. *J Small Anim Pract* 2010;51:376–81.
13. Todd A, Dunning MD, Firth AM. Mortality Rates of Gastric Dilation-Volvulus in Private Emergency Practice in the United Kingdom. *J Vet Emerg Crit Care* 2013;23:S26.